

## Evaluation of Various Oral Hygiene Instruction Methods on Effectiveness of Tooth-brushing in Primary School Children

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The purpose of this study was to evaluate various oral hygiene instruction methods on effectiveness of tooth-brushing in primary school children. This study was performed in three randomized primary schools (Baka-5, Baka-12, Baka-7; similar in socioeconomic and schooling condition) of Pyigyitagon Township, Mandalay. A baseline data collection (involving plaque score and gingival score) was done for 150 children (age 5 years±6 months) from three schools. They were divided into three groups (Group 1=50, Group 2=50, Group 3=50) from each school. Group 1 was given oral hygiene instruction by audiovisual (multimedia) methods and supervised tooth-brushing by an adult involved in front of mirror. Group 2 was given oral hygiene instruction by using cartoon flip charts and artificial giant tooth-brushing model (TBM). Group 3 got oral hygiene instruction verbally with the use of educational posters conventionally. All three groups were given additional oral hygiene instruction in similar manner, respectively, once per month two times. After 2 months of giving different oral hygiene instructions, the plaque scores and gingival scores were recollected from all groups and compared with baseline data. This study demonstrated that oral hygiene instruction by audiovisual methods and supervised tooth-brushing by an adult involved in front of mirror had greater effectiveness of adopting correct tooth-brushing ( $p<0.05$ , ANOVA) and reducing dental plaque and gingival scores in primary school children. Young children can learn and applied health education instructions effectively by using understandable educational cartoon videos than other conventional methods used for adults. Necessity of supervision by guiding the correct tooth-brushing with a feedback showing in a mirror should be noted.

*Keywords:* Oral hygiene instruction methods, Effectiveness, Tooth-brushing

### INTRODUCTION

In modern days, the popularity and availability of snacks and sweeteners among school-aged children is very high. Cariogenic foods are increasingly within reach of all peoples in even the poorest of countries. Lack of exposure to fluoride in many countries coupled with increased exposure to sugar has seen high levels of tooth decay across the globe.<sup>2</sup> Oral diseases qualify as major public health problems in all regions of the world. The severe impact in terms of

pain and suffering, impairment of function and effect on quality of life must also be considered. Traditional treatment of oral diseases is extremely costly in several industrialized countries and not feasible in most low-income and middle-income countries.<sup>1</sup> Of all the oral diseases, dental caries is the most occurrence in young children. Dental caries is a multifactorial

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infectious and transmissible disease interactions between the tooth surface/subsurface and the adjacent microbial biofilm where acids are produced.<sup>10</sup> Disproportionately affecting socially disadvantaged populations, dental caries remains the most common unmet health need among children, primarily manifested as low experience of restorative dental treatment. It is considered a public oral health problem.<sup>6</sup> Most of the children are suffering from early childhood caries, gingivitis and early loss of primary teeth. Dental plaque accumulation and inflammation of gingiva are strongly related to dental caries and periodontitis irrespective of age, gender or racial identification.<sup>3</sup> Regular removal of plaque by mechanical means is effective in controlling supra-gingival plaque but it has the limitations for most people.<sup>3</sup> Giving oral hygiene instruction and the use of proper tooth-brushing method is the good way to reduce dental plaque accumulation and prevents caries development to some extent.

Effective dental hygiene is an indispensable prerequisite for the development of a healthy dentition. There are undisputed scientific findings regarding frequency, time, and duration of tooth-brushing. Dental research, however, often focuses on material aspects of toothpastes and specific brushing differences.<sup>7, 9</sup> The understanding and learning the mechanisms of tooth-brushing by young children have been neglected.

Children are more interested and understanding in health education by the use of educational cartoon videos (audiovisual aids) than conventional educational posters for adult. Tooth-brushing is a highly complex motor skill that is difficult for young children who, therefore, need for parental assistance. Two aspects of the child's development are required for learning tooth-brushing: (1) the development of self-regulation; and (2) the recognition of one's own face in the mirror. Together, both conditions mark the starting point of self-controlled tooth-brushing. Adults can help in this process.<sup>5</sup> In addition, adult should demonstrate correct tooth-brushing, which cannot be learned by

simple demonstration alone in young children. In order to formulate a wider health education program for the specific community, it is therefore necessary to evaluate which oral hygiene instruction technique is the most effective for that specific community. The general purpose of this study is to evaluate the various oral hygiene instruction methods on effectiveness of tooth-brushing in primary school children.

## MATERIALS AND METHODS

The study was performed by single-blind method, controlled field trial. The total number of 150 children from three primary schools (Baka-5, Baka-12, Baka-7; similar in socioeconomic and schooling condition and fulfill necessary number of students) in Pyigitagon Township were selected to involve in this study (50 from each school). Children in Baka-5 was categorized as Group 1, Baka-12 as Group 2 and Baka-7 as Group 3, respectively). Lottery method was used to randomly assign different oral hygiene instruction methods to these three groups. Group 1 got audiovisual (multimedia) oral health education and supervised tooth-brushing with an adult involved in front of mirror. Group 2 received oral health education by using cartoon flip charts and Giant Artificial Tooth Brushing Model (TBM). Group 3 was given comprehensive oral hygiene instruction verbally by means of posters. Oral hygiene instructions using the respective methods were given once per month for two times. The children from all groups were instructed to perform routine tooth-brushing practice twice daily at their homes. Places for tooth-brushing after lunch (including basins, pipelines and mirrors) in each school were provided and all children in this study got toothbrushes and toothpastes free of charge.

Investigator selected the schools, obtain permission from schools, to perform baseline data collection and analysis, to provide oral health education and supervise proper tooth-brushing method. Informed consent was obtained through school authority. Examiners carried out pre- and post-

recording of dental caries status and plaque scores and collection and tabulation of the data for statistical analysis. Recording clerks assisted the examiners in recording dental caries status and plaque scores.

### *Study Phase I*

After approval, three primary schools in the township were requested to assemble the participants in their classrooms. A baseline survey was made by using WHO Oral Health Assessment Form (2013)<sup>4</sup> and Silness and Loe plaque index<sup>8</sup> to get dental plaque scores and gingival scores. Plaque Index (PII) used on 6 selected primary teeth and 4 surfaces (Mesial, Distal, Occlusal and Lingual). The six index teeth are primary upper right second molar, right lateral incisor, left first molar, and lower left second molar, left lateral incisor, right first molar. Gingival Index (GI) was also recorded in the same manner. Scores were recorded by using CPI-probes.

### *Study Phase II*

#### Group 1

This group was given comprehensive oral health education instructions by means of audiovisual learning methods pertaining natures, etiology and prevention of common oral diseases and oral hygiene procedures. And they also got supervised tooth-brushing practice with an adult involved in front of mirror.

#### Group 2

This group was given oral health education instructions by using cartoon flip charts but not using audiovisual aids. Tooth-brushing method was demonstrated by using giant artificial tooth brushing model (TBM) not involving supervised tooth-brushing practice.

#### Group 3

This group of children got comprehensive oral hygiene instructions verbally by using posters and not pertaining tooth-brushing practice.

All three groups were given regular oral hygiene instruction in similar methods respectively once per month. The children

and their parents from all groups were instructed to perform tooth-brushing practice twice daily at their homes. Places for tooth-brushing were provided and encouraging after-lunch tooth-brushing for the children in their schools every day.

### *Study Phase III*

After 2 months, plaque scores and gingival scores of the children were collected and compared with the previous baseline data by using WHO Oral Health Assessment Form for children (2013)<sup>4</sup> and Silness and Loe plaque index.<sup>8</sup>

Plaque Index (PII 0, 1, 2, 3) was scored as follows:

PII 0 =No plaque

PII 1 =A film of plaque which cannot be seen but only by disclosing solution or by using probes

PII 2 =Moderate deposits of plaque which can be seen with naked eye

PII 3 =Abundance of plaque

Gingival Index (GI 0, 1, 2, 3) was scored as follows:

GI 0 =No inflammation

GI 1 =Mild inflammation, no bleeding on probing

GI 2 =Moderate inflammation, bleeding on probing

GI 3 =Severe inflammation, spontaneous bleeding

### *Data management*

Plaque scores (0, 1, 2, 3) and gingival scores (0, 1, 2, 3) were analyzed. Plaque index scores and gingival index scores were calculated by using the formula;

#### 1. Individual

PII, GI Scores = Total Scores/No. of surfaces examined

#### 2. Population

PII, GI Scores = Total Scores/No. of subjects examined

Plaque index scores and gingival index scores at baseline and after OHI were compared by using paired sample t test. The scores among three groups were compared by using ANOVA test. Statistical significance was set at p=0.05.

*Ethical consideration*

The study received human subjects approval from the Research and Ethics Committee of University of Dental Medicine, Mandalay, Department of Human Resource for Health, Ministry of Health and Sports, Myanmar. Participants provided written informed consent to participate.

**RESULTS**

The data were recorded from all children of three randomized schools (Baka-5, Baka-12, Baka-7; similar in socioeconomic and schooling condition) of Pyigyitagon Township (Mandalay, Myanmar) and distributed by group, all 3 groups indicated similar plaque index scores and gingival index scores at the baseline examination (Table 1). After 2 months of the study, all groups showed decreased numbers of plaque index scores (Figure 1). Gingival index scores of Group 1 children showed a decrease whereas other 2 groups had no remarkable changes (Figure 2).

Group 1 children showed best results out of all 3 groups. The mean number of dental plaque index scores after 2 months of the study was the lowest ( $p<0.05$ ) in Group 1 children. All three groups showed significant decrease in plaque scores after the study. But there was no significant difference in plaque index scores after OHI between Group 2 and Group 3 (Table 2). When comparing the mean gingival scores of all 3 groups, there was no significant changes between baseline and after 2 months

Table 1. Mean values of Plaque Score and Gingival Score distributed by Group and Examination Month ANOVA test ( $p<0.05$ )

Group	Mean Plaque Index Score	Mean Gingival Index Score	N
<i>Before</i>			
Group 1	0.8832	0.617	50
Group 2	1.0266	0.5732	50
Group 3	0.9996	0.5	50
<i>After 2 months</i>			
Group 1	0.3568	0.3134	50
Group 2	0.7196	0.4998	50
Group 3	0.6966	0.63	50

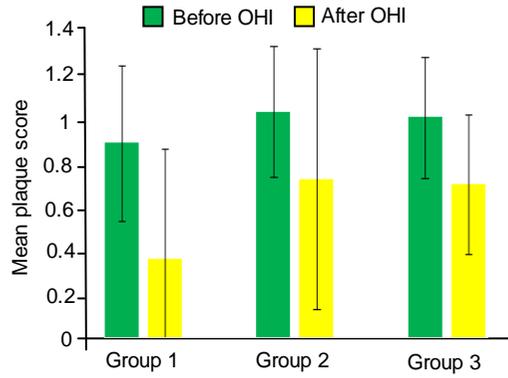


Fig. 1. The comparison of mean plaque score before and after the study of three groups ( $p<0.05$ )

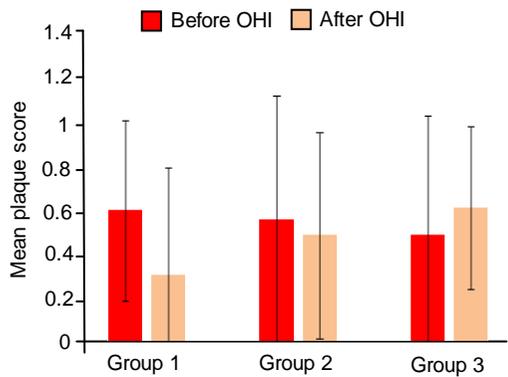


Fig. 2. The comparison of mean gingival score before and after the study of three groups ( $p<0.05$ )

Table 2. P-value for ANOVA test after 2 months study

Group comparison	Plaque Score (p value)	Gingival Score (p value)
I & II	0.001	0.111
I & III	0.002	0.002
II & III	0.969	0.338

study except Group 1 which showed slight but significant decrease in gingival score ( $p<0.05$ ) (Table 2).

**DISCUSSION**

In this study, oral hygiene instruction methods for primary school children were evaluated. These primary school children were chosen because dental caries prevalence is usually high at this age and first age of 6. In Myanmar, both parents and

children have little knowledge in oral hygiene practices and correct tooth-brushing methods. Most of the children are suffering from early childhood caries, gingivitis and early loss of primary teeth. The impacts of dental caries such as pain, loss of masticatory function and tooth crowding, etc. are very common among children in Myanmar. By effectively educating the children to practice effective tooth-brushing, the destruction of first permanent molar by caries at young age can be surely prevented. Moreover, most of the deciduous teeth of these children have to be used in daily function until the age of 11-12.

Children receiving oral hygiene instruction method using multimedia and supervised tooth-brushing (Group 1) had significantly greater effectiveness in reducing dental plaque and relieving gingival disease than other groups receiving different oral hygiene instruction methods after 2 months of study. However, within each group, Group 2 and Group 3 also showed significant reduction in dental plaque accumulation after receiving assigned oral hygiene instruction methods. Reduction in dental plaque accumulation means that each oral hygiene instruction method has effectiveness in perception of correct tooth-brushing methods by children.

Significant reduction in gingival index scores in Group 1 would be attributable to significant reduction in plaque index scores ( $p < 0.05$ ) in this group. In Group 2 and Group 3, there was no significant reduction in gingival index scores. The present study's results suggest that young children appreciate and learn effectively health education instruction by using comprehensive educational cartoon videos (audiovisual aids) than other methods using flip charts and conventional posters for adults. Children who learned tooth-brushing by a supervising adult in front of mirror can adopt correct tooth-brushing effectively and perform actively than the children who learned by seeing demonstration with Giant Tooth-brushing Model (TBM) and others by verbal instruction.

## *Conclusion*

The most effective oral hygiene instruction method in the present study was using audiovisual aids and supervised tooth-brushing with an adult involved in front of mirror. Young children can learn and applied health education instructions effectively by using understandable educational cartoon videos than other conventional methods used for adults. Necessity of supervision by guiding the correct tooth-brushing with a feedback showing in a mirror should be noted. From this study, oral hygiene instruction method using educational cartoon videos and demonstration of correct tooth-brushing method by an adult involved in mirror is applicable with success for further oral health education programs. Long-term results for this study may need further research.

## *Competing interests*

The authors declare that they have no competing interests.

## **ACKNOWLEDGEMENT**

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