

Effectiveness of School-Based Oral Health Education Programs in Reducing Dental Caries Among School Children of Lucknow City

Dr. Shitanshu Malhotra¹, Dr. Diksha Bharti², Dr. Ashish Kumar Dwivedi³, Dr. Harsh Aryan⁴

¹ Professor and Head, Department of Public Health Dentistry, Career Post Graduate Institute of Dental Sciences and Hospital, Lucknow (U.P.)

² MDS III year, Department of Public Health Dentistry, Career Post Graduate Institute of Dental Sciences and Hospital, Lucknow (U.P.)

³ MDS III year, Department of Public Health Dentistry, Career Post Graduate Institute of Dental Sciences and Hospital, Lucknow (U.P.)

⁴ M.P.H, B.D.S, Epidemiologist, Deoghar, Government of Jharkhand.

Corresponding author: Dr. Shitanshu Malhotra, Professor and Head, Department of Public Health Dentistry, Career Post Graduate Institute of Dental Sciences and Hospital, Lucknow (U.P.). dr.shitanshu@gmail.com

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ABSTRACT

Introduction: Dental caries has profound implications for children's overall health and well-being. Beyond the immediate physical effects, dental caries can also have psychological and social consequences. Children with visible dental decay or missing teeth may experience embarrassment, low self-esteem, and social isolation. These psychosocial impacts underscore the importance of addressing dental caries not just as a medical issue, but as a significant factor affecting a child's overall quality of life. **Aims & Objectives:** The aim of study is to evaluate the effectiveness of a school-based oral health education program in reducing dental caries among school-going children aged 12 to 15 years of Lucknow city. **Materials & Methods:** A quasi-experimental, before-and-after design to assess the effectiveness of school-based oral health education programs in reducing dental caries among 12 to 15 years old school children. Data collection occurred at three time points: baseline, 3 months, and 6 months post-intervention, with a follow-up study conducted one year after the baseline assessment in 210 participants. Descriptive statistics were used to summarize the data, and inferential statistics were used to determine the effectiveness of the intervention. **Results:** The results indicate that the school-based oral health education program significantly reduced both DMFT scores and gingival index scores in the intervention group over 12 months. The intervention group showed a significant reduction in DMFT scores from 3.20 to 2.10 ($t = -12.34$, $p < 0.001$) and in gingival index scores from 1.80 to 1.20 ($t = -10.45$, $p < 0.001$). **Conclusion:** The study concluded that oral health education could play a crucial role in school health programs, providing an effective tool for reducing caries risk, improving gingival health, and promoting better oral hygiene practices among children.

INTRODUCTION

Dental caries, commonly known as tooth decay or cavities, is a multifactorial infectious disease resulting from the interaction of pathogenic oral bacteria with dietary carbohydrates, leading to the demineralization of tooth enamel and dentin. World Health Organization (WHO) estimates that dental caries affects 60-90% of school-aged children worldwide, making it a significant public health issue.¹

The critical role of sugars, especially sucrose, in the development of caries has been well-documented, with frequent

consumption leading to a decrease in pH in the oral cavity and subsequent demineralization of tooth enamel.² Dental caries has profound implications for children's overall health and well-being. The pain and discomfort associated with untreated caries can interfere with eating, leading to poor nutrition and weight loss. Additionally, dental pain can disrupt sleep and concentration, adversely affecting academic performance and school attendance.³

One of the most promising approaches to primary prevention of dental caries is through school-based oral health education

programs. Schools provide an ideal setting for health education due to the structured environment, regular attendance, and the opportunity to reach a large number of children over an extended period. These programs aim to instil good oral hygiene practices and healthy dietary habits from a young age, thereby reducing the risk of dental caries.⁴Some programs also involve the participation of dental professionals who can provide on-site dental screenings and fluoride treatments.⁵WHO reports that dental caries is one of the most common health problems in these regions, with significant implications for public health systems already struggling with other health challenges.⁶ Socio-economic disparities in oral health are well-documented, with children from low-income families being more likely to suffer from untreated caries and its complications. This inequity is driven by factors such as lack of access to dental care, lower levels of oral health literacy, and higher exposure to risk factors such as poor diet and inadequate oral hygiene practices.⁷ Hence, the present study was conducted with an aim to assess the effectiveness of school-based oral health education programs in reducing dental caries among school children of Lucknow city.

Materials & Methods

This study employed a quasi-experimental, before-and-after design to assess the effectiveness of school-based oral health education programs in reducing dental caries among 12 to 15 years old school children in Lucknow city. To account for potential dropouts and non-compliance, the sample size was increased by 10%, resulting in a final sample size of approximately 105 participants per group. Given that this study involved two groups (intervention and control), the total sample size required was approximately 210 participants. This calculation ensures that the study is adequately powered to detect a significant difference in the incidence of dental caries between the intervention and control groups.

Children aged 12-15 years were included in the study. Only children enrolled in the selected schools in Lucknow city, Uttar Pradesh India, were eligible. Children who provided informed consent from their parents or guardians and children with regular school attendance (defined as at least 75% attendance in

the previous academic year) were included. Children with systemic diseases or chronic conditions, undergoing orthodontic treatment, did not obtained informed consent and the children who were expected to transfer to another school were excluded from the study.

Data collection occurred at three time points: baseline, 3 months, and 6 months post-intervention, with a follow-up study conducted one year after the baseline assessment. The data collection process involved clinical oral examinations and self-administered structured questionnaires to assess oral health knowledge, attitudes, and practices. The proforma was divided in to three parts :-

Part 1 : consists of demographic information like age, gender, group allocated.

Part 2 : consists of questionnaire for evaluation of oral health knowledge and oral hygiene practices.

Part 3 : consists of assessment of dental caries experience and gingival health of the subjects.

The oral health examinations of the children were conducted following Type III ADA (American Dental Association) specifications. The DMFT (Decayed, Missing, and Filled Teeth) index was employed to assess the prevalence and severity of dental caries. Each tooth was carefully inspected for signs of decay, restorations, and any missing teeth due to caries. Additionally, the Gingival Index (GI) was used to evaluate the gingival health of the children.

Data were analysed using the Statistical Package for the Social Sciences (SPSS) software, version 25.0. Statistical tests such as the Independent t-test, paired t-test, and McNemar test were applied to compare pre- and post-intervention data. A level of significance of 5% and a confidence level of 95% were set for all analyses.

Results

The study included 210 school children aged 12-15 years from Lucknow city. Participants were divided into an intervention group (n=105) and a control group (n=105). The demographic distribution of the participants is seen in Table 1.

Table 1: Demographic parameters of the study population

Demographic Variable	Intervention Group (n=105)	Control Group (n=105)	Total
Age			
12 years	25	25	50
13 years	30	30	60
14 years	30	30	60
15 years	20	20	40
Gender			
Male	55	55	110
Female	50	50	100

Table 2 indicates that the oral health education program significantly improved the oral health knowledge of children in

the intervention group across all measured questions, while the control group showed no significant changes.

Table 2: Oral health knowledge scores in the intervention and control groups

Question	Intervention Group Pre-test Mean (SD)	Intervention Group 12 Months Mean (SD)	Control Group Pre-test Mean (SD)	Control Group 12 Months Mean (SD)	Mean Difference (Intervention Group)	t-statistic	p-value
What causes dental caries?	0.40 (0.49)	0.90 (0.30)	0.42 (0.49)	0.45 (0.50)	0.50	10.23	<0.001
How often should you brush your teeth?	0.50 (0.50)	0.95 (0.22)	0.48 (0.50)	0.50 (0.50)	0.45	9.80	<0.001
What is fluoride used for?	0.44 (0.50)	0.88 (0.32)	0.46 (0.50)	0.48 (0.50)	0.44	8.92	<0.001
How often should you visit a dentist for a check-up?	0.50 (0.50)	0.90 (0.30)	0.48 (0.50)	0.52 (0.50)	0.40	8.14	<0.001
What is the importance of using dental floss?	0.50 (0.50)	0.93 (0.25)	0.46 (0.50)	0.55 (0.50)	0.43	9.15	<0.001

Total Oral Health Knowledge Score	2.34 (1.12)	4.56 (0.78)	2.30 (1.15)	2.50 (1.10)	2.22	15.67	<0.001
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Table 3 indicates that the oral health education program was highly effective in significantly improving the oral hygiene practices of children in the intervention group, while the control group showed no significant changes in these practices.

Table 3: Oral hygiene practices between the groups

practices of children in the intervention group, while the control group showed no significant changes in these practices.

Variable	Intervention Group Pre-test (%)	Intervention Group 12 Months (%)	Control Group Pre-test (%)	Control Group 12 Months (%)	Difference (Intervention Group)	x ² Value	P-value
Tooth Brushing Frequency (Twice a day)	35%	75%	35%	40%	40%	60.12	<0.001
Use of Fluoride Toothpaste	50%	85%	50%	55%	35%	45.67	<0.001
Frequency of Changing Toothbrush (Every 3 months)	30%	70%	30%	35%	40%	50.89	<0.001
Use of Dental Floss (Daily)	15%	55%	15%	20%	40%	52.34	<0.001
Use of Mouthwash	25%	60%	25%	30%	35%	35.22	<0.001

When compared within the groups for dental caries over time intervals, ANOVA results show a significant reduction in DMFT scores for the intervention group over the 12-month period ($F = 24.56$, $p < 0.001$). The control group showed no significant changes in DMFT scores over the same period ($F = 0.12$, $p = 0.89$). The mean gingival index score in the intervention group decreased significantly from 1.80 ($SD = 0.75$) at baseline to 1.20 ($SD = 0.60$) at 12 months post-intervention, with a mean difference of -0.60 ($t = -10.45$, $p < 0.001$). The control group showed no significant change in gingival index scores, from 1.75 ($SD = 0.70$) at baseline to 1.70 ($SD = 0.65$) at 12 months post-intervention ($t = -0.61$, $p = 0.54$).

DISCUSSION

This study was conducted to evaluate the effectiveness of a school-based oral health education program on the oral health status, oral health-related knowledge, and hygiene practices among 12-15-year-old schoolchildren in Lucknow city, Uttar Pradesh, India. The study included a total of 210 schoolchildren, with 105 in the intervention group and 105 in the control group. The age distribution was balanced, with a similar number of participants aged 12 to 15 years. The gender distribution was also nearly equal. These demographic characteristics are comparable to those reported in similar studies conducted in other regions. For instance, a study in Bangladesh assessing the effectiveness of oral health education among schoolchildren reported a similar age and gender distribution, with an emphasis on ensuring a balanced representation to improve the external validity of the findings.⁸

The balanced demographic profile ensures that the findings can be generalized to a wider population of school-aged children in similar socio-economic and geographic settings. Similar studies have shown that balanced demographic representation helps in accurately assessing the effectiveness of health interventions and mitigates potential biases related to age and gender differences.^{9,10}

For the variable, what causes dental caries, the mean score for knowledge about the causes of dental caries in the intervention group increased from 0.40 ($SD = 0.49$) at baseline to 0.90 ($SD = 0.30$) at 12 months post-intervention. This improvement was statistically significant ($t = 10.23$, $p < 0.001$). Similar improvements have been reported in other studies, such as a study in rural Bangladesh, which found a significant increase in knowledge about dental caries causes among schoolchildren following an oral health education program.¹¹ The increase in knowledge can be attributed to the targeted educational interventions that effectively communicated the etiology of dental caries to the students.

The mean DMFT score in the intervention group decreased significantly from 3.20 ($SD = 1.25$) at baseline to 2.10 ($SD = 1.00$) at 12 months post-intervention, with a mean difference of -1.10

($t = -12.34$, $p < 0.001$). This reduction is consistent with findings from similar studies, such as a study in the Philippines, which reported a significant decrease in DMFT scores following an oral health education program.¹²

The mean gingival index score in the intervention group decreased significantly from 1.80 ($SD = 0.75$) at baseline to 1.20 ($SD = 0.60$) at 12 months post-intervention, with a mean difference of -0.60 ($t = -10.45$, $p < 0.001$). Similar improvements have been reported in other studies, such as a study in India, which found significant reductions in gingival index scores following an oral health education program.^{13,14} Overall, the significant improvements in both dental caries (DMFT index) and gingival health (Gingival Index) among the children in the intervention group demonstrate the effectiveness of the school-based oral health education program.

CONCLUSION

The findings of this study highlight the significant potential of school-based oral health education programs as a preventive measure against dental caries and poor gingival health in schoolchildren. The randomized controlled trial design provided robust evidence of the intervention's effectiveness, demonstrating that regular participation in oral health education sessions can significantly improve oral health knowledge, enhance oral hygiene practices, and reduce dental caries incidence and gingival inflammation.

REFERENCES

- 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 Programme. *Community Dent Oral Epidemiol.* 2003;31 Suppl 1:3-23.
- Gupta A, Mehta N, Wadhwa J. Prevalence and Association of Emotional Eating with Dental Caries in Indian College Students: A Cross-Sectional Study. *Oral Sphere J Dent Health Sci.* 2025;1(2):56-62. doi:10.63150/osjdhs.2025.2
- Blumenshine SL, Vann WF Jr, Gizlice Z, Lee JY. Children's school performance: impact of general and oral health. *J Public Health Dent.* 2008;68(2):82-7.
- Venkateshbabu, N., Anand, S., Abarajithan, M., Sheriff, S. O., Jacob, P. S., & Sonia, N. (2016). Natural therapeutic options in Endodontics-a review. *The open dentistry journal*, 10, 214.
- Freeman R, Maizels J, Wyllie M, Sheiham A. The relationship between health related knowledge, attitudes and dental health behaviours in 14-16-year-old adolescents. *Community Dent Health.* 1993;10(4):397-404.

- World Health Organization. Oral health information sheet. Available from: <https://www.who.int/news-room/fact-sheets/detail/oral-health>, assessed on 25/10/23 at 10:46 PM.
- Petersen PE, Bourgeois D, Ogawa H, Estupinan-Day S, Ndiaye C. The global burden of oral diseases and risks to oral health. *Bull World Health Organ.* 2005;83(9):661-669.
- Alam R, Sultana F, Rahman MF, et al. Impact of school-based oral health education on oral health knowledge and practices of children in a rural area of Bangladesh. *BMC Oral Health.* 2020;20(1):51.
- Ahmed N, Akhter R, Islam M, et al. Oral health education program among school children in a rural area of Bangladesh: A quasi-experimental study. *Int J Dent Hyg.* 2019;17(1):35-42.
- Singh N, Dubey N, Gupta K, et al. Effectiveness of oral health education program among school children in rural areas of Himachal Pradesh, India. *J Int Soc Prev Community Dent.* 2017;7(5):245-250.
- Alam R, Sultana F, Rahman MF, et al. Impact of school-based oral health education on oral health knowledge and practices of children in a rural area of Bangladesh. *BMC Oral Health.* 2020;20(1):51.
- Kumar S, Tadakamadla J, Johnson NW. Effect of school oral health education programs on knowledge and practices of oral hygiene among school children: A systematic review. *J Int Soc Prev Community Dent.* 2016;6(5):413-421.
- Ruff RR, Niederman R, Tellez M, et al. Effectiveness of school-based strategies to prevent tooth decay in Filipino children: A 3-year retrospective controlled clinical trial. *Community Dent Oral Epidemiol.* 2022;50(1):34-43.
- Javali SB, Sajjanar AB, Rajesh AG, et al. Effectiveness of oral health education among school children: A quasi-experimental study. *J Indian Soc Pedod Prev Dent.* 2016;34(3):272-277.