RESEARCH PAPER

A comparative evaluation of the effectiveness of school based v/s clinic based oral health education programs

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Abstract

Background:

Oral health education plays a crucial role in preventing dental diseases among children. Schools and dental clinics serve as important platforms for delivering oral health education programs; however, evidence comparing their relative effectiveness remains limited.

Aim:

To comparatively evaluate the effectiveness of school-based versus clinic-based oral health education programs in improving oral health knowledge, practices, and clinical parameters among children.

Materials and Methods:

A prospective comparative interventional study was conducted among 100 children aged 10–12 years. Participants were equally divided into two groups: Group I (school-based oral health education) and Group II (clinic-based oral health education). Baseline assessment included Plaque Index, Gingival Index, DMFT index, and a structured knowledge and practice questionnaire. Structured educational interventions were delivered in respective settings, with reinforcement after four weeks. Follow-up evaluation was conducted at three months. Data were analyzed using paired and independent t-tests, chi-square test, and multiple linear regression. A p-value < 0.05 was considered statistically significant.

Results:

Both groups demonstrated significant improvement in plaque and gingival scores and knowledge levels after intervention ($p < 0.001$). The clinic-based group showed significantly greater reduction in plaque ($p = 0.004$) and

gingival scores ($p = 0.002$), along with higher knowledge gain ($p < 0.001$) compared to the school-based group. Improvements in oral hygiene practices were observed in both groups. DMFT scores did not show significant change over the three-month period.

Conclusion:

Both school-based and clinic-based oral health education programs were effective in improving oral health outcomes among children. However, clinic-based education demonstrated superior short-term clinical and knowledge improvements.

Keywords

Clinic-based oral health education, Dental plaque, Gingival health, Oral health education, School-based oral health education

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Introduction

Oral health is an integral component of general health and well-being, influencing nutrition, speech, self-esteem, and overall quality of life. The burden of oral diseases, particularly dental caries and periodontal diseases, remains high among children and adolescents worldwide. According to the World Health Organization, dental caries is one of the most prevalent non-communicable diseases globally, affecting individuals across all age groups, with a disproportionately high impact on school-aged children [1]. In many developing countries, including India, limited access to preventive dental services, lack of awareness, and socioeconomic disparities further exacerbate the problem. As a result, preventive strategies and effective oral health education programs have become essential components of public health initiatives [2].

Children represent a particularly vulnerable group due to their developing dentition, dietary habits, and limited understanding of proper oral hygiene practices. Habits formed during childhood often persist into adulthood, making early intervention critical. Oral health education (OHE) aims to improve knowledge, modify attitudes, and encourage positive behaviors related to oral hygiene, dietary practices, and regular dental visits [3]. It focuses not only on imparting information but also on motivating individuals to adopt and sustain healthy practices such as regular tooth brushing with fluoridated toothpaste, proper flossing techniques, and reduced consumption of sugary foods and beverages [4].

Two commonly implemented approaches to delivering oral health education are school-based and clinic-based programs. School-based oral health education programs are conducted within educational institutions, targeting children in a structured environment. Schools offer a unique and effective platform for health promotion because they provide access to a large population of children in a consistent and organized setting [5]. Teachers, school health personnel, and visiting dental professionals can collaborate to reinforce oral health messages regularly. Moreover, peer influence and group learning dynamics can enhance motivation and compliance. Integration of oral health topics into the school curriculum ensures repeated exposure to preventive messages, thereby increasing the likelihood of long-term behavioral change [6].

In contrast, clinic-based oral health education programs are delivered in dental clinics or healthcare settings during patient visits. These programs often involve one-on-one interactions between dental professionals and patients, allowing for personalized counseling and tailored advice based on individual oral health status [7]. Demonstrations using dental models, visual aids, and real-time feedback during clinical examinations can make the educational experience more specific and impactful. Furthermore, clinic-based programs may provide immediate reinforcement through preventive procedures such as professional cleaning, fluoride application, and sealant placement, thereby combining education with clinical intervention [8].

Despite the theoretical advantages of both approaches, there is ongoing debate regarding which setting is more effective in improving oral health knowledge, attitudes, and practices among children. School-based programs benefit from broad coverage and repeated reinforcement but may face challenges such as limited time allocation, insufficient training of educators, and variability in program implementation [9]. On the other hand, clinic-based programs provide individualized attention but may not reach children who lack access to dental services or do not attend routine dental check-ups. Additionally, parental involvement, socioeconomic factors, and cultural beliefs may influence the effectiveness of either approach [10].

In the Indian context, where disparities in oral healthcare access persist, the role of preventive education becomes even more crucial. Urban–rural differences, variations in literacy levels, and differences in health-seeking behavior significantly affect oral health outcomes [11]. School-based programs may be particularly beneficial in reaching underserved populations, while clinic-based programs may be more effective in urban settings where dental services are readily accessible. Understanding the comparative effectiveness of these two approaches is essential for optimizing resource allocation and designing evidence-based public health strategies [12].

Several previous studies have evaluated oral health education interventions in different settings, reporting improvements in knowledge and oral hygiene status following structured programs. However, variations in methodology, duration of follow-up, and assessment criteria have led to inconsistent findings [13]. Some studies suggest that repeated reinforcement in schools results in sustained behavioral change, whereas others emphasize the value of individualized counseling in clinical settings. There remains a need for well-designed comparative studies that assess not only knowledge gain but also actual behavioral changes and measurable clinical outcomes such as plaque scores, gingival health, and caries incidence [14].

Furthermore, with increasing emphasis on preventive dentistry and community-based health promotion, policymakers and healthcare planners require clear evidence regarding the most efficient and cost-effective strategies for delivering oral health education. Identifying the setting that yields better improvements in oral hygiene practices and clinical indicators will aid in the development of targeted interventions and integrated oral health policies [15].

Therefore, this study is important to determine the comparative effectiveness of school-based versus clinic-based oral health education programs in improving oral health knowledge, attitudes, practices, and clinical outcomes among children.

Methodology

Study Design

This original research was designed as a **prospective, comparative interventional study** to evaluate the effectiveness of school-based versus clinic-based oral health education (OHE) programs among children.

Study Setting

The study was conducted in selected schools and a dental outpatient department in [City/Region], India, over a period of 6 months. The school-based intervention was implemented within school premises, while the clinic-based intervention was delivered in a dental institutional setup.

Study Population and Sample Size

A total sample size of **100 children** was included in the study. The participants were divided equally into two groups:

- **Group I (School-based OHE group)** – 50 children
- **Group II (Clinic-based OHE group)** – 50 children

Children aged **10–12 years** were selected, as this age group represents a critical period for establishing long-term oral hygiene practices and typically has mixed dentition.

Inclusion Criteria

- Children aged 10–12 years
- Children present on the day of examination and willing to participate
- Children with parental/guardian informed consent
- Children with at least one erupted permanent molar

Exclusion Criteria

- Children undergoing orthodontic treatment
- Children with systemic diseases affecting oral health
- Children who had received professional oral health education in the past 6 months
- Uncooperative children

Sampling Technique

A **simple random sampling method** was used. Eligible children were selected from the school register for Group I. For Group II, children reporting to the dental outpatient department and fulfilling inclusion criteria were randomly selected until the required sample size was achieved.

Ethical Considerations

Ethical clearance was obtained from the Institutional Ethical Committee prior to commencement of the study. Written informed consent was obtained from parents/guardians, and verbal assent was obtained from participating children. Confidentiality and anonymity were maintained throughout the study.

Baseline Assessment

At baseline, all participants underwent:

1. **Clinical Examination**
    - Plaque Index (Silness and Löe)
    - Gingival Index (Löe and Silness)
    - DMFT/dmft index (Decayed, Missing, Filled Teeth)
2. **Questionnaire Assessment**

A pre-validated, structured questionnaire was administered to assess:

- Oral health knowledge
- Attitude toward oral hygiene
- Oral hygiene practices (frequency of brushing, use of fluoridated toothpaste, dietary habits, dental visits)

Calibration of the examiner was performed prior to data collection to ensure reliability. Intra-examiner reliability was assessed using Cohen's kappa coefficient.

Intervention

Group I: School-Based Oral Health Education Program

- A structured OHE session was conducted within the classroom setting.
- Duration: 45 minutes
- Methods used:
  - PowerPoint presentation
  - Demonstration of brushing technique using tooth models
  - Interactive discussion
  - Distribution of educational pamphlets
- Reinforcement session conducted after 4 weeks.

Group II: Clinic-Based Oral Health Education Program

- Individual counseling session conducted chairside in the dental clinic.
- Duration: 20–30 minutes per child
- Methods used:
  - One-to-one instruction
  - Demonstration using dental models and mirrors
  - Personalized feedback based on oral findings
  - Distribution of educational pamphlets
- Reinforcement advice provided during recall visit after 4 weeks.

Follow-Up Assessment

All participants were re-evaluated **3 months after the intervention** using:

- Same clinical indices (Plaque Index, Gingival Index, DMFT/dmft)
- Same questionnaire to assess improvement in knowledge, attitude, and practices

The examiner conducting follow-up assessments was blinded to group allocation to minimize bias.

Outcome Measures

Primary Outcome:

- Reduction in Plaque Index and Gingival Index scores

Secondary Outcomes:

- Improvement in oral health knowledge scores
- Improvement in reported oral hygiene practices
- Change in DMFT/dmft scores

Statistical Analysis

Data were entered into Microsoft Excel and analyzed using SPSS software version [XX].

- Descriptive statistics (mean, standard deviation, frequency, percentage) were calculated.
- Paired t-test was used to compare pre- and post-intervention scores within groups.
- Independent t-test was used to compare differences between the two groups.
- Chi-square test was used for categorical variables.
- Level of significance was set at $p < 0.05$.

Study Variables

- Independent Variable: Type of oral health education program (school-based vs clinic-based)
- Dependent Variables: Plaque score, gingival score, DMFT/dmft score, knowledge score, oral hygiene practices

This methodology enabled a structured and systematic comparison of the effectiveness of school-based and clinic-based oral health education programs among children.

RESULTS

A total of 100 children were included in the study, with 50 participants in the school-based oral health education group (Group I) and 50 in the clinic-based oral health education group (Group II). All participants completed the 3-month follow-up, resulting in a 100% response rate.

The mean age of participants in Group I was 11.2 ± 0.8 years, while in Group II it was 11.4 ± 0.7 years. There was no statistically significant difference in age or gender distribution between the groups ($p > 0.05$), indicating baseline comparability.

Baseline Comparison

At baseline, there was no statistically significant difference between the two groups with respect to Plaque Index, Gingival Index, DMFT score, or Knowledge score ($p > 0.05$), confirming homogeneity prior to intervention (Table 1).

Table 1: Baseline Comparison Between School-Based and Clinic-Based Groups

Variable	Group I (School) Mean ± SD	Group II (Clinic) Mean ± SD	p-value
Plaque Index	1.82 ± 0.34	1.79 ± 0.36	0.642
Gingival Index	1.56 ± 0.28	1.52 ± 0.30	0.488
DMFT Score	1.74 ± 1.02	1.68 ± 0.95	0.731
Knowledge Score (20)	8.4 ± 2.1	8.7 ± 2.0	0.521

Intragroup Comparison (Pre- and Post-Intervention)

Both groups demonstrated statistically significant improvement in Plaque Index, Gingival Index, and Knowledge scores after 3 months ($p < 0.001$). However, DMFT scores did not show statistically significant change within the short follow-up duration (Table 2).

Table 2: Intragroup Comparison (Paired t-test)

Variable	Group I Pre (Mean ± SD)	Group I Post (Mean ± SD)	p-value	Group II Pre (Mean ± SD)	Group II Post (Mean ± SD)	p-value
Plaque Index	1.82 ± 0.34	1.02 ± 0.29	<0.001	1.79 ± 0.36	0.86 ± 0.25	<0.001
Gingival Index	1.56 ± 0.28	0.98 ± 0.24	<0.001	1.52 ± 0.30	0.82 ± 0.22	<0.001
Knowledge Score	8.4 ± 2.1	15.6 ± 1.8	<0.001	8.7 ± 2.0	17.2 ± 1.5	<0.001
DMFT Score	1.74 ± 1.02	1.70 ± 1.00	0.210	1.68 ± 0.95	1.60 ± 0.92	0.134

Intergroup Comparison After 3 Months

When post-intervention scores were compared, the clinic-based group demonstrated significantly lower Plaque and Gingival scores and higher Knowledge scores compared to the school-based group ($p < 0.05$) (Table 3).

Table 3: Intergroup Comparison Post-Intervention

Variable	Group I Mean ± SD	Group II Mean ± SD	p-value
Plaque Index	1.02 ± 0.29	0.86 ± 0.25	0.004*
Gingival Index	0.98 ± 0.24	0.82 ± 0.22	0.002*
Knowledge Score	15.6 ± 1.8	17.2 ± 1.5	<0.001*

Statistically significant ($p < 0.05$)

Change in Oral Hygiene Practices

A significant improvement in oral hygiene practices was observed in both groups. However, a greater proportion of children in the clinic-based group adopted recommended practices compared to the school-based group (Table 4).

Table 4: Change in Oral Hygiene Practices

Practice	Group I Pre (%)	Group I Post (%)	Group II Pre (%)	Group II Post (%)	p-value
Brushing Twice Daily	32%	68%	30%	82%	0.031*
Use of Fluoridated Toothpaste	44%	76%	48%	88%	0.028*
Dental Visit in Last 6 Months	18%	36%	22%	54%	0.017*

(Chi-square test; *$p < 0.05$ significant)

STATA Statistical Analysis Findings

Data were analyzed using STATA software. The paired t-test for Group I revealed a significant reduction in Plaque Index (Mean difference = 0.80; $t = 14.52$; $p < 0.001$). Similarly, Group II showed a greater mean reduction (Mean difference = 0.93; $t = 17.84$; $p < 0.001$).

Independent t-test comparing post-intervention Plaque Index between groups showed a statistically significant difference ($t = 2.98$; $p = 0.004$), favoring the clinic-based intervention.

Multiple linear regression analysis adjusting for age and gender demonstrated that clinic-based education independently predicted lower post-intervention plaque scores ($\beta = -0.16$; $p = 0.003$). The overall regression model was statistically significant ($F(3,96) = 12.45$; $p < 0.001$; $R^2 = 0.28$).

Overall Interpretation of Results

Both school-based and clinic-based oral health education programs were effective in improving oral

health knowledge, plaque control, and gingival health among children. However, the clinic-based program demonstrated significantly greater improvement in clinical and behavioral outcomes over the 3-month follow-up period. DMFT scores did not change significantly in either group due to the short duration of evaluation.

DISCUSSION

This study compared the effectiveness of **school-based versus clinic-based oral health education programs** in improving oral health knowledge, hygiene practices, and clinical outcomes (plaque and gingival status) among children. Our findings showed significant improvements in both groups after intervention, with clinic-based education demonstrating greater short-term reduction in plaque and gingival scores and higher gains in knowledge scores compared to school-based education. These outcomes highlight the value of structured education in either setting, though individualized counseling in clinic environments may amplify behavioral change.

Our results align with existing literature showing that oral health education, irrespective of the setting, leads to favorable improvements in children's oral hygiene and knowledge. For instance, **Geetha Priya et al. (2019)** [16] conducted a systematic review evaluating school dental health education programs and found consistent improvements in oral health-related knowledge, behaviors, and reductions in plaque and gingival bleeding scores following school-based interventions. This supports the positive effects observed in our school-based group, where repeated education improved hygiene outcomes albeit to a slightly lesser extent than clinic-based education.

Similarly, **Bhardwaj et al. (2013) [17]** reported that short-term school-based oral health education significantly reduced plaque and gingival scores among 12- and 15-year-old children, demonstrating the immediate value of school interventions in promoting oral health. Although the sample and methodology differed, this aligns with our finding that school-based programs effectively improve clinical indicators, even if not as strongly as individualized clinic counseling.

A randomized controlled trial by **Suresh et al. (2023)** [18] examined the impact of theory-based oral health education delivered in schools and found that intervention significantly improved oral hygiene status, knowledge, attitudes, and practices compared to controls. This corroborates our observation that structured curriculum-based education, such as in schools, enhances multiple domains of oral health, particularly when reinforced systematically over time.

Beyond individual studies, broader evidence from meta-analyses also confirms the effectiveness of oral health education. **Gurav et al. (2022)** [19] performed a meta-analysis of school-based oral health educational methods and reported positive effects on oral hygiene indices and dental caries, although results varied depending on educational modality. While their focus was not on setting (school vs clinic), their findings reinforce that well-designed education enhances clinical outcomes. Our study extends this evidence by directly comparing settings, suggesting that context and delivery style (group vs one-on-one) influence effectiveness.

Additionally, **D'Cruz et al. (2013) [20]** evaluated the impact of OHE on plaque control and gingival health among schoolchildren and found significant reductions in plaque and gingival indices when oral health education included interactive demonstration and reinforcement. This resonates with our methodology, where both groups received demonstrations, but the clinic group's personalized counseling likely added motivational value leading to better outcomes.

Despite the strong evidence for school-based programs, our clinic-based group showed greater improvement in knowledge and clinical scores over the study period. This may be due to personalized feedback and immediate reinforcement of correct brushing techniques a factor not always feasible in classroom settings with larger groups. The individualized attention in clinical settings also allows for tailored responses to each participant's specific oral health status, which can enhance motivation and adoption of recommended practices.

However, clinic-based interventions may not always be scalable or accessible, particularly in low-resource settings where access to dental clinics is limited. School-based education, in contrast, reaches a broader population, is cost-effective, and integrates easily into routine educational activities. Long-term sustainability and reinforcement by teachers or trained peer leaders can further strengthen outcomes over time, as suggested by previous studies demonstrating that trained non-dental educators are effective in delivering oral health education.

One limitation of our study is the relatively short follow-up period (3 months); longer follow-up is needed to assess sustainability of behavioral change and caries incidence. This is supported by other reviews, such as Kim et al. (2024), who noted that although school-based oral health education improves short-term knowledge and hygiene, long-term evidence

for sustained effect and caries prevention remains limited.

In summary, our findings corroborate existing evidence that oral health education improves knowledge, oral hygiene practices, and clinical parameters among children. While school-based programs remain essential for wide reach and early behavior shaping, clinic-based education appears more effective in short-term clinical outcomes and knowledge enhancement. Tailoring educational strategies to context, resources, and follow-up reinforcement will be critical in optimizing oral health education delivery.

Limitations

The present study has certain limitations that should be considered while interpreting the findings. First, the sample size was limited to 100 participants from a single geographic area, which may restrict the generalizability of the results to broader populations. Second, the follow-up period of three months was relatively short and may not adequately reflect the long-term sustainability of behavioral changes or the true impact on caries experience, as indicated by the non-significant change in DMFT scores. Third, self-reported oral hygiene practices may be subject to reporting bias or social desirability bias. Additionally, although efforts were made to standardize interventions, variations in individual motivation, parental influence, and environmental factors could have influenced outcomes. Finally, the study did not assess cost-effectiveness or long-term reinforcement strategies, which are important considerations when comparing school-based and clinic-based oral health education programs.

Conclusion

Both school-based and clinic-based oral health education programs were effective in improving oral health knowledge, plaque control, and gingival health among children.

Significant reductions in plaque and gingival scores were observed in both groups after intervention. However, the clinic-based program demonstrated comparatively greater short-term improvement in clinical and knowledge outcomes.

No significant change in DMFT scores was noted due to the short follow-up duration.

Overall, while both approaches are beneficial, clinic-based oral health education showed superior effectiveness in enhancing immediate oral health outcomes.

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