ABSTRACT

Purpose: The aim of the present study was to evaluate the efficacy of plaque removal by using finger toothbrush among a group of preschool children by their mother/caretaker.

Materials and methods: Thirty healthy preschool children were enrolled in the study, their mother/caretaker were provided finger and manual toothbrushes and were asked to use these brushes on alternative days for 3 weeks in order to achieve optimum dexterity with both the brushes. The subjects were recalled with their mother/caretaker, after having abstained from all oral hygiene practices for 48 hours and they were divided into two groups. A single calibrated examiner assessed all the study subjects to measure amount of plaque using Silness and Loe plaque index, before and after the tooth brushing with allotted toothbrush. The mothers/caretakers were also questioned about the comfort and convenience in using the brushes provided in the study.

Results: Only 27 study subjects had returned along with their mother/caretaker for intervention. Finger toothbrush and manual toothbrush groups, consisted of total 10 males and four female subjects, and eight males and five female subjects respectively. The mean plaque scores before tooth brushing for finger toothbrush and manual toothbrush were 1.43 and 1.29 respectively, and after tooth brushing 0.22 and 0.16 for the finger toothbrush and manual toothbrush respectively. Higher mean plaque index score was recorded for finger toothbrush compared to manual toothbrush but the difference was not statistically significant.

Conclusion: Finger toothbrush was able to remove plaque as efficacious as manual toothbrush in preschool children of 3 to 6 years of age.

Keywords: Finger toothbrush, Manual toothbrush, Preschool children, Plaque removal, Efficacy.

INTRODUCTION

The role of the accumulation of dental plaque in the development of dental caries and periodontal diseases is well established.1,2 Dental plaque is considered as one of the risk factor for caries in infants and preschool children, mainly early childhood caries (ECC).3 ECC has been a major public health problem over many years and still continues to date. It affects normal growth and development as well as social adaptation of young children. Despite the drastic decline in the prevalence of dental caries, in children it remains a major problem, as it affects significant percentages of preschool populations, in both developed and developing countries.4 A comprehensive review observed a prevalence rate of 1 to 12% of ECC in developed countries, and prevalence as high as 70% in developing countries or within disadvantaged populations.5

Daily removal of plaque is important for the maintenance of gingival, periodontal and dental health. Tooth brushing is the primary and most important measure for people to remove dental plaque and to maintain good oral hygiene. Manual and electrical toothbrushes have been widely recommended by dental professionals for this purpose in children. Although improvements have been made in toothbrush type and design, most people when brushing their teeth only remove approximately 50% of the plaque. For manufacturers, it is highly desirable to design a toothbrush that allows the average person to remove almost all plaque from his or her teeth on a daily basis.

Finger toothbrush, which is mounted to the finger of the hand and used for brushing child’s teeth by mother/caretaker, is available commercially. Consequently, it permits a better control over the finger pressure as the finger can feel the teeth and gingival surface. This would, in effect, allow the brush to reach in less accessible teeth and gingival surfaces, which helps in effective plaque removal from all tooth surfaces.

Considering there are no published studies on the efficacy of using finger toothbrush in plaque removal this study was conducted. The aim of the present study was to evaluate the efficacy of plaque removal by using finger toothbrush among a group of preschool children by their mother/caretaker.

MATERIALS AND METHODS

Study Subjects

The present study was conducted in Shi Sajjan Rao Vidya Samsthe, Bengaluru. A total of 120 children of 3 to 6 years of age are studying in the school. An oral health education
program was conducted for the parents of these children. The number of parents that participated were only 70. At the end of the program, the study was explained to them. The children whose parents gave the consent were screened based on inclusion and exclusion criteria. There were totally 30 students who fulfilled the criteria and were enrolled in the study. The study included subjects who have no previous experience with the finger brush and subject’s who got parents/guardian consent for enrolment into the study and excluded those who had history of antibiotics usage during 3 months prior to the study, presence of acute oral lesions and presence of rampant caries.

**Brush Design**

The finger toothbrush (Little’s, Pearl Industries, India) is a new approach in toothbrush design. It is soft and flexible and it is a single moulded piece toothbrush with multi tufts made of soft silicon rubber material. It contains single bristle in each tuft, which is positioned in rows and placed perpendicular to the head. It is used by inserting or placing on to the finger, preferably the index finger, for brushing the child’s teeth (Fig. 1).

The control brush was a regular manual toothbrush (Colgate Palmolive, India) which is recommended for preschool children. This is also a multi-tufted toothbrush in which the bristle tufts are positioned in three rows, perpendicular to the straight handle.

**Study Design**

A double blind, randomized, controlled study was conducted to evaluate and compare the plaque removal efficacy of commercially available finger toothbrush to that of a manual toothbrush. The examiner and analyzer (statistician) were blinded. Written consent was obtained from parents of 30 qualified study subjects.

The mother/caretaker of each study subject received both finger brush and manual toothbrush. They were trained to use the brushes by giving demonstrations on typodont model and also in the child’s mouth in circular and horizontal scrubbing method. No instructions were given with regard to the frequency of tooth brushing. The mothers were asked to use finger toothbrush and manual toothbrush on alternate days for 3 weeks in order to achieve optimum dexterity with both the brushes.

The second visit was arranged at the end of 3 weeks. The subjects were recalled with their mother/caretaker, after having abstained from all oral hygiene practices for 48 hours to ensure sufficient amount of plaque formation. Plaque disclosing solution was used for identifying plaque in this study. The disclosing solution was applied using Dab technique, i.e. a small cotton pellet was saturated with disclosing agent and was applied on to the all tooth surfaces. After 5 minutes, the child was asked to rinse out the solution and scored for presence of plaque. The calibrated examiner assessed all the present study subjects to measure amount of plaque on the teeth using the Silness and Loe (1964) plaque index with a 0 to 3 scoring system.

Later, study subjects were randomly grouped into two groups, group A and B, then each group were assigned one randomly selected toothbrush and then mother/guardian were asked to clean their child’s teeth using allotted toothbrush in the absence of examiner for 60 seconds. Subjects were again evaluated for remaining plaque after brushing using same index and method by the same examiner. The mothers/caretakers were also questioned about the comfort and convenience in using the brushes provided in the study.

**Statistical Analysis**

The average plaque index score was determined for each individual. The percentage of plaque reduction was calculated from pretooth brushing and post-tooth brushing scores. The efficacy of finger toothbrush and manual toothbrush was compared using Student t-test. The p-values ≤0.05 were accepted as statistically significant.

**RESULTS**

After 3 weeks of familiarization period only 27 study subjects had returned along with their mother/caretaker for intervention. Group A, i.e. finger toothbrush group, consisted of total 10 males (71%) and four female study subjects (29%), and group B, i.e. manual toothbrush group, had eight males (62%) and five females (38%) study subjects. During this 3-week clinical trial, no adverse effects were found or reported for both the brushes.

![Fig. 1: Finger toothbrush and manual toothbrush](image-url)
The overall mean of plaque scores of the two groups is presented in Table 1. This provides the before and after—
tooth brushing plaque scores for the finger and manual
toothbrush as well as the plaque reduction in terms of
percentages. The mean plaque scores before tooth brushing
for finger toothbrush (group A) and manual toothbrush
(group B) were 1.43 and 1.29 respectively. The mean plaque
scores after tooth brushing was 0.22 for the finger toothbrush
and 0.16 for manual toothbrush.

Higher mean plaque index score was recorded for finger
toothbrush compared to manual toothbrush but the
difference was not statistically significant (p = 0.569). The
difference in mean plaque index scores between finger
toothbrush and manual toothbrush after brushing was also
not statistically significant (0.446).

The Table 2 shows the difference in plaque scores of
each toothbrush before and after tooth brushing. It was
observed that there was a reduction in mean plaque index
scores after brushing compared to before brushing in finger
toothbrush group and the difference was statistically
significant (p < 0.001).

Similarly in manual toothbrush group, the decrease
in mean plaque index scores from before brushing to
after brushing was found to be statistically significant
(p < 0.001).

With regard to convenience of brushing using these
brushes, among 27 mothers/caretakers in the study, 20 of
them preferred finger toothbrush and only seven of them
preferred manual toothbrush to brush their child’s teeth.

DISCUSSION

The results of the present clinical study indicate that finger
toothbrush was as efficacious as manual toothbrush in
plaque removal. Though the mean plaque index scores in
finger toothbrush group was higher than manual toothbrush
the difference was not significant.

There are few studies that report on finger brushing, but
these describe the effect in relation to caries incidence.6-8
No controlled studies were found, which compare finger
toothbrush to a regular manual toothbrush with regard to
plaque removal. There is, however, a study done by
Graveland et al in 20049 on efficacy of a finger brush
(I-Brush—which is an elastic stocking topped by micro-
fibres, which resembles to present study finger toothbrush)
in plaque removal which proved to be less efficacious as
compared to a manual toothbrush.

Also, a few ‘foam brush’ studies have been published
over the years. These brushes resemble a disposable soft
sponge on a stick and have been dispensed to hospital
patients for intraoral cleansing and refreshing as early as
the 1970s.10 They are particularly used for oral care in
medically compromised and immunocompromised patients,
to reduce the risk of oral and systemic infection.

Lefkoff et al 1995,11 studied the effectiveness of such a
disposable foam brush on plaque. In this study the regular
manual toothbrush was found to be significantly more
effective in cleaning. Compared to finger brush the foam
brush did, however, show some plaque removal capabilities.
Nevertheless according to most authors, foam brushes
should not be considered as a substitute for the regular
toothbrush.11-14

Most gingival diseases start in the interdental area.15
The main reason for the insufficient removal of proximal
plaque is that, the present brushes find it difficult to reach
these areas to make a proper scouring action across tooth
and gingival surfaces. The ability of a toothbrush to remove
plaque depends upon its ability to reach its sites of
accumulation.16 Toothbrush should be designed for easy
cleaning and access to all the tooth surfaces.

The most pronounced feature of the finger toothbrush
is that it is flexible enough to reach all the areas and permits
better control over the finger pressure and thus helps to brush

<table>
<thead>
<tr>
<th>Time interval</th>
<th>Group</th>
<th>Mean</th>
<th>Std. dev.</th>
<th>Mean difference</th>
<th>T</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before brushing</td>
<td>Group A</td>
<td>1.43</td>
<td>0.27</td>
<td>0.1374</td>
<td>1.410</td>
<td>0.569</td>
</tr>
<tr>
<td></td>
<td>Group B</td>
<td>1.29</td>
<td>0.23</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>After brushing</td>
<td>Group A</td>
<td>0.22</td>
<td>0.10</td>
<td>0.0542</td>
<td>1.544</td>
<td>0.446</td>
</tr>
<tr>
<td></td>
<td>Group B</td>
<td>0.16</td>
<td>0.08</td>
<td></td>
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</tr>
</tbody>
</table>
the child’s teeth efficiently without causing damage to soft tissues. Limitation of study was study consisted of small sample size.

CONCLUSION

Finger toothbrush was able to remove plaque as efficacious as manual toothbrush in preschool children between 3 and 6 years of age. More studies need to be done with larger sample size, to emphasize the effectiveness of finger toothbrush in plaque removal.

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