Assessment of the Effect of Oral Health Education with Use of Plaque-Disclosing Agent on Knowledge and Plaque score of Primary School Children

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ABSTRACT

Introduction: Poor oral hygiene and dental diseases are significant public health concerns among children however many children lack adequate knowledge about proper oral hygiene and often fail to visualize or remove plaque effectively. Efforts to remove this gap between knowledge and practice can be made in school where children spend a substantial time and are receptive to learning.

Objective: This study aimed to evaluate the impact of oral health education on the knowledge and plaque score of primary school children.

Methods: Experimental study with pre-and post-design without control group was conducted among 423 primary-level school children from four schools in Bharatpur. Closed-ended questionnaire was prepared by the researcher with ten questions in total, which was translated into local language for primary-level school children. Descriptive and inferential statistical methods, including the Paired t-test, were carried out.

Results: Oral health knowledge was assessed at baseline and one-week follow-up. Results demonstrated improvements in identification of permanent teeth count (82.3% to 91.3%), understanding of beneficial foods and drinks (96.7% to 97.6% and 94.8% to 96.5% respectively) and awareness of anticariogenic components in toothpaste (46.5% to 66.7%). Decrease observed in knowledge related to the importance of teeth in speech. Paired t-test was applied and there was statistically significant difference in plaque index scores before and after health education with decrease from 0.84 to 0.72.

Conclusions: In general, oral health education has positive effect on improving the knowledge of the school children. Reinforcement in health education should be done to have the lasting effect in children.

Keywords: *Health education, plaque index, school children.*

INTRODUCTION

Oral health is a fundamental component of overall health and well-being in school-aged children, with implications for their quality of life and academic performance.[1] Epidemiological evidence suggests a substantial impact on educational outcomes, with an estimated 51 million hours lost globally each year due to dental illness.[2,3]

Oral health education is strategy for improving individual oral hygiene, especially for school-aged populations. While regular and effective tooth brushing is essential for plaque removal, many children lack adequate knowledge about proper oral hygiene and often fail to visualize or remove plaque effectively. Efforts to remove this gap between knowledge and practice can be made in school setting where children spend considerable amount of time and are receptive to learning new health behaviors due to constant interaction with teachers and peers. [4,5]

Plaque-disclosing agents, used to record plaque index, provide visual representation of bacterial biofilm, serving as powerful educational tools that enable children to

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visualize otherwise invisible plaque. No studies have been done for the use of plaque disclosing agent and oral health education in Chitwan. Therefore, this study was conducted to assess the effect of oral health education on knowledge of the students and plaque status of the students in Bharatpur, Chitwan.

METHODS

An experimental study with pre- and post-designs without a control group was conducted among 423 primary-level children from four schools in Bharatpur, Chitwan, from October 2022 to June 2023. Ethical clearance was obtained from College of Medical Sciences - Institutional Review Committee (Reference number COMSTH-IRC/2022-026). The study procedure was explained and consent was taken from the school authorities as well as study participants and their parents prior to data collection.

The sample size was calculated using the following formula.

$$N = \frac{2\,(Z_{\alpha/2} + Z_{\beta})^2 .\, \sigma^2}{d^2}$$

Where, N is the desired sample size, $Z_{\alpha/2}$ is the Z-score corresponding to the desired significance level, alpha i.e. 1.96 for 95% confidence interval, $\alpha = 0.05$, Z_{β} is the Z score corresponding to the desired power (1 - β) i.e. 0.84 for 80% power and $\beta = 0.20$. σ is the standard deviation of the population = 0.52[6] and d is the minimum difference between two means that you want to detect = 0.10. Therefore, the sample size was calculated to be 423.

We included primary-level students who were present during both data collection sessions, submitted completed baseline and follow-up proformas, and whose parents provided written informed consent. The study employed a systematic sampling approach for school selection from the list schools that submitted camp request letters to our department where every second school was selected. This systematic selection continued until we reached four schools, where we met our sample size requirements.

A closed ended questionnaire with 2-3 predetermined response options which was prepared by the researcher with ten questions in total. It was translated in Nepali language apt for primary level school children. Pre-testing was done among 20 children where test-retest within one week determined reliability, with Cronbach's alpha of 0.74 for knowledge questions. Questionnaire was administered to the study participants which included questions on types of dentitions, functions of teeth, healthy dental habits and oral hygiene maintenance. Full mouth plaque index scores were recorded based on scoring criteria by Silness J and Loe H,[7] using mouth mirror and explorer, before the health education included PowerPoint presentation on teeth anatomy and functions, dental diseases and maintenance of oral hygiene followed by demonstration on teeth brushing with use of disclosing solution to make the plaque assessment easier for both researcher and participants. We visited the same school after a week, distributed the same questionnaire to collect the information followed by measurement of plaque index scores.

For the total number of permanent teeth, those who chose 32 was considered correct. Similarly, those who answered that water is the drink beneficial for teeth, fruits and vegetables are foods beneficial for teeth, fluoride is the anti-cariogenic component in toothpaste were also marked as correct option. Participants responding with a "Yes" for importance of teeth for smile, mastication and speech were recorded as correct answer. For frequency of tooth brushing -response of two, for frequency of dental visit-response of every six months and for duration of tooth brushing-response of 2 minutes were recorded as correct. Participants selecting the other options were considered incorrect.

Data entry was done in Microsoft Excel, and statistical analysis was done in the Statistical Package for Social Sciences version 20. Descriptive and inferential statistical methods, including the Paired t-test, were employed.

RESULTS

There was a total of 423 participants, 232 (54.8%) of whom were from government schools and 191 (45.2%) from private schools. The distribution of study participants based on gender shows that 202, comprising 47.8% of them, are females, and 221, comprising 52.2%, are males. The age of the study participants ranged from 7 to 12 years, with a mean age of 10.80 years.

The knowledge of the study participants on oral health at baseline and at follow-up after a week was carried on. Based on the data collected, it was found that 82.3% of the participants answered correctly the question on the number of permanent teeth which increased to 91.3% on a follow-up visit. Similarly, percentage of participants giving correct response for drinks and food benefits increased from 94.8%, 96.7% to 96.5% and 97.6% respectively. Correct response of the anticariogenic component in toothpaste increased from 46.5% of the participants to 66.7% on the follow-up visit. However, decreases in score was observed in response related to the importance of teeth in speech. Correct responses with regards to the frequency of tooth brushing increased from 84.9% to 90.1% and duration of tooth brushing from 48 to 62.2% on the follow-up visit (Table 1).

There was a statistically significant difference in plaque index scores before and after health education with a decrease from 0.84 to 0.72 (Table 2).

Table 1. Knowledge of students on oral health before and after oral health education.

Question	Number of participants giving correct response at baseline (Total = 423) N(%)	Number of participants giving correct response at follow up (Total = 423) N(%)
Number of permanent teeth	348 (82.3)	394 (91.3)
Drink beneficial for teeth	401 (94.8)	408 (96.5)
Food beneficial for teeth	409 (96.7)	413 (97.6)
Anticariogenic component in toothpaste	195 (46.5)	282 (66.7)
Importance of teeth for healthy smile	366 (86.5)	376 (88.9)
Importance of teeth for mastication	352 (83.2)	357 (84.4)
Teeth and speech	359 (84.9)	343 (81.1)
Frequency of tooth brushing	359 (84.9)	381 (90.1)
Frequency of dental visit	128 (30.3)	178 (42.1)
Duration of tooth brushing	203 (48)	263 (62.2)

Table 2. Plaque index scores before and after health education using plaque disclosing agent and tooth-brushing demonstration

Plaque index scores	Mean	Standard deviation	Standard error of mean	p value
Before health education	0.84	0.12	0.00	0.00*
After health education	0.72	0.07	0.03	

*Statistically significant, paired t test applied

DISCUSSION

School children show high prevalence of oral diseases often due to lack of oral health education and lack of preventive measures. The diseases that occur in their childhood often leads to long lasting effects affecting them in their adulthood as well. School oral health programs are greatly necessary to reach out to school children and encourage them to promote their oral health. This study was conducted on 423 school students to investigate the effectiveness health education programs using multimedia presentation, followed by demonstration among primary school children. Our findings provide important insights into the potential of structured educational approaches to improve dental health awareness among children and integrate them into regular school oral health programs, alongside screening, and preventive and curative procedures.

Several studies in the literature suggest that school oral health programs are greatly essential to improve the knowledge of oral health among students[8,9] similar to our study which shows an improvement in knowledge along with significant decrease in plaque scores. Studies have also shown significant decrease in caries incident due to supervised tooth brushing programs.[10] In our study, the improvement in knowledge was evident across multiple domains including understanding of basic oral hygiene techniques, recognizing importance of regular dental check-ups and comprehending the relationship between diet and dental health. However, we found increase in frequency of wrong responses with regards to importance of teeth in speech. The responses suggest us to highlight these aspects and make improvement in our educational resources in further health education sessions. Studies have also emphasized on the potential of school-based interventions in improving health literacy among school children.[11,12]

While the study provides valuable insights, several limitations should be acknowledged. This study was conducted among students of Bharatpur, which may limit the generalization of the findings. Apart from this, the short follow-up period could be a limitation as it suggests that the long-term impact of the health education program hasn't been determined. Also, without a control group, we cannot definitely attribute all observed changes solely to our interventions as other factors may have influenced the outcomes as well. While acknowledging these limitations, our findings provide important preliminary evidence to conduct more rigorous studies in future.

CONCLUSION

This study demonstrates that oral health education using multimedia presentations and practical demonstrations with plaque-disclosing agents effectively improves both oral health knowledge and plaque control among primary school children in Bharatpur, Chitwan. The significant reduction in plaque index scores from 0.84 to 0.72 following intervention, coupled with marked improvements in knowledge across multiple domains, supports the potential of such educational approaches in school settings.

The improvement in understanding of fundamental concepts such as tooth brushing duration, frequency, and the role of fluoride suggests that age-appropriate educational interventions can effectively bridge the gap between knowledge and practice in pediatric populations. However, the decrease in correct responses regarding the importance of teeth for speech indicates areas for improvement in educational content.

This study supports the integration of structured oral health education into regular school health programs. We recommend implementing periodic reinforcement sessions to maintain the improvements observed and conducting longitudinal studies with control groups to evaluate long-term impacts. Additionally, involving parents and teachers in educational initiatives could potentially enhance outcomes by reinforcing positive oral hygiene behaviors across different environments.

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Conflict of Interest: None

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