



Comparative Evaluation of Efficacy of with and without Lift the Lip Technique in the Removal of Dental Plaque among 2-5 Years Preschool Children in Davangere city - A Concurrent Parallel Randomized Controlled Trial

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Abstract

Objective: A study was planned to evaluate the efficacy of with and without lift the lip technique in the removal of dental plaque among 2-5 years preschool children in Davangere city.

Materials and Methods: The present study is a concurrent parallel randomized controlled trial. A total of 28 participants aged 2 - 5 years were randomly allocated to two different groups as with and without lift the lip technique as group 1 and 2, where Fones toothbrushing was demonstrated to the parents of all the participants. Dental plaque was assessed at baseline, after seventh day and 14th day using plaque index. For within group and between group comparison Repeated measures ANOVA and independent t test were applied. Chi square test was used to assess the association between cooperation by children during toothbrushing with age and gender.

Results: Statistically significant reduction ($p = 0.00$) was found from baseline to seventh day and 14th day in dental plaque with mean scores from baseline (1.31;1.29), (0.95;0.86) at seventh day and reduced to (0.63;0.76) at 14th day for Group 1 and 2. No significant difference between the groups ($p = 0.47$; $p = 1$; $p = 0.4$) was found. There were no statistically significant association seen between the cooperation by children during toothbrushing with age ($p = 0.69$) and gender ($p = 1.0$).

Conclusions: Lift the lip technique is a simple and less time consuming technique which can provide better visualization and hence can help in the removal of dental plaque. Ultimately, it can help in the reduction of Early Childhood Caries.

Keywords: Early Childhood Caries; Dental Plaque; White Spot Lesion; Fones Method; Toothbrushing; Oral Hygiene

Introduction

Early Childhood Caries (ECC) is defined as the presence of one or more decayed (noncavitated or cavitated lesions), missing (due to caries), or filled tooth surfaces in any primary tooth in a child 71 months of age or younger and severe ECC (S-ECC) as any smooth surface caries in children under 3 years of age [1,2]. In India, the prevalence of ECC have shown to be 49.6% and 19.7% in Davangere, Karnataka [3,4]. Dental plaque considered to be the primary etiological factor related to early childhood caries [5-7].

Early Childhood Caries develops when the dental plaque (a polymicrobial biofilm) is not removed regularly, and the diet consists of mainly monosaccharides. Monosaccharides can be metabolized by many of the oral bacteria especially streptococci and actinomyces. This leads to an increased production of acids-based product including lactate and causes drop in pH. Lactate products demineralize the enamel. Dental plaque is built on top of the pellicle starting directly after mechanical removal of the biofilm. Bacteria and their alkaline products are responsible for pH rise in plaque and

base generating metabolism of plaque bacteria is considered to be a determinant for carcinogenicity of plaque [5].

Dental plaque can be removed by mechanical plaque control methods like various types of toothbrushing which is considered to be the most common and easy method [9-11]. Studies have shown that Fones toothbrushing technique for children is practiced frequently as it is an easily learnt and effective technique for tooth brushing. There is a study showing significant reduction in dental plaque among preschool children using Fones technique under supervision [12].

To achieve good oral health among children, parent's efforts are involved in maintaining their oral hygiene by toothbrushing. This can be done by correct visualization and position of its brush bristles [12,13]. Due to lack of visibility of areas in oral cavity like gum line, can cause plaque accumulation and ultimately lead to ECC when left untouched for cleaning.

Lift the lip technique was developed in National health and nutrition examination surveys for easy detection of high caries risk children group to prevent from ECC. According to Ministry of Health's Early Childhood Oral Health Toolkit, Lift the Lip technique is non-invasive, straightforward technique which can be used in any setting. It is not a full clinical examination or a diagnostic test, but parents can be trained to look at the teeth to identify early signs including presence of plaque on tooth surface, change in the colour of tooth to chalky white. It can also help to assess developed tooth decay. It takes only a couple of minutes to complete, hence not a time-consuming technique [14,15]. During toothbrushing, it will help parents to clean the tooth surface more efficiently with proper visualization.

Literature search revealed that there is no tool for parents to assess the oral cavity during or after toothbrushing at home setting. Lift the lip technique can influence the toothbrushing as an additional step to remove dental plaque. This technique can be affordable, easily accepted and adopted by the parent or caregiver during toothbrushing to improve oral health related quality of life [16].

Thorough literature search showed that in India, no research have been conducted for the assessment of the efficacy of lift the

lip technique in the removal of dental plaque using Fones toothbrushing technique among preschool children. This study is an attempt to demonstrate and encourage parents to regularly check and perform proper toothbrushing for their children which can reduce Early Childhood Caries. Hence, this study aimed to assess the efficacy of with and without lift the lip technique in the removal of dental plaque among 2-5 years preschool children in Davangere city. It was hypothesized that There is difference in the efficacy of with and without lift the lip technique in the removal of dental plaque among 2-5 years preschool children in Davangere city.

Materials and Methods

Study design and participants

Present study is a concurrent parallel design, type of randomized controlled trial conducted from July to November 2019. The study protocol was approved by the Ethical Review Board of Bapuji Dental College and Hospital, Davangere. Two to five years old children who visited the Pedodontia department, Bapuji Dental College and Hospital for any dental treatment were recruited for the study. Permission for the recruitment of subjects was obtained from the department of Pedodontia and study conducted in the department of Public Health Dentistry of the same college. Subjects aged 2-5 years who fulfilled the eligibility criteria were selected for the study using simple random sampling technique.

Eligibility criteria

Subjects whose parents gave voluntary written informed consent and assent from the children were included in the study. Subjects were selected who belonged to age between 2-5 years with presence of deciduous maxillary anterior teeth¹⁵, white spot at gum line of maxillary anterior tooth surface^{1,18} and baseline mean plaque index score of at least 1 (Plaque index) [11,16].

Subjects who were unable to comply with the study appointment schedules, known to have systemic conditions and diseases and on medication, subjects with fractured anterior teeth, crown placement on anterior teeth, restoration of anterior teeth, carious lesion, grossly decayed and subjects who had undergone oral prophylaxis within a month were excluded from the study.

Sample size estimation [19]

Sample size was calculated using G*Power software (G* Power HSD for indows.3.1.9.2.Germany: Heinrich-Heine-UniversitätDüs-

seldorf ;2017) with effect size as 1.5 (Based on previous study) [16], type I (α) error was fixed at 0.05 and type II (β) error at 0.8. After anticipating 20% drop out, final sample size was 28 (14 subjects in each group).

Preparation of special format

A specially prepared format in English language, exclusively designed for recording all the relevant data pertaining to general information, plaque scoring and subject cooperation scoring was used.

White spot identification [18,19]

And with lesion of 2mm Children were screened for the presence of white spot lesion.

Child was allowed to lie in semi-sitting position on the dental chair and the investigator was sitting at 11 o'clock position to the child. Index teeth 51 and 61 were cleaned and dry for the evaluation under adequate light using mouth mirror. Scoring criteria was based on presence or absence of white spot on the tooth surface at gum line. Presence of white spot was considered as high risk for Early Childhood Caries.

Interventional groups

Parents of subjects in intervention group were trained to follow Fones toothbrushing technique using lift the lip technique for 14 days. Parents of subjects in control group were trained to follow only Fones toothbrushing technique without lift the lip technique for 14 days.

Method of generating randomization sequence

Computer generated randomization technique was used. It was done to avoid selection bias, confounding bias, and baseline comparability during allocation of the subjects into two groups. Allocation was done by the person who was not involved in the study.

Intervention Details

Study purpose and procedure was explained to the parents in their regional language (Kannada) with the help of a mediator. After explanations, written consent were taken from the parents and verbal assent was taken from the study participants. Oral prophylaxis was performed by post graduate student of Pedodontia department. Fones toothbrushing technique was explained to both the groups using Dentoform model and lift the lip technique was

explained only to parents of the subjects in study group [9]. Use of Compliance checklist and cooperation assessment table was distributed to the parents.

Participants were recalled along with the parents after seventh and 14th day for follow up through phone calls and reminder messages were sent at alternate days to remind parents for the continuation of toothbrushing and to ask for any difficulty. Clinical examination for the assessment of dental plaque was performed by the examiner at baseline, seventh day and after 14 days of intervention.

Lift the lip technique [14]

The children should stand or sit straight in front of the parent.

Parents were asked to perform lift the lip technique thrice for the assessment.

Before toothbrushing - Gently children's upper lip should be moved up with the help of thumb and two fingers so that all deciduous anterior teeth are visible.

During toothbrushing - Upper lip was lifted by one hand and Toothbrushing was performed for one side by other hand, same procedure followed for other side.

After toothbrushing: It is done to assess for any type of debris or stain if left after tooth brushing.

Soft bristle kids' toothbrush and Colgate kids' toothpaste were distributed to the participants. Their parents were instructed to brush children's teeth with soft bristle toothbrush, for 2-3 minutes, twice a day. Two checklists were provided to parent for the assessment of compliance and for the assessment of cooperation shown by children during toothbrushing.

Assessment of dental plaque accumulation was performed using Dental Plaque Index [16,19]. With.

Index teeth as labial surface of maxillary deciduous anteriors. It was scored based on a numerical scale of 0 to 3 from no plaque to nearly entire tooth with visible plaque. Interpretation included categorization as good, fair and poor.

Behaviour shown by children during toothbrushing	Score	Interpretation
Children showing positive attitude towards toothbrushing (Happy and enjoying)	5	Excellent
Children showing acceptance and trying to follow parent/guardian	4	Very good
Children neither refusing nor accepting (Neutral behaviour)	3	Good
Children reluctant to cooperate with parent/guardian (Dull or cheerless)	2	Fair
Children refusing toothbrushing (Crying)	1	Poor

Table a: Cooperation of subjects related to toothbrushing was assessed based on Behaviour rating scales [5].

Blinding

Present study was single blinded study as the statistician was blinded during the analysis of gathered data. Investigator and the participants were aware of the groups and respective intervention.

Statistical Analysis

Data analysis was done using SPSS software version 20.0 (IBM Corp., Armonk, N.Y., USA). The statistical significance was fixed at $P < 0.05$. Intragroup baseline and post intervention assessment of dental plaque score were assessed using repeated measures Analysis of variance (rANOVA). Intergroup comparison was assessed by t test. Assessment of cooperation by children was done using chi-square test.

Results

This randomized controlled trial was conducted to evaluate the efficacy of with and without lift the lip technique in the removal of dental plaque among 2-5 years preschool children at baseline, seventh day and 14th day in Davangere city.

A sample of 28 participants were included, out of which 64% come under the age 4-5 years and 36% belonged to 2-3 years age group (Graph 1). Among all the participants 54% were males and 46% were females (Graph 2). Both the groups had equal number of participants that consisted of 14 participants in each group. Group 1 had participants with “with lift the lip technique” and Group 2 had participants “without lift the lip technique”.

The data obtained from the study was subjected to statistical analysis. Baseline Dental Plaque scores were assessed between the groups and there was no statistically significant difference between

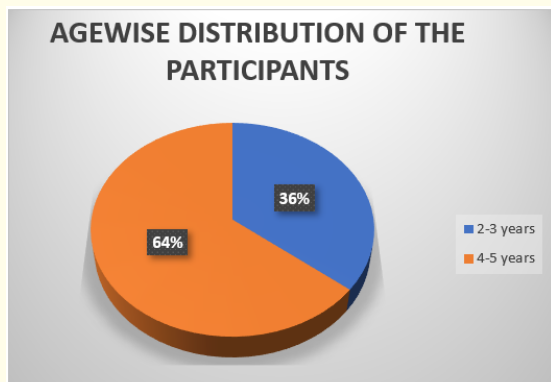
the groups. It was done to ensure baseline comparability. Table 1 shows Intra-group comparison at baseline, seventh day and fourteenth day for without lift the lip technique group using rANOVA test. Statistically significant reduction ($p = 0.00$) was found from baseline to seventh day and 14th day in dental plaque with mean scores from 1.29 at baseline, 0.86 at seventh day and reduced to 0.76 at 14th day. After applying post hoc test there was significant reduction ($p = 0.00$) in dental plaque was found between baseline to seventh day and 14th day with the mean difference of 0.429 from baseline to seventh day and 0.536 from baseline to 14th day (Table 2).

Table 3 shows Intra-group comparison at baseline, seventh day and fourteenth day for with lift the lip technique group using rANOVA test. Statistically significant reduction ($p = 0.00$) was found from baseline to 14th day in dental plaque with mean scores from 1.31 at baseline, 0.95 at seventh day and reduced to 0.63 at 14th day. After applying post hoc test there was significant reduction in dental plaque was found between baseline to seventh day and 14th day with the mean difference of 0.357 ($p = 0.002$) from baseline to seventh day and 0.679 ($p = 0.00$) from baseline to 14th day (Table 4).

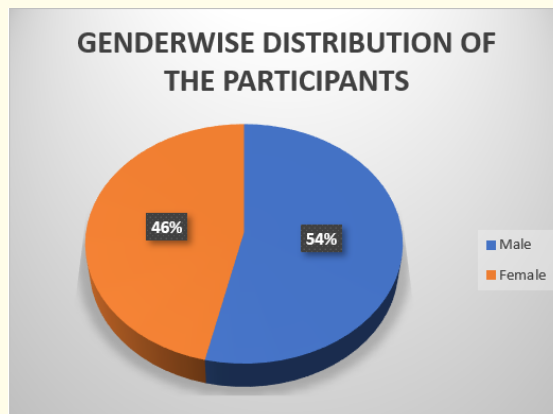
Table 5 shows Inter-group baseline, seventh day and fourteenth day comparison using t test.

Baseline mean dental plaque score was assessed between both the groups with the mean scores at baseline (Group 1 = 1.31; Group 2 = 1.29), at seventh day (Group 1 = 0.96, Group 2 = 0.86) and at 14th day (Group 1 = 0.63; Group 2 = 0.74) and there was no statistically significant difference between the groups ($p = 0.47$; $p = 1$; $p = 0.4$).

Table 6a and 6b show cooperation by children during toothbrushing on the basis of age and gender using chi square test. There were no statistically significant association seen between the cooperation by children during toothbrushing with age ($p = 0.69$) and gender ($p = 1.0$).



Graph 1: Pie chart depicting the distribution of participants by age.



Graph 2: Pie chart depicting the distribution of participants by gender.

Groups	Tests	Mean	Std deviation	Std error	CI		F value	p value
					Lower	Upper		
Without lift the lip technique group	Baseline PI	1.29	.264	.071	1.140	1.446	337.708	.000*
	Seventh day PI	.86	.247	.066	.722	1.007		
	Fourteenth day PI	.76	.282	.075	.594	.920		

P value - probability value ($p < 0.05$); F value - rANOVA value

Table 1: Intra-group comparison at baseline, seventh day and fourteenth day for without lift the lip technique group using rANOVA test.

Post-Hoc test for pairwise comparisons within without lift the lip technique group						
	PLAQUE	Mean Difference	Std. Error	Sig. ^b	Confidence Interval	
					Lower Bound	Upper Bound
Baseline	Seventh day	.429	.066	.000*	.248	.609
	14 th day	.536	.099	.000*	.263	.808
Seventh day	Baseline	.429	.066	.000*	.609	.248
	14 th day	.107	.076	.545	.101	.316
14 th day	Baseline	.536	.099	.000*	.808	.263
	Seventh day	.107	.076	.545	.316	.101

b. Adjustment for multiple comparisons: Bonferroni.

Table 2: Post-Hoc test for pairwise comparisons within without lift the lip technique group.

Group	Tests	Mean	Std deviation	Std error	CI		F value	p value
					Lower	Upper		
Lift the lip technique Group	Baseline PI	1.31	.230	.062	1.174	1.440	318.59	.000*
	Seventh day PI	.95	.274	.073	.792	1.108		
	Fourteenth day PI	.63	.255	.068	.481	.776		
P value - probability value (p < 0.05); F value - rANOVA value								

Table 3: Intra-group comparison at baseline, seventh day and fourteenth day for with lift the lip technique group using rANOVA test.

Post-Hoc test for pairwise comparisons within lift the lip technique group						
	PLAQUE	Mean Difference	Std. Error	Sig. ^b	Confidence Interval	
					Lower Bound	Upper Bound
Baseline	Seventh day	.357	.081	.002*	.135	.580
	14 th day	.679	.050	.000*	.540	.817
Seventh day	Baseline	.357	.081	.002*	.580	.135
	14 th day	.321	.079	.004*	.106	.537
14 th day	Baseline	.679	.050	.000*	.817	.540
	Seventh day	.321	.079	.004*	.537	.106
b. Adjustment for multiple comparisons: Bonferroni.						

Table 4: Post-Hoc test for pairwise comparisons within with lift the lip technique group.

Test	Group	Mean	Std deviation	Std error	CI		T value	P value
					L	U		
Baseline PI	Lift the group	1.31	.225	.060	.169	.212	0.231	.475
	Without	1.29	.264	.071	.170	.212		
Seventh day PI	Lift the group	.96	.259	.069	.097	.297	1.046	1.000
	Without	.86	.247	.066	.097	.297		
Fourteenth day PI	Lift the group	.63	.255	.068	.313	.098	1.071	.406
	Without	.74	.273	.073	.313	.098		
P value - probability value (p < 0.05); t value - Unpaired t test value								

Table 5: Intergroup baseline, seventh day and fourteenth day using unpaired t test.

Age	Cooperation during toothbrushing					χ^2	p Value
	Excellent	Very good	Good	Fair	Poor		
2-3 Years	0	4	2	4	0	1.867	0.69
4-5 Years	0	6	8	4	0		
P value – probability value (p<0.05); χ^2 - Chi square value							

Table 6a: Cooperation by children during toothbrushing on the basis of age using chi-square test.

Discussion

The present study assessed and compared the efficacy of with and without lift the lip technique in the removal of dental plaque among 2-5 years preschool children at baseline, seventh day and 14th day in Davangere city. In India, present study is first of its kind to evaluate lift the lip technique along with Fones toothbrushing technique among preschool children.

The results indicate that there was a statistically significant drop in mean dental plaque score within both the study groups (1.31 to 0.63 in Group 1 and 1.29 to 0.76 in Group 2; p = 0.00) from baseline to 14th day. But no significant difference was found between with and without lift the lip technique groups (p = 0.47; p = 1; p = 0.4). Any properly learned technique by parents can effectively controls the dental plaque in child. Furthermore, it has been demonstrated that the parents brush the children’s teeth more efficiently after instructions. Results from the study done by Damle., *et al.* (2014) showed that proper application of instructions and demonstration can help in reduction of dental plaque and hence can improve oral hygiene [23]. Toothbrushing is inefficient among children younger than eight years due to their inability to hold toothbrush for poor manual dexterity and lack of motivation. Nowadays, plaque removal with parent involvement for a young child is advisable. Parent supervision in maintaining oral hygiene help child to learn better how to brush their teeth properly. It increases the value of oral health and behaviour among that child [24]. Participants’ cooperation was also not statistically associated with age (p = 0.69) and gender (p = 1.0). Statistically significant reduction was found in mean plaque score using lift the lip technique along with modified bass toothbrushing method by Manrique., *et al.* (2019) [16].

According to systematic review performed by Ganesh., *et al.* (2019) plaque-associated diseases have a high prevalence (49.6%) among children aged 2-5 years since they depend on their parents

or caregivers to carry out or supervise oral hygiene for preventing ECC [3]. In Davangere city, the prevalence of Early Childhood Caries was 19.7% among children of age between 205 years [4].

According to American Academy of Pediatric Dentistry, dental plaque is one of the primary etiological factors and to prevent early childhood caries among children, adequate plaque control is important. For early childhood caries to occur, first changes are appearance of white spot lesions on the gumline of maxillary incisors. If the child with early signs is not treated then the damage will continue [2,25].

There are various devices available nowadays, such as pediatric toothbrushes, finger-adapted brush, tooth wipes, wet cloth, or wet gauzes. Abanto., *et al.* (2009) reported that Manual Fones toothbrushing method still remains the most efficient method for removing dental plaque in children [26]. According to literature, Fones toothbrushing technique is mostly recommended for children especially preschoolers as it is easy to be learned and practiced by the parents and can be easily accepted by the children [13,27,28].

In the present study, parents’ involvement in maintaining oral health of their children was an important factor. As a result of correct visualization, proper technique and position of the bristles, it was possible to reduce plaque score. Participant compliance also played an important role.

Strengths of the study

In the present study, sample size was scientifically determined form the data taken from previously conducted study using G Power software. Computer generated randomization was done to eliminate confounding bias. Strict eligibility criteria was followed which reduced selection bias. Hawthorne effect was minimized by retracting the lower lip along with lift the lip technique. Oral prophylaxis was done and oral hygiene kit was distributed to the study

participants containing pedo toothbrush and toothpaste for standardization of oral hygiene practices. Parents were demonstrated and trained toothbrushing method resulted in good compliance. Proper reminders were given to the parents through phone call in short intervals.

Limitations of the study

Calibration was not done for the examiner prior to clinical examination. Method by which dental plaque assessment was done, it was subjective in nature that can alter the score during recording. Study was single blinded as only statistician was blinded throughout the study.

Future recommendations of the study

Clinical trials are recommended to evaluate the long-term effect of Lift the lip technique among 2-5 years children. The most important factor associated with Early Childhood Caries is plaque accumulation. Alternative dental plaque evaluation including Quigley-Hein plaque index can be done using chemical antiplaque agents for more accuracy. Microbial count analysis for Lactobacilli can be done in future studies as confirmatory tests.

Conclusions

The results of the present study showed there was a significant reduction in the plaque scores in with and without lift the lip technique among children aged 2-5 years in Davangere city. Lift the lip technique is a simple and less time-consuming technique which can provide better visualization and hence can help in detection and removal of dental plaque which is one of the early signs. Ultimately, it can help in the reduction of Early Childhood Caries.

Public Health Significance

There is high prevalence of Early Childhood Caries in country like India, it can be reduced at initial stage, Lift the lip technique can help parents to easily and efficiently remove dental plaque. Fones toothbrushing using Lift the lip technique can help to prevent Early Childhood Caries among children as it is cost effective, affordable and can be easily adopted by the parents. Maintaining proper oral hygiene practices by parents can help inculcating healthier oral habits among children which can prevent ECC.

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