

Does Providing Story Books to Children Lead to an Improvement in Oral Hygiene in School Children: A Quasi-Experimental Study

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Author's Contribution

Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work and final approval of the version to be published,²⁻⁴Drafting the work or revising it critically for important intellectual content, ⁵⁻⁶ literature review, active participation in active methodology

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ABSTRACT

Objective: To assess the effect of giving tooth brushing storybooks along with verbal oral hygiene (OHI) instructions on plaque levels to schoolchildren.

Methodology: This quasi-experimental study was conducted in a private school in Islamabad from October to November 2022. Children in Class V were selected as the Experimental Group I (Storybooks + OHI), while Class IV children were placed in the Control Group II (OHI alone). There were 20 students in each group. Plaque levels were compared at the baseline (before intervention) and after seven days. Tooth brushing practices were recorded at the baseline. Quantitative variables, such as age and mean plaque score were reported as mean and standard deviation. Categorical variables such as gender and tooth brushing frequency were described as frequencies and percentages.

Results: The mean age of the children was 9.6 + 1.08 years. A total of 16 (40%) boys and 24 (60%) girls were included in the study. Children in Group II had significantly better self-reported tooth brushing practices with 16 (80%) children brushing twice a day, as compared to 10 (50%) children from Group I ($p = 0.041$). There was no difference in the reduction in plaque scores between group I (0.14 + 0.21) and group II (0.08 + 0.21; $p = 0.382$).

Conclusion: Giving story books to children is not an effective intervention to improve the oral hygiene status of children, as compared to oral hygiene instructions alone.

Keywords: Paque scores; oral hygiene; oral health status; Storybooks.

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Introduction

Oral diseases are estimated to affect approximately 3.5 billion people worldwide – permanent teeth caries being the most common oral condition.¹ Although there is no biological plausibility correlating biofilm and dental caries, strong evidence suggests that plaque removal is highly effective for the maintenance of oral health. Mechanical plaque control has been found to effectively reduce the incidence of periodontal diseases. Subsequently, tooth brushing is recommended as the most common and effective way to clean most tooth surfaces.²

Nonetheless, most people do not brush their teeth thoroughly enough to prevent plaque build-up.³ The

American Dental Association recommends that toothbrushing should be initiated as soon as the first tooth erupts and that teeth be brushed twice daily.⁴ In a survey of toothbrushing practices among American children, Evans et al reported that almost 80% of children aged 3–15 years begin toothbrushing before they reach the age of one year; over 30% brushed once daily, and almost 40% of children younger than six years use more than the recommended amount of toothpaste.⁵ In comparison, Umer et al conducted a study on the prevalence of oral diseases in Pakistan. They observed that only 37.5% of the children aged 6-12, brushed their teeth and even these children only brushed either occasionally (71%) or once a day (28%).⁶ Although this study is not representative of the entire Pakistani population, it does suggest a low

frequency of toothbrushing practice in the country. It is imperative to motivate the parents to support their children to brush twice a day as this will facilitate better oral hygiene in children.

Similar to other hygiene habits, tooth brushing is also acquired during the child's socialization process. When this habit is taught early in childhood, it becomes embedded in the child's daily routine and only requires positive reinforcement.⁷ However, tooth brushing in children under the age of ten is inept. This difficulty can be explained by the lack of motivation and the low level of manual dexterity typical of this age. Effective plaque removal instructions can be taught when the child actively participates in oral hygiene education. For optimal primary prevention, children should therefore be trained in plaque removal.⁸ Instructions should be given according to the child's readiness to brush their teeth and should include regular training and reinforcement. Research suggested that the most common promoters of tooth brushing are positive oral health beliefs such as the effectiveness of oral hygiene, social norms, emotional responses to the consequences of not brushing, high self standards, making it part of a routine, and finding ways to do so more easily.⁹

Children should be taught oral self-care according to their level of psychological development. Studies show that there is a significant relationship between the methods of oral hygiene instruction and reinforcement and the plaque index.⁸ Therefore, instruction and supervision do play a significant role in establishing effective toothbrushing habits in children. While educational lectures can improve oral hygiene habits in adolescents significantly, this method is only effective for children over 5 years of age. Children younger than that do not understand grammatical terms such as 'on top of' or 'behind' and therefore the use of only words would be ineffective in teaching them how to brush. Audio-visual methods have been demonstrated to be more effective in preschool children.^{2, 10}

Furthermore, there is no consensus regarding the best approach for encouraging proper tooth brushing in children. However, several innovative concepts for health behavior-based interventions have emerged recently, such as gaming apps to encourage tooth brushing.³ The key to successfully teaching the children how to brush is to engage them effectively. A non-threatening and more playful strategy for promoting dental hygiene among the younger audience is to use a fun "package" to wrap educational messages about dental hygiene. This so-called entertainment-education approach is used, for example, in

Sesame Street to teach children about the world and social thinking.¹¹ Moreover, short written social stories with pictorial cues, or visual pedagogy based on social stories, have been developed over the past two decades to help children with autism communicate, manage moods, and learn life skills.¹² Direct visual stimuli have proven to enhance a child's understanding of social situations and teach an appropriate behavioral response for the child to practice.¹³ A study by Balint et al. examined the long-term effects of repeated exposure of children to a humorous tale about brushing teeth about an orange monkey compared to an explanatory text about dental care on their biomedical and self-reported plaque scores. They reported that the humorous narration increased the character engagement, enjoyment, and moral judgment compared to the explanatory text, and enjoyment and moral judgment predicted an increase and decrease in plaque scores, respectively.¹⁴ There is a paucity of evidence suggesting the effectiveness of using storybooks as an intervention to improve the oral hygiene status of children. The present study aimed to assess the effectiveness of giving storybooks to children on their oral hygiene status.

Methodology

A quasi-experimental study was conducted. The focus of the study was on schoolchildren. Therefore, a private school in Islamabad was selected for sampling purposes. Sampling technique was convenience sampling and a total sample of 40 children aged 8-11 years were recruited. After ethical approval from ERB of School of Dentistry, informed written consent was taken from the parents of all children. Any child with an underlying systemic disease was excluded. The presence of a systemic history was determined from the medical records of the children present in their respective school files. Also, any child with a high plaque score of 3 on even one tooth was excluded. The children were conveniently divided into two groups. Children from Class IV and Class V were selected. For convenience, children from Class V were allocated to Group I (Experimental Group), while children from Class IV were allocated to Group II (Control Group).

Plaque disclosing tablets were given to all the children and modified plaque index was used to assess the oral health status of all children before the trial. A single dentist assessed the oral health status of the children. Fones brushing technique was demonstrated to all children on a dental model. Thereafter, children in group I were given storybooks, while no further intervention was carried out for group II. The storybook was based on an interesting

story with the moral that brushing is good for health and makes children smile. The Fones brushing technique was incorporated into the story. The Fones technique employs a circular brushing stroke after the children clench their teeth. This lingual and occlusal/incisal aspects of the teeth are also cleaned.¹⁵ The storybooks were written in the English language since the medium of instruction in the selected school was English. Written instructions were given to the children requesting the parents to read the stories to the children daily. However, no follow up was done as to assess whether the parents read out the stories to the children on a regular basis or not.

A follow-up assessment of the oral health plaque status was assessed on the 7th day. Using plaque disclosing tablets, the modified plaque index was used to assess the plaque levels of the students in both groups. The plaque scores were recorded as 0, 1, 2 or 3 as per the modified plaque index for the labial or lingual surfaces of six teeth in the mixed dentition.

The gender, age and self-reported tooth brushing frequency of each student was also reported on proformas.

Table I: Teeth Used for Indexing

Tooth Number	Tooth Surface
#54	Labial
#61	Labial
#82	Labial
#75	Lingual
#26	Labial
#46	Lingual

All data were entered and analyzed using SPSS v 25.0. Quantitative variables, such as age and mean plaque score were reported as mean and standard deviation. Categorical variables such as gender and tooth brushing frequency were described as frequencies and percentages. Any difference in the change in mean plaque scores from day 1 to day 7 between the two groups was calculated using independent sample T test.

Results

A total of 40 students were recruited for this study. Each group had 20 children. The mean age of the students was 9.6 ± 1.08 years. There were 16 (40%) boys and 24 (60%)

Table II Baseline Characteristics of Children in Both Groups.

Characteristic	Group I	Group II	Total	P Value
Age	10.3±0.73 years	8.9±0.91 years	9.6±1.08 years	< 0.001
Gender	Male	7 (35%)	16 (40%)	0.519
	Female	11 (55%)	24 (60%)	
Tooth Brushing Frequency	Once a day	3 (15%)	13 (32.5%)	0.041
	Twice a day	16 (80%)	26 (65%)	
	More than twice a day	1 (5%)	1 (2.5%)	

girls in the study sample. Most of the students (n = 26, 65%) reported brushing their teeth twice a day. The baseline characteristics of the patients in both groups have been illustrated in table II. As compared to 16 (80%) children brushing their teeth twice a day in Group II, only 10 (50%) children from group I brushed twice a day. This shows that the toothbrushing practices of the children in Group II were significantly better than those in Group I (p = 0.041).

The initial, final and change in plaque scores for both groups has been shown in table III. The initial (p = 0.027) and final (p = 0.005) plaque scores were significantly lesser for Group I as compared to Group II. However, there was no significant difference in the mean change in plaque scores between the two groups (p = 0.382).

Table III Mean Initial, Final and Change in Plaque Scores for Groups I and II.

Groups	Initial Plaque Score	Final Plaque Score	Change in Plaque Score
Group I	0.41 ± 0.34	0.27 ± 0.28	0.14 ± 0.21
Group II	0.76 ± 0.58	0.68 ± 0.55	0.08 ± 0.21
P Value	0.027	0.005	0.382

Discussion

Narrations have been shown to be an effective way of encouraging healthy behaviors in children.¹⁶ It has also been suggested that narrations may be used to prevent dental caries in children by changing their attitudes towards brushing their teeth.¹⁷ The present study set out to compare any difference in oral hygiene between children given story books and oral hygiene instructions and those give oral hygiene instructions alone.

The mean age of the non-intervention group was significantly greater than the intervention group in our study (p < 0.001). This is because the children selected for the experimental group (group I) were one class senior to those in the control group (group II). Male and female students were equally matched in both groups. The toothbrushing practices of the children from the control group II were significantly better than the children from the experimental group I (p = 0.041), as illustrated in table II. Overall, the majority of the participants (n = 26, 65%)

brushed twice a day. This shows that the majority of the selected children already had generally good oral hygiene practices. No significant difference in the mean change in plaque scores was found between the two groups ($p = 0.382$). This suggests that providing storybooks is not effective in reducing plaque scores among children. In comparison, Hebbal et al. conducted a study in India on the evaluation of knowledge and plaque scores in children after health education. They found that plaque scores were significantly improved ($P < 0.001$) after health education via audiovisual aids was given compared to the use of blackboards to teach oral hygiene practices and not giving any instructions at all.¹⁸ In a similar study by Ngunjairak et al., the authors observed significantly improved plaque scores (0.076) in children who underwent multimodal health education programs using animated cartoons about toothbrushing after three months compared to those who were only given verbal instructions.¹⁹

One factor that needs to be taken into account is that all the children in our sample brushed their teeth regularly and subsequently, had low plaque scores at the start of the study. As the baseline plaque scores were already low in our sample, not much reduction in the plaque scores was possible. This was a possible confounding factor in the reported results of the present study. Moreover, the sample of our study was taken from a private school. Literature shows that the oral hygiene status of children from lower socioeconomic backgrounds is poor as compared to children from a better socio-economic background attending private schools.²⁰ Children in Pakistani government schools are generally from lower socioeconomic strata, as compared to their counterparts from private schools. Khalid et al. reported that children from private schools in Pakistan had better oral hygiene (plaque levels, $p < 0.001$ and bleeding gums status, $p < 0.001$) as compared to children studying at government schools.²¹ Future studies should assess the effect of storybooks on oral health practices of children studying at government/public schools.

Another limitation of our study was a relatively small sample size. Future studies should recruit a larger sample size. Moreover, the results of the intervention were recorded only after one week. It is possible that if the final plaque scores were measured after one month of intervention, relatively different results may have been observed. Although the results suggest that storybooks are not effective in reducing the plaque levels of school-going children, future studies should recruit larger samples that

are more representative of the Pakistani population and they should be followed up for a longer period of time.

Conclusion

Giving story books to children is not an effective intervention to improve the oral hygiene status of children, as compared to oral hygiene instructions alone.

References

1. Roth G. Global Burden of Disease Collaborative Network. Global Burden of Disease Study 2017 (GBD 2017) Results. Seattle, United States: Institute for Health Metrics and Evaluation (IHME), 2018. *Lancet* 2018;392:1736-1788.
2. Leal SC, Bezerra ACB, Toledo OAd. Effectiveness of teaching methods for toothbrushing in preschool children. *Braz Dent J.* 2002;13:133-136. <https://doi.org/10.1590/S0103-64402002000200011>
3. Hotwani K, Sharma K, Nagpal D, Lamba G, Chaudhari P. Smartphones and tooth brushing: content analysis of the current available mobile health apps for motivation and training. *Eur Arch Paediatr Dent* 2020;21(1):103-108. <https://doi.org/10.1007/s40368-019-00457-1>
4. Affairs ADACoS. Fluoride toothpaste use for young children. *J Am Dent Assoc.* 2014;145(2):190-191. <https://doi.org/10.14219/jada.2013.47>
5. Thornton-Evans G, Junger ML, Lin M, Wei L, Espinoza L, Beltran-Aguilar E. Use of toothpaste and toothbrushing patterns among children and adolescents-United States, 2013-2016. *Morb Mortal Wkly Rep.* 2019;68(4):87. <https://doi.org/10.15585/mmwr.mm6804a3>
6. Umer MF, Farooq U, Shabbir A, Zofeen S, Mujtaba H, Tahir M. Prevalence and associated factors of dental caries, gingivitis, and calculus deposits in school children of sargodha district, pakistan. *J Ayub Med Coll Abbottabad* 2016;28(1):152-156.
7. Pareek S, Nagaraj A, Yousuf A, Ganta S, Atri M, Singh K. Effectiveness of supervised oral health maintenance in hearing impaired and mute children-A parallel randomized controlled trial. *J Int Soc Prev Community Dent* 2015;5(3):176. <https://doi.org/10.4103/2231-0762.159953>
8. Underwood B, Birdsall J, Kay E. The use of a mobile app to motivate evidence-based oral hygiene behaviour. *Br Dent J.* 2015;219(4):E2-E2. <https://doi.org/10.1038/sj.bdj.2015.660>
9. Huebner CE, Riedy CA. Behavioral determinants of brushing young children's teeth: implications for

- anticipatory guidance. *Pediatr Dent* 2010;32(1):48-55.
10. Vidyashri S, R V. Dentist's Preference Of Mode Of Teaching Brushing Techniques To Children With Permanent Dentition. *Int J Dent Oral Sci.* 09/22 2021;8:4495-4499.
<https://doi.org/10.19070/2377-8075-21000914>
 11. Mares M-L, Pan Z. Effects of Sesame Street: A meta-analysis of children's learning in 15 countries. *J Appl Dev Psychol* 2013;34(3):140-151.
<https://doi.org/10.1016/j.appdev.2013.01.001>
 12. Zhou N, Wong HM, McGrath C. Efficacy of social story intervention in training toothbrushing skills among special-care children with and without autism. *Autism Res* 2020;13(4):666-674.
<https://doi.org/10.1002/aur.2256>
 13. Du RY, Yang W, Lam PPY, Yiu CKY, McGrath CP. Developing a Toothbrushing Visual Pedagogy (TBVP) for Preschool Children with Autism Spectrum Disorder. *J Autism Dev Disord.* 2022/01/01 2022;52(1):327-338.
<https://doi.org/10.1007/s10803-021-04946-5>
 14. Bálint KÉ, Das E, Stel G, Hoppener M. Can A Funny Story about Tooth Brushing Decrease Plaque Scores in Children? A Longitudinal Field Experiment. *Health Commun.*2021:1-11.
<https://doi.org/10.1080/10410236.2020.1871166>
 15. Ceyhan D, Akdik C, Kirzioglu Z. An educational programme designed for the evaluation of effectiveness of two tooth brushing techniques in preschool children. *Eur J Paediatr Dent.* Sep 2018;19(3):181-186.
 16. de Droog SM, Buijzen M, Valkenburg PM. Enhancing children's vegetable consumption using vegetable-promoting picture books. The impact of interactive shared reading and character-product congruence. *Appetite.*2014;73:73-80.
<https://doi.org/10.1016/j.appet.2013.10.018>
 17. den Elzen N. Johnny Joker gaat onder de loep. Een onderzoek naar narratieve overtuiging bij kleuters. 2015.
 18. Hebbal M, Ankola AV, Vadavi D, Patel K. Evaluation of knowledge and plaque scores in school children before and after health education. *Dent Res J (Isfahan).* 2011;8(4):189.
<https://doi.org/10.4103/1735-3327.86036>
 19. Nguanjairak R, Duangsong R, Patcharanuchat P, Muangsom N, Bradshaw P. Effectiveness of multimodal dental health education with animated cartoons for improving knowledge, attitudes, oral hygiene practices and reducing dental plaque in 7-9 year-old children in Khon Kaen Province. *J Public Hlth Dev.* 2016;14(3):69-82.20.
 20. Soumya SG, Shashibhushan KK, Pradeep MC, Babaji P, Reddy VR. Evaluation of oral health status among 5-15-Year-old School Children in Shimoga City, Karnataka, India: a cross-sectional study. *Journal of clinical and diagnostic research: JCDR.* 2017;11(7):ZC42.
<https://doi.org/10.7860/JCDR/2017/24879.10185>
 21. Khalid T, Mahdi SS, Khawaja M, Allana R, Amenta F. Relationship between socioeconomic inequalities and oral hygiene indicators in private and public schools in Karachi: An observational study. *International Journal of Environmental Research and Public Health.* 2020;17(23):8893.
<https://doi.org/10.3390/ijerph17238893>