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Effect of Proper Tooth Brushing Technique on Dental Plaque Among School Going Children

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ABSTRACT

Background: Health education is crucial for fostering good oral health and using dental care to build cleaning habits is the most effective way to achieve good oral health. This study aimed to compare the reduction in dental plaque score among lecture and pamphlet groups via bass tooth brushing demonstration among school-going children of Karachi.

Methods: A randomized controlled trial was conducted with sixth-grade students aged 11 to 13 from three government schools, selected through convenience sampling, and students were randomly assigned to three groups: Group A (Lecture), Group B (Pamphlet), and Group C (Control). The sample size was 168 (56 per group). Data collection involved structured proformas and oral health examinations. Groups A and B learned the Bass brushing method based upon criteria of the American Dental Association, while Group C maintained routine practices. Plaque scores were assessed at baseline, one month, and three months, with analysis using SPSS and Chi-square tests for significance. P-value ≤ 0.05 was considered statistically significant.

Results: Mean age of participants was 12.161±0.493 years. Group A and B had good plaque scores (0.1-0.9mm) at T0, T1 and T2 among 51.8%, 85.7% and 69.6% of the students respectively for group A, while 73.2%, 82.1% and 69.6% of the students respectively for group B. A significant difference found for plaque score between the control and intervention groups (p<0.001 each).

Conclusion: Proper brushing technique resulted in the reduction of plaque score among the lecture group followed by the Pamphlet group, but no reduction was reported for control group.

Keywords: Prevalence, Bass Tooth Brushing Technique, Dental Plaque, Association, Demographic Factors.

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INTRODUCTION

Oral health care should be an integral part of regular health care for school-going children. With easy oral hygiene measures like brushing and flossing oral diseases are avoidable before their emergence[1].Health education is critical for adopting actions that promote good oral health and creating a positive attitude toward dental health. The main aspects in promoting oral health are dental health education and continual periodic reinforcement, which counteracts the effect of fading over time. Because many oral health issues can be eliminated, raising awareness among children at a young age has a direct impact on developing health-related habits[2].

National/International studies found a great transition in children's habits and improved knowledge via oral health education provided at school. A study was conducted to improve dental health by conducting lectures and implementing other activities. Their results showed that the students brushing their teeth irregularly has improved by 4.1% only from 20.7% previously, which is much less as compared with those students brushing their teeth regularly showed49.7 a % decrease in the index from 60.7% formerly; hence the good hygiene index improved by from 8.9% to 32% in total[3]. Dental health is an integral unit of general health for humans. Hence overall health promotion, as well as focus on oral health promotion by health education is important for overall betterment in health[4].

Short-term dental health and awareness programs can improve oral hygiene conditions and promote student's health. To achieve long-term advantages, communication between school workers, parents, and health experts should be encouraged[5]. Optimal oral health is achieved with effective plaque removal methods, avoiding periodontal diseases. The most efficient tool to prevent periodontal disease is mechanical plaque control and to attain it manual toothbrushes are used[6].

Although measuring plaque and calculus indices is the best technique to assess an individual's oral hygiene, several studies have analyzed an individual's self-reported oral hygiene activities. According to our findings, students with terrible toothbrushing practices, as reported by their parents and themselves, are more likely to have an undesired (moderate/poor) Plaque Index[7]. Previous literature reported that an intervention in which the students were educated about good or poor hygiene, prevention of disease as well as appropriate ways of tooth brushing led to an improvement in dental health. This educational intervention and proper tooth brushing demonstration resulted in improvement[4].

Dental health education programs demonstrate different methods to enhance the oral hygiene of school-going students[8]. Many associated factors influenced the pattern of oral hygiene among children. A study in which 1,120 children did not know the pattern of oral hygiene and performed irregularly. The dental plaque prevalence was 37.0% among them[9].Plaque Index (PI) of all three educational groups (lecture, video &pamphlet) after 24 hours and two months of training was decreased as compared to the control group[10].

Since there is a dearth of information on interventional techniques for evaluating the oral hygiene of schoolchildren, this study will be useful in determining the impact of proper tooth brushing methods demonstrated to schoolchildren through lectures and pamphlets for reducing dental plaque and its consequences. Despite the existence of international studies, their target populations' sociodemographic characteristics and cultural norms are distinct from ours[2,10,11,12]. A study of this kind was desperately needed in the local population. This study aimed to compare the reduction in the dental plaque score among lecture and pamphlet groups via bass tooth brushing demonstration among school-going children of Karachi; Furthermore, association of demographic factors and dental Plaque score will be obtained.

METHODS

After taking ethical approval from Altamash Institute of Dental Medicine (AIDM) Karachi (AIDM/RDRC/10/2021/3 this randomized control trial was conducted from September-December 2021. Sixth standard students aged 11 years to 13 years from three Government schools of Karachi whose guardian provided written, informed consent were enrolled in the study. Students wearing orthodontic appliances, in need of emergency dental care, or suffering from any kind of systemic disease were excluded. Formerly non- probability convenience sampling technique was used to select three government schools, furthermore written permission from each school administration was obtained. Later students were divided into three groups by using lottery method. On the paper were listed class roll numbers of the students from all three selected schools. Then lottery method was used to allocate them into group A, B & C, one from each school. Group A&B were interventional groups whereas group C was the control group. The sample size was calculated by using the OpenEpi sample size calculator. Reduction in plaque score among lecture group 61,7% and control group 32.6%at one month follow up was used from a previous study2.95% confidence level, 80% power of test and 5% margin of error were kept; The calculated sample size was 47 in each group. By keeping dropout rate of 18% sample size was taken as 56 in each group(n=168). Oral examination kit, proforma (containing age,

gender, socioeconomic status, and parents' education) and loe and silness plaque index were used as research tools.[13] Initially plaque score(mm) at baseline(T0) was recorded. The chosen study subjects were seated in regular chairs with adequate lighting and a torch to help with the examination while thorough intraoral examinations were conducted. A mouth mirror, probe, and tweezer were included in the standard examination kit. Loe and silness plaque index scores ranging from 0mm-3mm; Excellent(0mm), Good(0.1-0.9mm), Moderate(1-1.9mm) and Poor(2-3mm).The distobuccal, buccal, mesiobuccal, and lingual surfaces of all index teeth(16,12,24,36,32,34) were examined in order to calculate the plaque score.The tooth PI was calculated using the average of the area indices. The individual PI was computed by dividing the total number of examined teeth by the sum of the recorded index tooth scores.Afterrecording baselineplaque index(T0)the students of intervention Group A &B (lecture& pamphlet)were demonstrated Bass method of brushing based upon criteria of American dental association(Toothbrush at a 45-degree angle placed over gums then gently movedin back and forth direction,now outer inner and chewing surfaces of the teeth were cleaned with the brush). Both groups were taughtEnglish and Urduthat they should clean their teeth twice in a day for 2 minutes.Group C(Control) had no intervention. Later plaque scores were assessed at one month(T1) and three months(T2)follow up from the baseline plaque score.

The data was entered in SPSS version 22.0. Mean and SD was calculated for quantitative variable age. Moreover, categorical variables including gender, socioeconomic status qualification and plaque index were presented as frequency/percentage. The Shapiro-Wilk test was used to check for normality of data. The data was non-parametric and the relationship between demographic factors and oral health education strategies was examined using the Chi square test. The chi square/fisher's exact test was used to stratify and compare the results between the groups. The purpose of this was to determine if there was any statistically significant difference between the groups and the plaque score at baseline(T0), one month(T1), and three months(T2) follow up. The level of significance was $p < 0.05$.

RESULTS

Table 1 shows the frequency distribution of demographic variables and it was found that out of a total of 168 study subjects a Majority 123(73.2%) were 12years old. 84(50%) were male and female each and 92(54.8%) belong to the middle-class families. 46(27.4%) of Mother's had secondary and Intermediate qualifications each and 53(31.5%) Father's had Intermediate qualifications. Mean age was 12.161±0.493.

Table 1: Frequency Distribution of Demographic Variables

Variable (n=168)		N	Frequency %
Age	11 years	9	5.4%
	12years	123	73.2%
	13 years	36	21.4%
Gender	Male	84	50%
	Female	84	50%
Socioeconomic status	Lower	68	40.5%
	Middle	92	54.8%
	Upper	8	4.8%
Mother's Education	Illiterate	29	17.3%
	Primary	23	13.7%
	Secondary	46	27.4%
	Intermediate	46	27.4%
	Graduate	36	14.3%
Father's education	Illiterate	14	8.3%
	Primary	21	12.5%
	Secondary	44	26.2%
	Intermediate	53	31.5%
	Graduate	36	21.4%
	Total	168	100%
Age(Mean±SD)	12.161±0.493		

Table 2 shows the frequency distribution of Plaque score and it was reported that at baseline(T0), 1st month(T1) and 3rd months(T2) follow up group A(Lecture) had good plaque score(0.1-0.9mm) among 51.8%, 85.7% and 69.6% of the students respectively. Among group B(Pamphlet) students at baseline(T0), 1st month(T1) and 3rd month(T2) follow up good plaque score(0.1-0.9mm) was found among 73.2%, 82.1% and 69.6% respectively. Furthermore at baseline(T0), 1st month(T1) and 3rd month(T2) follow up group C(Control) had Moderate plaque score (1.0-1.9mm) among 58.9%,55.4% and 53.6% of the students respectively. Hence a significant reduction in plaque score occurredin terms of increased %age of students showing good plaque score(from baseline to above 80% at 1st month(T1) in both lecture and pamphlet groups. whereas at 3rd month(T2) follow up it declined to 69.9% in each group. Furthermore statistically a significant difference exists between different categories of groups and plaque score (p<0.001 each).

Table 2: Comparison of Plaque score among the Study Groups

Loe and Sillness plaque index Scores		Group A(Lecture)		Group B(Pamphlet)		Group C(Control)		p-value
		N	%	N	%	N	%	
At Baseline(in mm)	Excellent 0	1	1.8%	8	14.3%	0	0	<0.001*
	Good 0.1-0.9	29	51.8%	41	73.2%	21	37.5%	
	Moderate 1.0-1.9	24	42.9%	6	10.7%	33	58.9%	
	Poor2.0-3.0	2	3.6%	1	1.8%	2	3.6%	
	Total	56	100%	56	100%	56	100%	
Follow up at 1st month(in mm)	Excellent 0	6	10.7%	7	12.5%	0	0	<0.001*
	Good 0.1-0.9	48	85.7%	46	82.1%	23	41.1%	
	Moderate 1.0-1.9	2	3.6%	3	5.4%	31	55.4%	
	Poor 2.0-3.0	0	0	0	0	2	3.6%	
	Total	56	100%	56	100%	56	100%	
Follow up at 3rd month(in mm)	Excellent 0	16	28.6%	12	21.4%	1	1.8%	<0.001*
	Good 0.1-0.9	39	69.6%	39	69.6%	23	41.1%	
	Moderate 1.0-1.9	1	1.8%	5	8.9%	30	53.6%	
	Poor 2.0-3.0	0	0	0	0	2	3.6%	
	Total	56	100%	56	100%	56	100%	

Chi-square/Fischer exact test applied *Statistically significant p<0.05

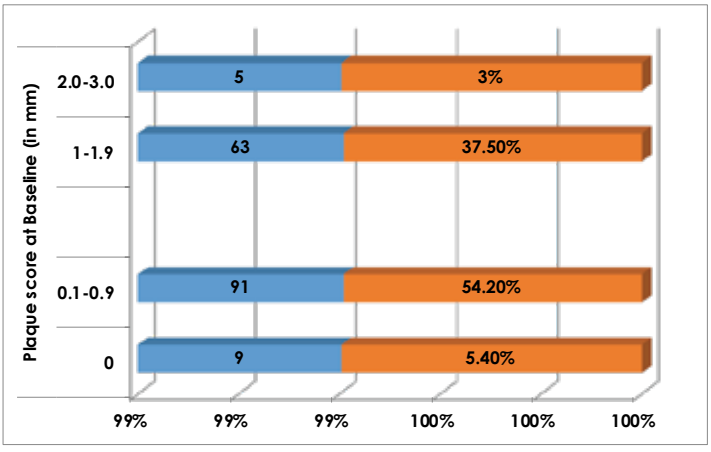

Figure 1: Frequency Distribution of Baseline Plaque score(in mm) Among study participants(n=168)

Figure 1 showed the baseline plaque score (T0) of all study groups(n=168) and it was seen that out of a total of 168 students 91(54.2%) had good (0.1-0.9 mm) plaque score followed by 63(37.5%) showing moderate(1-1.9mm), 9(5.4%) had Excellent(0mm) and only 5(3%) had poor (2.0-3.0mm) Plaque score at baseline(T0).

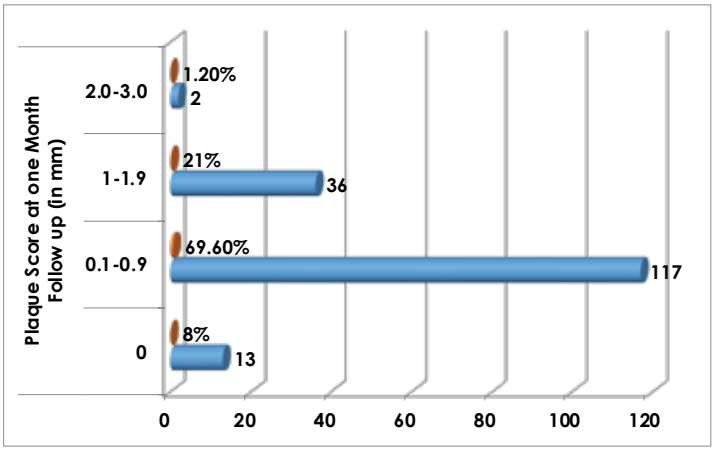

Figure 2: Frequency Distribution of Plaque score(in mm)at 1st month Follow up Among study participants(n=168)

Figure 2 showed plaque score of all study groups(n=168) at 1_{st} month(T1) follow up and it was seen that out of all the students enrolled 117(69.6%) had good(0.1-0.9 mm) plaque score, 36(21%) had moderate(1-1.9 mm) and 13(8%) had a excellent (0 mm) plaque score this value is 3% greater compared to the Baseline. Moreover, at baseline 5(3%) had poor(2-3mm) plaque score whereas after one month follow up it decreased to 2(1.2%).

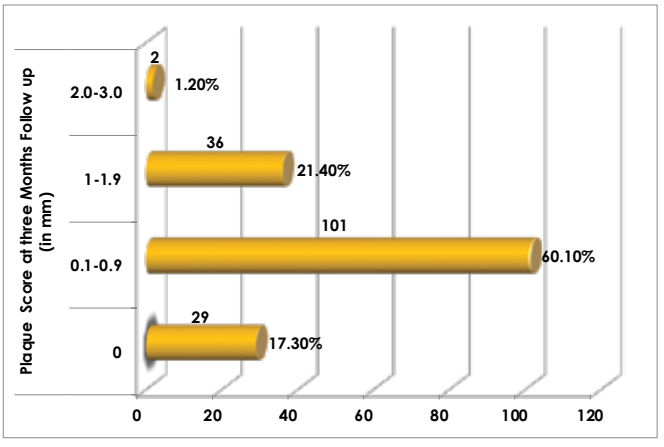

Figure 3: Frequency Distribution of Plaque score at 3rd month Follow up Among study participants(n=168)

Figure 3 showed plaque score of all study groups(n=168) at three month(T2) follow up and it was seen that out of a total of 168 study participants 101(60.1%) had good(0.1-0.9mm) plaque score followed by 36(21.4%) showing moderate(1-1.9mm) and 29(17.3%) had excellent(0mm) plaque score, this value is 12% greater compared to baseline (5.4%). Moreover, at baseline 5(3%) had poor(2-3mm) plaque score whereas after three months follow up it decreased to 2(1.2%)

Table 3 shows the association of demographic variables with oral health education strategies and it was reported that there is a statistically significant association of Group A(Lecture), group B (Pamphlet), and Group C (Control) with different categories of age(p=0.005), gender (p= 0.00), Mother's qualification(p=0.001) and Father's qualification(p=0.003).

Table 3: Association of Demographic Variables with Oral Health Education Strategies

Parameters(n=168)		Groups			Total	p-value
		Group A(Lecture)	Group B(Pamphlet)	Group C(Control)		
Age	11Years	5(8.9%)	3(5.4%)	1(1.8%)	9	
	12Years	31(55.4%)	47(83.9%)	45(80.4%)	123	
	13Years	20(35.7%%)	6(10.7%)	10(17.9%)	36	**0.005***
Gender	Male	28(50%)	0(0%)	56(100%)	84	
	Female	28(50%)	56(100%)	0(0%)	84	**0.000***
Socioeconomic status	Lower	19(33.9%)	20(35.7%)	29(51.8%)	68	
	Middle	33(58.9%)	32(57.1%)	27(48.2%)	92	
	Upper	4(7.1%)	4(7.1%)	0(0%)	8	0.118
Mother's qualification	Illiterate	10(17.9%)	7(12.5^)	12(21.4%)	29	
	Primary	1(1.8%)	11(19.6%)	11(19.6%)	23	
	Secondary	16(28.6%)	18(32.1%)	12(21.4%)	46	
	Intermediate	20(35.7%)	7(12.5%)	19(33.9%)	46	**0.001***
	Graduate	9(16.1%)	13(23.2%)	2(3.6%)	24	
Father's qualification	Illiterate	2(3.6%)	4(7.1%)	8(14.3%)	14	
	Primary	6(10.7%)	3(5.4%)	12(21.4%)	21	
	Secondary	9(16.1%)	23(41.1%)	12(21.4%)	44	
	Intermediate	21(37.5%)	15(26.8%)	17(30.4%)	53	**0.003***
	Graduate	18(32.1%)	11(19.6%)	7(12.5%)	36	
Total		56	56	56	168	

Chi square test applied *statistically significant p<0.05

DISCUSSION

Health education programs that aim to promote oral health and control the rising burden of oral diseases find the ideal home in schools. As a component of oral health promotion, oral health education has long been regarded as a fundamental and necessary aspect of dental health services[14]. It is defined as "a process that informs, motivates, and helps persons to adopt and maintain healthy practices and lifestyles; advocates environmental changes as needed to facilitate this goal; and conducts professional training and research to the same end[15].Health education, which should begin in early childhood and be reinforced in schools, is the key to promoting good oral hygiene practices because it helps children form lifelong healthy habits in their early years[16] .The main aim of intervention strategies is to drastically change personal behavior from harmful to productive[5].Traditionally, information, education, and counseling have been used to achieve this. According to this study, school going students can improve their oral hygiene with the aid of a school-based educational intervention that is easy to set up and inexpensive. The individuals were chosen at random and shared a number of background traits, including similar socioeconomic status, age ranges, and city school districts. The reduction in dental plaque score was observed in this study and it was concluded that lecture method followed by Pamphlet method showed reduction in plaque as compared to the control group. As from baseline to 1st follow-up (T1) both lecture and pamphlet groups had good plaque scores (0.1-0.9mm) among 85.7% and 82.1% of students which at baseline(T0) was only 51.8% in the lecture group and 73.2% in pamphlet groups; Moreover, at 2nd follow up(T2) both groups had 69.9% students with good plaque score (0.1-0.9mm). No change was observed among the control group Contrary to this a study supporting the current findings showed 61.7% of the lecture group and only 32.6% of the control group showed a reduction in plaque score[2].

Another similar study reported that at two months

follow-up Plaque Index decreased in the lecture group former to the Pamphlet group[10]. Compared to the control groups, the study groups underwent proper toothbrushing teaching sessions and they showed a significant reduction in plaque and gingival scores[11]. Among different dental health education strategies used it was found that a Positive impact on dental plaque was seen among 58% of the students in the leaflet group whereas only 37% in the videotape and 10% among controls. Hence the use of leaflets instead of videotapes improved oral hygiene among Nigerian children[12]. Another similar study by L. Gavic and colleagues found that Pamphlet method of dental education was weaker then lecture method[17].The pamphlet is still useful even though the study's results were less than ideal. Pamphlets are now a popular and widely used tool for public education in health promotion. The pamphlet's benefits as an instructional tool include its affordability, ease of distribution, and ease of display. Additionally, readers have the option to go back and reread content whenever they see fit or when additional information is required. As a result, they are among the preferred media for educating the broader public. Sadly, pamphlets can occasionally be difficult to understand, having no effect on the reader and being ineffective as a teaching tool. The level of linguistic expressions used in pamphlets is the primary factor contributing to their inefficiency.[18]

According to our research only 9(5.4%) of the 168 study participants had a excellent(0mm) Plaque score at the start of the study. Following baseline(T)), 13 (8%) of the subjects had excellent (0mm)plaque score at one month(T1) follow up; this value is 4% higher than baseline. Additionally, at three months(T2) follow up, 29 people (17.3%) had plaque scores of excellent (0mm), making this value 12% higher than the baseline (5.4%). After three months of follow-up, the plaque score dropped from 2-3mm at baseline, when it was 5(3%), to 2(1.2%). Similar to our study a previous study found proper brushing techniques adoption proved significant reduction in plaque among pre-school students as recorded from baseline at 1st and 2nd follow ups but later at 3rd follow up it matches baseline, hence there was a rise in plaque index[19]. Another literature supported plaque index further decreased as a result of interactive educational sessions with kids using the right tools[20].In line with current findings a decline in plaque was reported as formerly it was 75.5% which later declined to 66.5% post-intervention[21]. A meta analysis by Handayatun, N.N., concluded that dental health education initiatives carried out in schools can lower children's plaque scores. It is evident from the analysis that the plaque scores from the pre-and post-test differ. There was a notable difference between the intervention group and the control group[22].

In this study, the authors used three main modalities of health education, two of which were a pamphlet and a lecture. The pamphlet was chosen as the drafting method because of its advantages, including content summarized form, rapid replication, easy-to-use design, reusability, and multitasking capability. On the other hand, the pamphlet was unable to effectively communicate the information and the subtleties of a practical instruction. Less specialized equipment and facilities were needed for verbal instruction/lecture using a dental model, which helped kids know how to brush their teeth more cautiously. The benefit of the lecture method is that it enables multiple students to learn at once. With a predetermined lesson plan, schedule, venue, and flexibility, the lecture technique is easy to use, practical, and popular[23]. The same age group encountered in both national and international literature may be the cause of the synonymous findings between this study and earlier ones. Additionally, similar social and cultural norms prevailing in the community may help people understand oral health education.

This study proved a statistically significant association exists between different categories of age(p=0.005) gender (p=0.00), mother's qualification(p=0.001)and Father's qualification(p=0.003) among study and control groups. Similar findings were observed by authors previously they found statistically significant differences among study and control groups and different categories of gender (Male/Female)[2,10]. Another study showed dental health awareness has a significant correlation with parents' education only whereas family income and parents' education had a positive and significant correlation with the dental health practice[24].

Overall health well as oral health promotion/education is critical. Moreover, oral health facility should be available to all not just to primary school going children. Many different types of health education interventions to improve children's oral health are planned and they may lead to instill good oral health knowledge, attitudes, and healthy behaviors among them. Oral health education includes proper brushing methods implementation, food and nutritional strategies and dental flossing, according to many countries' standards.[25] Oral health as well as oral hygiene are inextricably linked and neglected oral hygiene behaviors can lead to morbidities like caries and gingivitis. On the contrary lifestyle adaptations, such as eating vigorously, sugary drinks ingestion, smoking cigarettes and alcohol consumption have bad impact on oral health; however improved oral health strategies emphasize at preventive intervention. All of these behaviors can be controlled in school settings by improving the physical environment and provision of oral health promotion intervention in school policy[4].

This study had small sample size, despite being a multi-centered investigation and only government schools were approached no private institution were encountered. Furthermore, at the first follow-up, there was a notable decrease in the frequency of plaque in both the lecture and pamphlet groups (85.7% and 82.1%, respectively). However, these numbers later declined to 69.6% each, so we are unable to determine which approach is superior between lecture and pamphlet. Based on current findings dental health education should be implemented at school level to promote better oral hygiene practices. Furthermore, incorporating dental health education sessions into curriculum will aid school going children to build good oral habits at early age.

CONCLUSION

This study concluded that oral health education via Bass brushing method demonstration resulted in the reduction of plaque score from baseline to three months follow up in the lecture group followed by Pamphlet group whereas no change was seen in control group. Hence lecture method was found effective in reducing plaque scores. Moreover, demographic variables age, gender, mother's qualification and Father's qualification showed a statistically significant association among Groups.

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CONFLICT OF INTERESTS

All authors do not have any conflict of interest.

ETHICAL APPROVAL

Ethical approval was obtained before study initiation by the institutional review board of Altamash Institute of Dental Medicine (AIDM) Karachi (AIDM/RDRC/10/2021/3). All procedures performed in studies involving human participants were in accordance with the ethical standards of the Helsinki Declaration.

CONSENT FOR PUBLICATION

Before data collection, verbal informed consent was taken from each participant in the study.

AVAILABILITY OF DATA

Data cannot be shared publicly because it is the intellectual property of Altamash Institute of Dental Medicine (AIDM). Data are available from the Altamash Institute of Dental Medicine (AIDM) Karachi.

FUNDING STATEMENT

No funding was sought for this study.

DISCLAIMER

This article is extracted from a thesis project of one of the authors.

REFERENCES

1. Al-Tayar BA, Ahmad A, Sinor MZ, Harun MH. Oral health knowledge, attitude, and practices among Yemeni school students. Journal of International Oral Health. 2019 Jan 1;11(1):15-20. DOI: 10.4103/jioh.-jioh_176_18
2. Reddy MP, Lakshmi SV, Kulkarni S, Doshi D, Reddy BS, Shaheen SS. Impact of oral health education on plaque scores with and without periodic reinforcement among 12-year-old school children. Journal of Indian Association of Public Health Dentistry. 2016 Apr 1;14(2):116-20.DOI: 10.4103/2319-5932.183806
3. Carvalho TH, Pinheiro NM, Santos JM, Costa LE, Queiroz FS, Nóbrega CB. Estratégias de promoção de saúde para crianças em idade pré-escolar do município de Patos-PB. Revista de Odontologia da UNESP. 2013;42:426-31.
4. Ahmad M, Hussain M, Afzal M, Gilani SA. Effectiveness of health education to improve oral care of primary school children in a rural community of Pakistan. EC Dental Science. 2019;18:1-9.
5. Rana BK, Rizwan Z, Rizwan G, Zia H, Afzaal M, Tariq R. Integrated school-based child oral health education-An intervention with an impact. The Journal of Medical Research. 2021;7(3):83-8.
6. Rajesh KS, Ansari AS, Hegde S, Kumar A. Clinical evaluation of plaque removal efficacy of three commercially available toothbrushes. Int J Appl Dent Sci. 2018;4(1):62-7.
7. Asgari I, Amiri A. Relationship between self-reported oral hygiene and clinical plaque index among adolescents in Isfahan. Caspian Journal of Dental Research. 2019 Sep 15;8(2):56-62. DOI: 10.22088/cjdr.8.2.56.
8. Demiriz L, Dede FO, Balli U. Impact of three different education methods on oral hygiene and theoretical knowledge of schoolchildren. Pesquisa Brasileira em Odontopediatria e Clinica Integrada. 2018 Feb 26;18(1):3897. http://dx.doi.org/10.4034/P-BOCI.2018.181.29.
9. Cascaes AM, Peres KG, Peres MA, Demarco FF, Santos I, Matijasevich A, Barros AJ. Validity of 5-year-old children's oral hygiene pattern referred by mothers. Revista de saude publica. 2011;45:668-75. https://doi.org/10.1590/S0034-89102011005000033.
10. Ramezaninia J, Naghibi Sistani MM, Ahangari Z, Gholinia H, Jahanian I, Gharekhani S. Comparison of

the effect of toothbrushing education via video, lecture and pamphlet on the dental plaque index of 12-year-old children. Children. 2018 Apr 14;5(4):50. https://doi.org/10.3390/children5040050.
11. Damle SG, Patil A, Jain S, Damle D, Chopal N. Effectiveness of supervised toothbrushing and oral health education in improving oral hygiene status and practices of urban and rural school children: A comparative study. Journal of international society of preventive and Community Dentistry. 2014 Sep 1;4(3):175-81. DOI: 10.4103/2231-0762.142021.
12. Yazdani R, Vehkalahti MM, Nouri M, Murtomaa H. School-based education to improve oral cleanliness and gingival health in adolescents in Tehran, Iran. International Journal of Paediatric Dentistry. 2009 Jul;19(4):274-81. https://-doi.org/10.1111/j.1365-263X.2009.00972.
13. Asgari I, Amiri A. Relationship between self-reported oral hygiene and clinical plaque index among adolescents in Isfahan. Caspian Journal of Dental Research. 2019 Sep 15;8(2):56-62. DOI: 10.22088/cjdr.8.2.56.
14. Malhotra S, Singh P, Dubey H. Effectiveness of Oral Health Education on knowledge and practice among 15 year old children of Government High Schools in Lucknow city (Uttar Pradesh). University Journal of Dental Sciences. 2020 Aug 27;6(2):51-6. https://doi.org/10.21276/ujds.2020.6.2.4
15. Hiremath SS. Textbook of preventive and community dentistry. Elsevier India; 2011 Aug 15.
16. Cabrera MF, Pillacela JF, Lafebre MF, Reinoso JD, Ramón JE. Impact of an educational intervention on oral health in children aged 8 to 11 years. World Journal of Advanced Research and Reviews. 2022;14(2):510-4. https://doi.org/10.30574/wjarr.2022.14.2.0459.
17. Gavic L, Marcelja M, Gorseta K, Tadin A. Comparison of different methods of education in the adoption of oral health care knowledge. Dentistry journal. 2021 Sep 26;9(10):111. https://-doi.org/10.3390/dj9100111.
18. Arian M, Ramezani M, Tabatabaeichehr M, Kamali A. Designing and evaluating patient education pamphlets based on readability indexes and comparison with literacy levels of society. Evidence Based Care. 2016 Jul 1;6(2):19-28. https://-doi.org/10.22038/ebcj.2016.7304
19. Ceyhan D, Akdik C, Kirzioglu Z. An educational programme designed for the evaluation of effectiveness of two tooth brushing techniques in preschool children. European journal of paediatric dentistry. 2018 Sep 1;19(3):181-6. https://-doi.org/10.23804/ejpd.2018.19.03.3

20. Joybell C, Krishnan R. Comparison of two brushing methods-Fone's vs modified bass method in visually impaired children using the audio tactile performance (ATP) technique. Journal of clinical and diagnostic research: JCDR. 2015 Mar;9(3):ZC19. doi: 10.7860/JCDR/2015/11307.5651.
21. Raj S, Goel S, Sharma VL, Goel NK. Short-term impact of oral hygiene training package to Anganwadi workers on improving oral hygiene of preschool children in North Indian City. BMC Oral health. 2013 Dec;13:1-7. https://-doi.org/10.1186/1472-6831-13-67.
22. Handayatun, N.N., Kalsum, U., Anggereini, E. and Rusdi, M. Meta-Analysis: Effectiveness of Dental Health Education with Plaque Control in Children 6-12 Years Old. 2024 ;DOI:10.36349/easj-dom.2024.v06i03.008
23. Habib E, Shiraz AS, Naseri-Kouzehgarani G, Hooman S, Reza MM. The determinants of high school students smoking habits with special focus on teachers smoking in Iran: a population based study. Pneumologia (Bucharest, Romania). 2012 Jan 1;61(1):28-33.
24. Goodarzi A, Hidarnia AR, Tavafian SS, Eslami M. The survey of oral-dental health of elementary school students of tehran city and its related factors. Military Caring Sciences Journal. 2018 Dec 10;5(2):137-45.Doi;10.29252/mcs.5.2.137.
25. Jürgensen N, Petersen PE. Promoting oral health of children through schools–Results from a WHO global survey 2012. Community Dent Health. 2013 Dec 1;30(4):204-18. doi:10.1922/CDH_3283Petersen15.