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**EFFECTIVENESS IN THE USE OF SOFT AND MEDIUM TOOTHBRUSH
BRISTLES WITH FONE'S TECHNIQUE FOR PLAQUE REDUCTION**

Fennita Himawan¹⁾, Isnur Hatta²⁾, Ika Kusuma Wardani³⁾

¹⁾Faculty of Dentistry, Lambung Mangkurat University, Banjarmasin

²⁾Department of Public Dental Health, Faculty of Dentistry, Lambung Mangkurat University, Banjarmasin

³⁾Department of Public Dental Health, Faculty of Dentistry, Lambung Mangkurat University, Banjarmasin

ABSTRACT

Background: Dental and oral hygiene of children in Indonesia is so alarming that serious awareness and attention are needed. Poor dental and oral hygiene is characterized by the presence of plaque deposits on tooth surface, forming an intercellular matrix that may instigate various dental and mouth problems. The prevalence of correct tooth brushing in Indonesia was very low at only 2.80%, in which South Kalimantan Province was 4.97% and Barito Kuala Regency was 3.55%. **Objective:** To determine the effectiveness of using soft and medium toothbrush bristles with fone's technique to reduce plaque in students aged 10-11 years at SDN Berangas Timur 1, Barito Kuala Regency. **Methods:** The study used a true experimental method with a pretest-posttest with control group design consisting of pre-test and 8 post-test, and control group that was not given any treatment. Samples were randomly allocated by name sequence through simple random sampling technique of students aged 10-11 years at SDN Berangas Timur 1, Barito Kuala Regency. Inspection using PHPM plaque index was assessed on 6 index teeth. Research data were analysed using Mann Whitney's post hoc Friedman test. **Results:** The results for Friedman test in the treatment group showed $p = 0.000$. Mann Whitney test results in the treatment group with the control group showed $p = 0.000$ with a comparison of mean difference of 1.29 and 1.22 between the use of soft and medium toothbrush bristles with fone's technique. **Conclusion:** The use of soft toothbrush bristles with fone's technique is the most effective in plaque reduction.

Keywords : Effectiveness of brushing teeth, Fone's technique, Plaque index, Soft and medium toothbrush dental

Correspondence: Fennita Himawan, Faculty of Dentistry, University of Lambung Mangkurat, Veteran Street No. 128B Banjarmasin 70249, South Borneo, Indonesia. Email: ceciliafennita@gmail.com

INTRODUCTION

Dental and oral hygiene of children in Indonesia is so concerning that serious awareness and attention need to be instilled in children from the early age.¹ Poor oral and dental hygiene can cause various oral and dental health problems. The results of Basic Health Research (RISKESDAS) stated that the prevalence of dental and mouth problems in South Kalimantan Province had increased from 36.10% in 2013 to 59.60% in 2018. Children aged 10-14 years presented with a prevalence of 59.56%.² Dental and mouth problems are mostly suffered by children under the age of 12 years by 98%.³

Dental and mouth problem that often occur is caries. This is due to the large number of plaque deposits on the tooth surface.⁴

Plaque is a colorless soft deposit containing microorganisms, such as *S.mutans* bacteria that attach to the surface of the tooth.⁵ Plaque can be effectively removed by regular brushing.⁶ It is usually found in groups of school-age children because of the behavior and habits that are less concerned with dental and oral hygiene.⁷ In the age of 10-11 years old, children are still in the period of mix dentition with a habit of having snacks or drinks at school or whenever away from home.⁸ At this age, children can be trained to develop skill gradually,

such as tooth brushing.⁹ Plaque control is an individual behaviour in preventing the formation of plaque on the tooth surface. Plaque control is divided into 3, they are mechanical, chemical and natural. One of the mechanical actions for plaque control is tooth brushing.¹⁰ The results of the 2018 Basic Health Research (RISKESDAS) stated the prevalence of correct tooth brushing in Indonesia was 2.80%, in which South Kalimantan Province amounted to 4.97%, with a prevalence of 3.55% for Barito Kuala Regency specifically.^{2,11} The success of tooth brushing is influenced by several factors, those are the tools used, techniques, frequency and duration of tooth brushing.⁷

Tooth brushing technique is divided into 6, namely horizontal, vertical, roll, bass, stillman and fone's.¹² Fone's technique is a technique of brushing the teeth in a circular motion that is centered on the gingival and the tooth surface.¹ This technique does not cause irritation and abrasion to the teeth.¹³ Fone's technique is recommended for children because of its simple movements so it is easy to learn and do.¹⁴

In terms of the tools used, the selection of toothbrush bristles is important so as not to damage the tooth structure. Based on its use, soft and medium toothbrush bristles do not cause gingival recession when the brushing frequency increases, whereas hard toothbrush bristles are characterized with soft tissue damage, i.e gingival recession.¹⁵

SDN Berangas Timur 1 is one of the elementary schools located in Barito Kuala Regency. The results of the Basic Health Research (RISKESDAS) 2018 stated that the prevalence of dental and mouth problems in Barito Kuala Regency was quite high, amounting to 68.66%. People in this regency still use river water as a resource meet their needs so that it has a negative impact on oral health, one of which occurs caries.¹⁶

Based on this, researchers are interested in conducting research to determine the effectiveness in the use of soft and medium toothbrush bristles with fone's technique for plaque reduction in students aged 10-11 years at SDN Berangas Timur 1, Barito Kuala Regency.

MATERIALS AND METHOD

This study has obtained research permission and ethical clearance issued by Ethics of Faculty of Dentistry, Lambung Mangkurat University No. 093 / KEPKG-FKGULM / EC / I / 2020. This research employed a true experimental method with a longitudinally pretest-posttest with control group

design conducted in SDN Berangas Timur 1, Barito Kuala Regency in January-March 2020.

The tools used in this study included gloves, masks, toothbrushes, glass, dental mirror, nierbekken, phantom, headlamp, PHPM (Personal Hygiene Performance Modified) plaque index check sheet, informed consent sheet, buckets and garbage plastic. Ingredients used in this study included toothpaste, disclosing agent, gauze alcohol, mineral water, tissue, detergent and whitening liquid.

Determination of the study sample was taken from all population of students aged 10-11 years at SDN Berangas Timur 1 through sampling techniques, namely simple random sampling. From simple random sampling technique in a total of 42 children, which later selected by inclusion and exclusion criteria. Inclusion criteria in this study included: students aged 10-11 years at SDN Berangas Timur 1, students that had index teeth, cooperative, had submitted informed consent, while exclusion criteria included: index teeth experiencing severe malocclusion and students did not follow the research procedure until the end. Respondents who met the criteria were divided into groups, namely intervention group (the use of soft and medium toothbrush bristled with fone's technique) and control group. Each group had a total sample of 14 people. First the researchers conducted a pretest for each group, then educated the children with fone's technique and distributed toothbrushes to the intervention group (posttest), while in the control group students brushed their teeth according to their habits. Researchers instructed each group to brush their teeth alternately, then gargled with a disclosing solution. Visible plaques were examined and measured with PHPM (Personal Hygiene Performance Modified) index. The index teeth used in this examination were the most posterior teeth in the upper right quadrant, 53 or 13 if there were no 12 or 11, 64 or 24, the most posterior teeth in the lower left quadrant, 73 or 33 if there were no 32 or 31 and 84 or 44 can be used.

Data analytics was performed using the non-parametric analysis of Mann Whitney Friedman post hoc test. The Friedman test was used to analyze data from more than 2 categories of groups and repeated measurements were carried out, while the Mann Whitney test was used to determine plaque index in 2 groups. Data distribution was identified using Shapiro wilk test.

RESULT

The results for the study on the effectiveness of the using soft and medium toothbrush bristles with fone's technique for plaque reduction in students aged 10-11 years at SDN Berangas Timur 1, Barito Kuala Regency can be seen in the following table:

Plaque Index Before Tooth Brushing Using Soft and Medium Toothbrush Bristles With Fone's Technique

Table 1. Plaque Index Category before Tooth Brushing with Fone's Techniques with the Use of Soft and Medium Toothbrush Bristles.

| Group | Pretest | | | | | |
|---------|-------------|------|------------------|-------|-------------|-------|
| | Good (0-20) | | Moderate (21-40) | | Bad (41-60) | |
| | Σ | % | Σ | % | Σ | % |
| Soft | 0 | 0% | 7 | 50% | 7 | 50% |
| Medium | 1 | 7.1% | 4 | 28.6% | 9 | 64.3% |
| Control | 0 | 0% | 6 | 42.9% | 8 | 57.1% |

Based on table 1, it is shown that the use of soft toothbrush bristles with fone's technique revealed 7 respondents in moderate category (50%) and 7 respondents in bad category (50%). The group using medium toothbrush bristles with fone's technique presented 1 respondent in good category (7.1%), 4 respondents in moderate category (28.6%) and 9 respondents in bad category (64.3%), whereas the control group obtained 6 respondents in moderate category (42.9%) and 8 respondents in bad category (57.1%).

Plaque Index After Tooth Brushing Using Soft and Medium Toothbrush Bristles With Fone's Technique

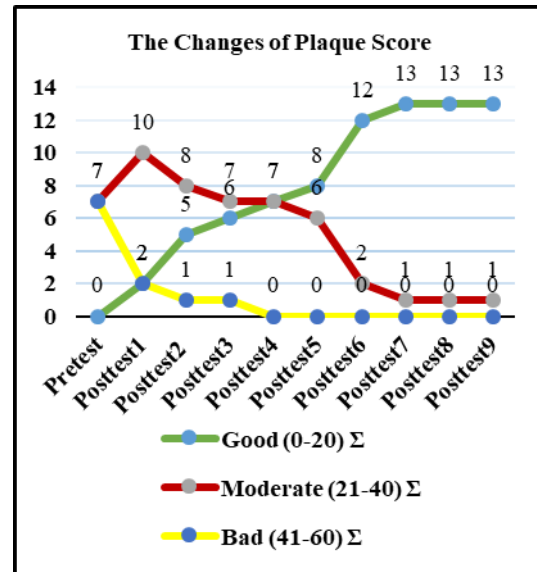


Figure 1. Graph of Plaque Score Changes in Group Using Soft Toothbrush Bristles with Fone's Technique.

Based on figure 1, it is shown that there is an improvement in the category of plaque index throughout the measurement interval. Measurements were performed in 2 weeks with observations in 1 week.

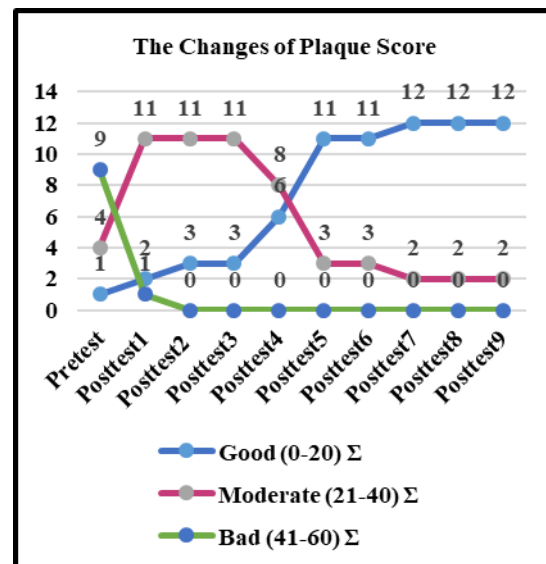


Figure 2. Graph of Plaque Score Changes in Group Using Medium Toothbrush with Fone's Technique.

Figure 2 shows that there is a refinement in the category of plaque index in the course of measurement time interval. Measurements were conducted in 2 weeks with a week of observations

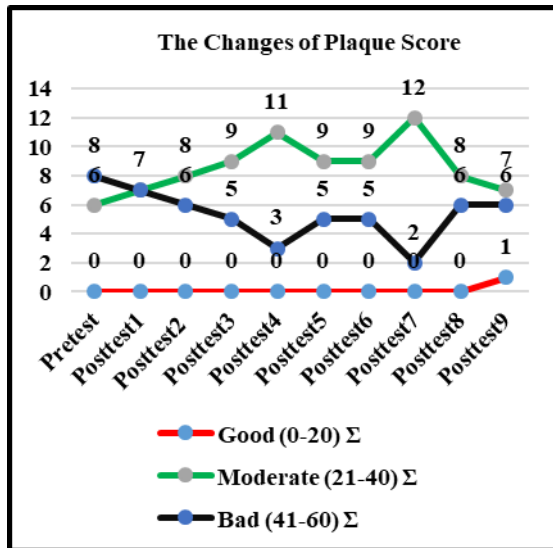


Figure 3. Graph of Plaque Score Changes in Control Group.

Figure 3 shows that there is an enhancement as well as a regression in plaque index categories in the course of throughout measurement interval. Measurements were implemented in 2 weeks with observations in 1 week.

Table 2. Plaque Index Category Posttest 9 when Toothbrushing with Fone’s Techniques in the Use of Soft and Medium Toothbrush Bristles.

| Category | Posttest 9 | | | | | |
|----------|-------------|-------|------------------|-------|-------------|-------|
| | Good (0-20) | | Moderate (21-40) | | Bad (41-60) | |
| | Σ | % | Σ | % | Σ | % |
| Soft | 13 | 92.9% | 1 | 71% | 0 | 0% |
| Medium | 12 | 85.7% | 2 | 14.3% | 0 | 0% |
| Control | 1 | 7.1% | 7 | 50% | 6 | 42.9% |

Based on table 2, the results for posttest 9 in the group using soft toothbrush bristles with fone’s technique comprised of 13 respondents in good category (92.9%) and 1 respondent in moderate category (7.1%). The group using medium toothbrush bristles with fone’s technique presented 12 respondents in good category (85.7%) and 2 respondents in moderate category (14.3%), whereas the control group obtained 1

respondent in good category (7.1%), 7 respondents in moderate category (50%) and 6 respondents in bad category (42.9%).

Effectiveness in Using Soft and Medium Toothbrush Bristles with Fone’s Techniques for Plaque Reduction

Table 3. Results of Friedman Test Analysis for Group Using Soft Toothbrush with Fone’s Technique.

| | N | Asymp.Sig. (2-tailed) |
|--------------------|----|-----------------------|
| Pretest-Posttest 9 | 14 | .000 |

Table 3 shows that the p value (Asymp. Sig. 2-tailed) of 0.000 is smaller than the alpha value of 0.05 so there is a difference in the effectiveness of using soft toothbrush bristles with fone’s technique to reduce plaque in the time interval of measurement.

Table 4. Results of Friedman Test Analysis for Group Using Medium Toothbrush Bristles with Fone’s Technique.

| | N | Asymp.Sig. (2-tailed) |
|--------------------|----|-----------------------|
| Pretest-Posttest 9 | 14 | .000 |

Table 4 shows that the p value (Asymp. Sig. 2-tailed) is 0.000 which is smaller than the alpha value of 0.05 so there is a difference in the effectiveness in using medium toothbrush bristles with fone’s technique to reduce plaque throughout the measurement interval.

Table 5. Results of Friedman Test Analysis for Control Group.

| | N | Asymp.Sig. (2-tailed) |
|--------------------|----|-----------------------|
| Pretest-Posttest 9 | 14 | .159 |

Table 5 shows that the p value (Asymp. Sig. 2-tailed) of 0.159 is greater than the alpha value of 0.05 so there is no difference in the effectiveness of the control group on plaque reduction in the time interval of measurement.

The Use of Toothbrush Bristles Using Fone's Technique with The Most Effective Result for Plaque Reduction.

Table 6. Results of the Mann Whitney Analysis of the Use of Soft Toothbrush Bristles with Fone's Technique in the Control Group.

| Soft toothbrush bristle and control group | Mean Difference | Asymp. Sig. (2-tailed) |
|---|-----------------|------------------------|
| | 1.29 | .000 |

Based on table 6, the group that used soft toothbrush bristles with fone's technique and control group had the mean difference of 1.29 and the p value (Asymp. Sig. 2-tailed) of 0.000 which is smaller than the alpha value of 0.05 so that there are differences in the effectiveness of using soft toothbrush bristles with fone's technique in the control group for plaque reduction.

Table 7. Results of Mann Whitney Analysis for the Use of Medium Toothbrush Bristles with Fone's Technique in the Control Group.

| Medium toothbrush bristle and control group | Mean Difference | Asymp. Sig. (2-tailed) |
|---|-----------------|------------------------|
| | 1.22 | .000 |

Table 7 shows that the use of medium toothbrush bristles with fone's technique and control group had a mean difference of 1.22 and a p value (Asymp. Sig. 2-tailed) of 0.000 which are smaller than the alpha value of 0.05 so that there are differences in the effectiveness of using medium toothbrush bristles with fone's technique in the control group for plaque reduction.

DISCUSSION

Plaque Index Before Tooth Brushing Using Soft and Medium Toothbrush Bristles With Fone's Technique

The results showed that the group using soft toothbrush bristles with fone's technique demonstrated 7 respondents in moderate category and 7 respondents in bad category. The group using medium toothbrush bristles with fone's technique revealed most respondents in bad category (9 respondents) and most respondents in control group was also determined in bad category (8 respondents) which can be seen in table 1. This is because the students tend not to know the proper way to brush their teeth and the frequency of brushing the teeth. Habits of cariogenic food consumption

among children may also trigger plaque formation on the surface of the teeth. This is supported by RISKESDAS data (2018) which states that the prevalence of correct tooth brushing in Barito Kuala Regency was only 3.55%.² Further supported by a scientific article by Sufriani and Aflah (2018), it was affirmed that proper and regular tooth brushing is an initial step to obtain healthy gingiva and teeth, helps to clean the teeth from the remaining plaque that sticks to the tooth surface as well as prevent gingival disease and bad breath.¹⁷

Plaque Index After Tooth Brushing Using Soft and Medium Toothbrush Bristles With Fone's Technique

The results of research that was conducted in a group using soft and medium toothbrush bristles with fone's technique showed an increase in plaque index category, but there were also some posttests that portrayed same results or remained within the two week of measurement time and one week observations which can be seen in Figure 1 and 2. This means students need a process or stages to understand and apply the correct fone's brushing techniques. It is also supported by a study from Roza et al (2018) mentioning that 10-11 years old children are able to be offered with the responsibility for regular tooth brushing compared with children under this age.¹⁸

The results for the current research in the control group showed an improvement and regression in the plaque index category. The decline in plaque index categories occurred in posttest 5 and posttest 8 which can be seen in Figure 3. This is because the researcher did not provide intervention by instructing students to brush their teeth according to their habits so that the results of dental and oral hygiene of students can change at any time.

The final results (posttest 9) in this study showed the results in the group using soft toothbrush bristles with fone's technique were comprised of 13 respondents in good category, while in the group using medium toothbrush bristles with fone's technique presented 12 respondents in good category and most respondents in control group with a total of 7 respondents were classified in moderate category. These results can be seen in table 2. In the provision of intervention by researchers, it can be said that students have begun to understand and know how to toothbrush with fone's techniques correctly which is marked by the improvement in plaque index category before and after the treatment.

Effectiveness in Using Soft and Medium Toothbrush Bristles with Fone's Techniques for Plaque Reduction

The results for the use of soft and medium toothbrush bristles with fone's technique in the control group showed effective results in decreasing plaque with sig values of 0.000 which can be seen in table 3 and 4. The control group is part of the research group that is not intervened with fone's technique and not directed with the selection of toothbrush bristles. Toothbrush with soft bristles have flexible bristles and small diameter which enable them to reach the proximal gaps, margins and subgingiva.¹⁹ The use of soft toothbrush bristles shows no signs to soft tissue damage, irritation, sensitivity, tooth abrasion. It can maintain gingival health in the oral cavity.²⁰ Toothbrush with medium bristles have a thicker diameter and broad surface so they can clean the surface of the teeth and ease the access areas more efficiently, as well as in providing an optimal gingival massage effect.²¹ In the use of medium toothbrush bristles, gingival recession may not be presented as the result in the increase in toothbrushing frequency so that it is safe to be used. Fone's technique is a tooth brushing technique with a circular motion that is able to reach the gingiva and tooth surface at the same time because the movement is centered on the gingival gap and tooth surface.²² The above results are in line with Faisal's research (2015) which states that there are significant mean differences in reduction of plaque index among children who brush their teeth with soft and medium bristled toothbrushes.²³ Supported more by the study of Aldiaman et al (2016), which states that fone's technique can increase in the oral hygiene index between before and after brushing teeth with fone's technique.¹³ Table 5 shows the control group obtained an ineffective result in decreasing plaque with sig. amounted to 0.159.

The Use of Toothbrush Bristles Using Fone's Technique with The Most Effective Result for Plaque Reduction

The results of the analysis showed that the group using soft and medium toothbrush bristles with Fone's technique had a sig value of 0.000 with a mean difference of 1.29 which can be seen in table 6. Group using medium bristle toothbrushes with fone's technique has a sig value of 0.000 with a mean difference of 1.22 which can be seen in table 7. This means that there is a difference in the effectiveness of using soft and medium toothbrush bristles with fone's technique in the control group for reduction

plaque in students aged 10-11 years at SDN Berangas Timur 1, Barito Kuala Regency. The results of this study indicate that the group using soft toothbrush bristles with the fone's technique is the most effective for plaque reduction because it has larger mean difference, which is 1.29 compared to the group using medium toothbrush bristles with fone's technique, which is equal to 1.22. Soft toothbrush bristles have thinner, flexible and groups of bristles or filaments that are more numerous than other types. This is what makes soft toothbrush bristles more effective in removing plaque especially on the gingival lines and tooth surfaces.^{24,25} Based on the results of the research that has been done, it can be concluded that the use of soft toothbrush bristles with fone's techniques is more effective for plaque reduction in students aged 10-11 years at SDN Berangas Timur 1, Barito Kuala Regency.

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