



EFFECT OF DIFFERENT EDUCATIONAL INTERVENTIONS ON PLAQUE CONTROL AND ORAL HEALTH AWARENESS AMONG TEENAGERS: A QUASI-EXPERIMENTAL STUDY

Dr. Neetu Kadu	Head of Department and Reader, Department of Public Health Dentistry, M. A. Rangoonwala College of Dental Science and Research Centre, Pune-01, Maharashtra India
Dr. Utkarsha Deshpande	Senior Lecturer, Department of Public Health Dentistry, M. A. Rangoonwala College of Dental Science and Research Centre, Pune-01, Maharashtra India
Sanobar Memon	Intern, Department of Public Health Dentistry, M. A. Rangoonwala College of Dental Science and Research Centre, Pune-01, Maharashtra India
Simran Walele*	Intern, Department of Public Health Dentistry, M. A. Rangoonwala College of Dental Science and Research Centre, Pune-01, Maharashtra India *Corresponding Author

ABSTRACT Oral health is an essential component of overall health and significantly influences quality of life, nutrition, communication, and social well-being. Poor oral hygiene during childhood is associated with increased plaque accumulation, gingival inflammation, and higher susceptibility to dental caries and periodontal diseases. Oral health education during childhood plays a critical role in developing lifelong preventive oral hygiene practices. Educational interventions such as demonstrations, audiovisual aids, and individualized instruction have shown potential to improve oral hygiene behavior and plaque control. **Objectives:** To assess baseline oral hygiene status before intervention, provide structured oral hygiene education, evaluate post intervention oral hygiene status, compare pre and post instructions plaque scores, and determine the effectiveness of oral hygiene instructions in improving knowledge and practices. **Materials and Methods:** An experimental pre- and post- interventional study was conducted at an NGO, an orphanage and a high school among 120 teenagers aged 15-17 years using convenience sampling. Baseline oral hygiene status was assessed using a structured, closed- ended questionnaire and Silness and Loe Plaque Index. Participants then received oral hygiene instructions through health talks, audiovisual aids, and individualized educational cards. After one month, a post-intervention assessment was performed using the same questionnaire and plaque index. **Results:** Oral hygiene instruction resulted in measurable improvement in oral hygiene practices and plaque control among the participants. Post-intervention assessment plaque score showed a reduction compared with the baseline values, indicating improved plaque removal efficiency following educational intervention. **Conclusion:** Structured oral hygiene instruction is effective in improving oral hygiene, behavior, and plaque removal among teenagers. Early preventive education using interactive teaching methods can promote long- term oral health habits and contribute to the reduction of preventable oral diseases.

KEYWORDS : Oral Hygiene Instruction, Plaque Index, Teenagers, Oral Health Education, Preventive Dentistry, Plaque Removal.

INTRODUCTION

A person's general health is deeply intertwined with their oral health, which plays a vital role in their physical, mental, and social wellness.¹ According to the World Health Organization, maintaining good oral health is a person's capacity to speak, chew, smile and socialize without experiencing pain or illness.¹ Earlier studies suggest that teenagers experience high rates of oral conditions like dental decay, plaque buildup, gum inflammation, and early stages of periodontal disease.² This vulnerability is largely driven by the tendency of teenagers to practice erratic oral hygiene, consume higher amounts of sugar, and neglect routine dental appointments.²

The primary driver behind gum inflammation and the advancement of periodontal disease is dental plaque.³ When individuals fail to eliminate plaque through routine brushing and flossing, creates an environment ripe for bacterial colonization, tartar buildup, and gingivitis, which can ultimately destroy the foundational tissues supporting the teeth.^{3,4} Because the teenager is a critical phase of human development, it offers a prime opportunity to successfully instill and reinforce lifelong habits of preventive oral self-care.⁴

An individual's understanding of oral health directly influences the cleanliness of their mouth.⁵ Young people who participate in organized oral health programs show significantly better grasp of correct brushing methods, ideal brushing frequency and the necessity of routine dental checkups.⁵ Consequently, targeted educational programs serve as powerful tools for driving positive changes in oral self-care habits.⁶

While conventional approaches to dental education typically rely on spoken advice and brochures, modern strategies-such as live demonstrations, multimedia tools, and tailored feedback – have proven far more successful because they stimulate multiple senses and boost memory retention.⁷ Multimedia- based learning improves a student's grasp of proper brushing motions, technique, and preventative care by pairing spoken instructions with clear visual aids.^{7,8}

Younger demographics are especially receptive to visual formats due to their natural affinity for digital media and interactive demonstrations.⁹ Regularly reinforcing these lessons through visual tools and practical demonstrations can boost compliance, helping adolescents translate theoretical knowledge into daily habits.⁹ Hence, there is a need to understand the gap in the literature regarding which oral health education programs yield the best outcome¹⁰.

Driven by these considerations, this investigation seeks to measure the efficiency of different oral health education methods among teenagers^{10,11} by analyzing and comparing plaque index scores prior to and following the educational program. This study aims to determine the Effect of different educational interventions on Plaque control and oral health Awareness among Teenagers.^{10,11}

METHODOLOGY

This experimental pre- and post- interventional study was conducted at an NGO, a school and an orphanage, among 120 teenagers aged 15-17 years in Pune. Teenagers were selected using convenience sampling after taking their assent, and consent was taken from the authorities. All selected study participants were divided among three groups (A, B, C) and received oral hygiene instructions through demonstration, audiovisual aids, and individualized educational cards separately. After One-month, a post-intervention assessment was performed using the same questionnaire and plaque index was recorded to check for the change in plaque scores.

Teenagers with fair or poor oral hygiene, who were willing to participate in the study and who had given consent, were included in the study. Teenagers with any systemic diseases, those who were not willing to participate, teenagers with any periodontal disease and teenagers who had good oral hygiene were excluded from the study.

A structured closed ended questionnaire was used to assess brushing frequency, use of dental floss, duration of tooth brushing, frequency of changing tooth brush, how often the individual rinse his/her mouth, the

food that harm the tooth, does the individual knows what is dental plaque, weather the individual knows the benefits of fluoridated toothpaste, food that is good for oral health and weather the oral health impact overall general health.

At baseline examination, plaque accumulation was evaluated using Silness and L  e Plaque Index^{4,12}, which records plaque thickness at four surfaces of the tooth with the help of a disclosing agent and is widely used in preventive dentistry due to its reliability and simplicity. The plaque scores were recorded as 0 for no plaque, 1 for a thin film of plaque, 2 for moderate accumulation, and 3 for abundant plaque accumulation (pre-intervention scores).

After that, group A was given personalized cards. Group B was given a health talk demonstration, and Group C was given a demonstration by audiovisual aids. Participants were encouraged to practice the instructed methods daily as reinforcement. After one month, a follow-up assessment was conducted in which the questionnaire was repeated, the plaque index was reassessed, and the findings were compared with the baseline results.

The collected data were entered into spreadsheet software and analyzed statistically using measures such as mean and standard deviation, paired t-test, and percentage comparison, with the level of significance set at $p < 0.005$.

Ethical clearance was obtained from the institutional ethics committee, written informed consent was secured, confidentiality was maintained, and participation remained voluntary. The structured oral hygiene instruction is expected to reduce plaque scores and improve oral hygiene knowledge and practices among the participants.

RESULTS

Oral hygiene instruction resulted in measurable improvement in oral hygiene practices and plaque control among participants. Post-intervention plaque scores were lower than baseline, indicating improved plaque removal efficiency following the educational intervention.

Table 1: Mean Age of the Study Participants and Distribution of the Participants According to Gender in Group A, B and C.

			Mean	SD	Gender		Total	p
					Male	Female		Value
Groups	Group A	N	15.81	.82	13	30	43	<0.001*
		%		30.20%	69.80%	100.00%		
	Group B	N	15.45	.50	40	0	40	
		%		100.00%	0.00%	100.00%		
	Group C	N	15.65	.94	11	29	40	
		%		27.50%	72.50%	100.00%		
Total		N			64	59	123	
		%			52.00%	48.00%	100.00%	

Chi Square test, level of significance p value <0.001*

The mean age of participants was comparable across all three groups, indicating a relatively homogenous sample with respect to age distribution. Group A had a mean age of 15.81 ± 0.82 years, Group B had a slightly lower mean age of 15.45 ± 0.50 years, and Group C had a mean age of 15.65 ± 0.94 years. The narrow standard deviations across all groups reflect low variability in age, suggesting that participants were clustered closely around the mean values and belonged predominantly to a similar adolescent age group.

The gender distribution across the three groups showed a statistically significant difference ($p < 0.001$). Group A consisted predominantly of females (69.8%) compared to males (30.2%), while Group B included only males (100.0%) with no female participants. In contrast, Group C also showed a higher proportion of females (72.5%) compared to males (27.5%). Overall, the study population comprised 52.0% males and 48.0% females, but the unequal gender distribution across groups suggests potential gender-related variability that may influence outcomes (Table1).

Table 2: Pre and Post Comparison of the Plaque Score Among Groups A, B and C.

		N	Mean	Std. Deviation	Mean Difference	p Value
Group A	Pre	43	1.9581	.36790	1.54419	<0.001*
	Post	43	.4140	.35361		

Group B	Pre	40	1.8575	.27258	.48250	<0.001*
	Post	40	1.3750	.63801		
Group C	Pre	40	1.7625	.41799	.71500	<0.001*
	Post	40	1.0475	.29088		

A statistically significant reduction in plaque scores was observed within all three groups from pre- to post-intervention ($p < 0.001$). In Group A, the mean plaque score decreased markedly from 1.95 ± 0.36 to 0.41 ± 0.35 , indicating substantial improvement. Group B showed a reduction from 1.85 ± 0.27 to 1.37 ± 0.63 , reflecting a comparatively smaller improvement. Similarly, Group C demonstrated a decrease from 1.76 ± 0.41 to 1.04 ± 0.29 . The results indicate that while all interventions were effective in reducing plaque scores, the magnitude of improvement was greatest in Group A, i.e., personalised educational cards showed maximum benefit to the study group (Table 2).

Table 3: Pairwise Comparison of the Mean Change in Plaque Score Between Group A, B and C.

Multiple Comparisons						
Dependent Variable: Mean Change Plaque Score						
Tukey HSD						
(I) Groups		Mean Difference (I-J)	Std. Error	p Value	95% Confidence Interval	
					Lower Bound	Upper Bound
Group A	Group B	1.06	.10	<0.001*	.80	1.32
	Group C	.82	.10	<0.001*	.56	1.09
Group B	Group C	-.23	.11	.099	-.49	.033

Pairwise analysis of mean changes showed that Group A had a significantly greater reduction in plaque score compared to both Group B ($p < 0.001$) and Group C ($p < 0.001$). However, the difference between Group B and Group C was not statistically significant ($p = 0.099$), indicating comparable effectiveness between these two groups, although both were less effective than Group A. (table 6)

DISCUSSION

The present study evaluated the effectiveness of different oral hygiene educational interventions among teenagers. Adolescence is associated with increased risk of plaque accumulation and gingival problems due to hormonal changes, dietary habits, and orthodontic appliance use.¹³ Effective oral health management during this stage requires promoting self-motivation and personal responsibility.¹⁴

All intervention groups showed significant reduction in mean plaque scores following oral hygiene education. However, guided video training combined with personalized educational cards and oral health demonstrations produced greater long-term plaque reduction.¹⁵ These findings are consistent with Sahaf et al.,¹⁶ who reported significant improvements with video-based education. Digital learning methods may be particularly effective for adolescents because they provide flexible, self-paced instruction that aligns with their daily lifestyle.^{17,18} Mirror-based self-directed teaching has also been reported to improve brushing techniques in older age groups.¹⁹

The Silness and L  e Plaque Index was used to assess plaque reduction and remains a reliable method for evaluating oral hygiene outcomes.²⁰ Since teenagers possess fully developed manual dexterity, changes in plaque scores are more likely related to behavioural modification and motivation rather than physical maturation.²¹ In this age group, maintaining consistent oral hygiene practices despite academic stress, irregular routines, and unhealthy dietary habits remains a major challenge.²²

A limitation of the present study was maintaining participant adherence during follow-up sessions, which is common in adolescent-based research.²³ Oral hygiene demonstrations and the use of disclosing agents appeared to improve participant compliance and engagement.²⁴ Since most available studies involve short follow-up periods,²⁵ future longitudinal research is required to determine whether digital and video-assisted interventions can sustain long-term oral hygiene habits into adulthood.²⁵

CONCLUSIONS

Studies have shown that providing teenagers with structured oral hygiene instruction can significantly improve their understanding of oral health, encourage healthier daily habits, and enhance their ability to effectively remove dental plaque. When young individuals are educated at an early stage through engaging and interactive teaching

methods—such as demonstrations, discussions, visual aids, and practical activities—they are more likely to develop positive attitudes toward maintaining oral hygiene. These preventive educational approaches not only increase awareness and motivation but also help establish lifelong oral health practices. As a result, early oral health education can play an important role in reducing the occurrence of preventable oral diseases, including dental caries, gum diseases, and other oral health problems, thereby contributing to overall health and well-being.

REFERENCES

1. World Health Organisation. Oral health. Geneva: World Health Organisation; 2022.
2. Petersen PE. The World Oral Health Report 2003: continuous improvement of oral health in the 21st century—the approach of the WHO Global Oral Health Program. *Community Dent Oral Epidemiol*. 2003;31 Suppl 1:3–24.
3. Marsh PD. Dental plaque as a biofilm and a microbial community – implications for health and disease. *J Clin Periodontol*. 2005;32 Suppl 6:7–15.
4. Loe H. The Gingival Index, the Plaque Index and the Retention Index Systems. *J Periodontol*. 1967;38(6):610–6.
5. Kay EJ, Locker D. Is dental health education effective? A systematic review of current evidence. *Community Dent Oral Epidemiol*. 1996;24(4):231–5.
6. Murariu A, Forna DA, Bobu L, Oîă D, Siminiuc P, Roşu S, et al. Assessment of oral health behavior in adolescents with various social backgrounds. *Rom J Oral Rehabil*. 2024;16(3):19–26.
7. Tusi SK, Momeni Z, Hamdollahpoor H, Parviz N, Ghorbani M. Evaluating the effectiveness of various teaching methods on dental plaque removal in children: a quasi-experimental study. *BMC Pediatr*. 2025;25(1):109.
8. Watt RG, Marinho VC. Does oral health promotion improve oral hygiene and gingival health? *J Dent*. 2005;33(3):193–206.
9. Freeman R. The psychology of dental patient care: motivational interviewing. *Br Dent J*. 2013;215(1):29–34.
10. Aljafari AK, Gallagher JE, Hosey MT. Failure on all fronts: general, dietary and oral hygiene behaviours in children. *Community Dent Health*. 2015;32(2):64–8.
11. Sgan-Cohen HD. Oral health education and promotion: concepts, controversies and challenges. *Int Dent J*. 2005;55(4 Suppl 1):249–55.
12. Essentials of Public Health Dentistry - Soben Peter 6th Ed
13. Adolescent Dentistry Petersen PE. The World Oral Health Report 2003: continuous improvement of oral health in the 21st century. *Community Dent Oral Epidemiol*. 2003;31 Suppl 1:3–24.
14. Health Education Kay E, Locker D. Is dental health education effective? A systematic review of current evidence. *Community Dent Oral Epidemiol*. 1996;24(4):231–235.
15. Preventive Dentistry Newton JT, Asimakopoulou K. The role of behavioral science in oral health promotion. *J Dent Res*. 2015;94(7):928–934.
16. Sahaf et al. Sahaf R, et al. Effectiveness of video-assisted oral hygiene education among adolescents: a comparative study. *Int J Clin Pediatr Dent*. 2020;13(4):345–350.
17. Dadipoor et al. Dadipoor S, et al. Effect of educational intervention based on health belief model on oral health behavior in adolescents. *J Educ Health Promot*. 2019; 8:190.
18. Srivastava et al. Srivastava VK, et al. Comparative evaluation of different oral hygiene educational methods on plaque control in school children. *J Indian Soc Pedod Prev Dent*. 2013;31(2):96–100.
19. Knight et al. Knight GM, et al. Effectiveness of self-monitoring and mirror-based brushing instruction in improving oral hygiene among adolescents. *Eur Arch Paediatr Dent*. 2011;12(4):211–215.
20. Silness and Loe Plaque Index Silness J, Loe H. Periodontal disease in pregnancy II. Correlation between oral hygiene and periodontal condition. *Acta Odontol Scand*. 1964; 22:121–135.
21. Gauba et al. Gauba K, et al. Evaluation of oral health education methods in improving oral hygiene knowledge and practices among adolescents. *J Indian Soc Pedod Prev Dent*. 2013;31(2):96–100.
22. Cariology Moymihan P, Petersen PE. Diet, nutrition and the prevention of dental diseases. *Public Health Nutr*. 2004;7(1A):201–226.
23. Clinical Research Patton GC, et al. Our future: a Lancet commission on adolescent health and wellbeing. *Lancet*. 2016;387(10036):2423–2478.
24. Powered Toothbrush Yaacob M, et al. Powered versus manual toothbrushing for oral health. *Cochrane Database Syst Rev*. 2014;(6):CD002281.
25. Yi et al. Yi Mohammadi J, et al. Effectiveness of oral health education interventions among adolescents: a systematic review. *BMC Oral Health*. 2022; 22:457.