Differences in the Effectiveness of Herbal, Betel Leaves, and Chlorhexidine Mouthwash on Plaque Reduction in Orphanage Children

Yetty Herdiyati¹, Meirina Gartika², Ninda Kartikadewi³, Fellani Danasra Dewi⁴

¹, ³, ⁴Universitas Padjadjaran, Faculty of Dentistry, Sekeloa Selatan I St, Bandung, West Java, Indonesia 40132

Abstract: Betel leaves, herbal (betel leaves, aloe vera, lime extracts) and chlorhexidine mouthwash could help reducing plaque on the tooth surface. This study aimed to determine the differences in the effectiveness of betel leaves, herbal and chlorhexidine mouthwash against plaque index decreased in orphanage children. Quasi-experimental research method was performed on 300 orphans consist of 160 boys and 140 girls aged between 11 and 14 years from 10 orphanages in Bandung, West Java Province. The three hundred children were divided into two groups, 150 people in each group. Group 1 rinsed with betel leaves mouthwash and group 2 rinsed with chlorhexidine. One week later, both groups were give different mouth rinse. Group 1 rinsed with herbal mouthwash. Group 2 rinsed with placebo mouthwash. Rinsing was done twice a day for 5 days. Plaque index scores were recorded daily. The results showed all three mouthwash equally effective in lowering plaque over a period of 5 days. There are significant differences among the three mouthwashes (P<0.05). This study concludes that there is significant difference in the effectiveness of betel leaves, herbal and chlorhexidine mouthwash against plaque index in children.

Keywords: herbal mouthwash, chlorhexidine, plaque index, children

1. Introduction

Indonesia is rich in medicinal plants. The plant has been developed extensively in Indonesia. Almost every Indonesian ever use medicinal plants to treat diseases of the body[1]. One of the utilization of medicinal plants is the manufacture of mouthwash as an anti-plaque agent of herbal ingredients.

Plaque that is not controlled can disrupt the ecological balance in the mouth. If left unchecked and untreated, plaque can cause gingivitis, which is inflammation of the gum tissue. It is characterized by the presence of inflammatory exudate, edema, collagen fiber damage of the gums, ulcerated and epithelial proliferation that is attached directly to the teeth. Poor diet and hormonal changes during puberty increase the risk of gingivitis[2].

Plaque can be reduced through mechanical action, such as brushing and flossing. Good brushing technique is needed for optimal plaque removal, but most people have not been able to do a good brushing technique. Additional media required to reduce the accumulation of plaque, one of which is a mouthwash. Mouthwash can help reduce plaque that can not be cleaned by brushing teeth[3]. Chemicals in the mouthwash is proven to reduce the number of bacteria in plaque[4].

Chlorhexidine is an antiseptic agent from bis-biguaniide class that is widely regarded as one of the ingredients that are quite effective in controlling plaque[5]. Chlorhexidine mouthwash with a concentration of 0.12 % can work quite effectively as plaque control[6]. Recently, several studies have been conducted to verify the wealth of herbal mouthwashes, as they contain naturally occurring ingredients called as Phytochemicals that have the desired antimicrobial and anti-inflammatory effects. Herbal formulations can be more appealing because they do not contain alcohol, artificial preservatives, flavors or colors[7].

The purpose of this study is to determine the differences in the effectiveness of betel leaves, herbal and chlorhexidine mouthwash against plaque index decreased in orphanage children.

2. Materials and Methods

This study was a quasi-experimental study. Population and sample were children from 10 orphanages in Bandung, West Java Province. Orphanage children were chosen because they have the same diet. This can reduce confounding factors in the formation of plaque. Moreover, the orphanage children also rarely gets health care. This research can introduce them to the use of mouthwash and also provide knowledge about the maintenance of oral health.

Purposive sampling technique is used with the following criterias: aged 11 to 14 years old, have a good general health, the gums and periodontal tissues in healthy condition, and not being on antibiotics. Total sample in accordance with the criteria obtained 300 children consisting of 160 boys and 140 girls.

These three hundred children were divided into two groups, each numbering 150 children. The first group rinsed with betel leaf mouthwash and the second group rinse with chlorhexidine. One week later the three hundred children are redivided into 2 groups. Group 1 gargle with herbal mouthwash, which consists of betel leaf, aloe vera, and lime. Group 2 rinse with placebo mouthwash, which is a mixture of water and glycerin.

This research was carried out for 5 days. The entire sample was asked to rinse 2 times a day. Plaque index measurement was done every day for 5 consecutive days. Rinsing process
is supervised by researchers. The method used for the measurement of plaque index is Turesky et al Modified Quigley Hein Plaque Index (TQHIP).

Data were analyzed using SPSS version 21. The statistical analysis used was ANOVA and post-hoc LSD. P values of <0.05 were considered significant.

3. Results

This study shows that betel leaves, herbal and chlorhexidine mouthwash were proven to reduce plaque attached to the tooth surface. The chart (Figure 1) shows the average reduction of plaque index for 5 days.

The average plaque score of children who rinsed with betel leaves, herbal and chlorhexidine mouthwash decreased from the plaque index prior to the study and the lowest average plaque score was owned by the children in the herbal group. After day 5, children rinsing with chlorhexidine mouthwash and herbs have the lowest average plaque score.

ANOVA (Table 1) was used to test for differences in mean (average) of the data obtained from four mouthwashes. With a degree of confidence of 95% it can be concluded that there are significant differences of four mouthwash. The decrease in plaque scores occurred for 5 days at four mouthwash.

Post-hoc LSD (Table 2) was utilized to obtain multiple comparison. On LSD test output, sig. Number of less than 5 % indicates that the mouthwash has a significant effect on reducing plaque index. From the output of LSD it can be seen that the sig number of less than 5 % is chlorhexidine and herbal mouthwash. This demonstrated that the mouthwashes that have statistically different effects on plaque reduction are chlorhexidine and herbal mouthwash (P <0.05).

4. Discussion

In this study, we compared the effectiveness of betel leaf, chlorhexidine, herbal, and placebo mouthwash. We did not use non brushing model for plaque accumulation prior to the study. During the 5-day period, there was a significant decrease in plaque scores occurred in four groups. Research conducted by Haq et al (2010) also showed a decrease in plaque scores over a period of 5 days.

Mouthwashes that show significant differences are herbal and chlorhexidine mouthwash. The results are consistent with research conducted by Naiktari et al which compared the effectiveness of triphala with chlorhexidine mouthwash. However, Kumar et al research results (2014) which compared the mouthwash rinses of aloe vera with a concentration of 100 % and chlorhexidine showed no significant results. This can be due to differences in the composition of herbal mouthwash that we use contains aloe vera added betel leaves and lime.

Table 2: Post-hoc LSD test for multiple comparison

<table>
<thead>
<tr>
<th>(I) Mouthwash</th>
<th>(J) Mouthwash</th>
<th>Mean Difference (I-J)</th>
<th>Std. Error</th>
<th>Sig.</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Betel leaves</td>
<td>Chlorhexidine</td>
<td>.19120</td>
<td>.14406</td>
<td>.193</td>
<td>-.1010 - .4834</td>
</tr>
<tr>
<td></td>
<td>Herbal</td>
<td>.20480</td>
<td>.14406</td>
<td>.164</td>
<td>- .0874 - .4970</td>
</tr>
<tr>
<td></td>
<td>Placebo</td>
<td>-.26180</td>
<td>.14406</td>
<td>.078</td>
<td>-.5540 - .1041</td>
</tr>
<tr>
<td>Chlorhexidine</td>
<td>Betel leaves</td>
<td>-.19120</td>
<td>.14406</td>
<td>.193</td>
<td>-.4834 - .1010</td>
</tr>
<tr>
<td></td>
<td>Herbal</td>
<td>-.01360</td>
<td>.14406</td>
<td>.925</td>
<td>-.2786 - .3058</td>
</tr>
<tr>
<td></td>
<td>Placebo</td>
<td>-.45300</td>
<td>.14406</td>
<td>.003</td>
<td>-.7452 - -.1608</td>
</tr>
<tr>
<td>Herbal</td>
<td>Betel leaves</td>
<td>-.20480</td>
<td>.14406</td>
<td>.164</td>
<td>-.4970 - .0874</td>
</tr>
<tr>
<td></td>
<td>Chlorhexidine</td>
<td>-.01360</td>
<td>.14406</td>
<td>.925</td>
<td>-.3058 - .2786</td>
</tr>
<tr>
<td></td>
<td>Placebo</td>
<td>-.46500</td>
<td>.14406</td>
<td>.003</td>
<td>-.7588 - -.1744</td>
</tr>
<tr>
<td>Placebo</td>
<td>Betel leaves</td>
<td>.26180</td>
<td>.14406</td>
<td>.078</td>
<td>-.0304 - .5540</td>
</tr>
<tr>
<td></td>
<td>Chlorhexidine</td>
<td>.45300</td>
<td>.14406</td>
<td>.003</td>
<td>.1608 - .7452</td>
</tr>
<tr>
<td></td>
<td>Herbal</td>
<td>.46500</td>
<td>.14406</td>
<td>.003</td>
<td>.1744 - .7588</td>
</tr>
</tbody>
</table>

Figure 1. The average plaque of betel leaves, herbal, and chlorhexidine mouthwash

Table 1: Analysis of variance for plaque score in four mouthwashes

<table>
<thead>
<tr>
<th>Analyses of Variance</th>
<th>Sum of Squares</th>
<th>Df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>1.425</td>
<td>3</td>
<td>.475</td>
<td>4.579</td>
<td>.008</td>
</tr>
<tr>
<td>Within Groups</td>
<td>3.736</td>
<td>36</td>
<td>.104</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>5.161</td>
<td>39</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
This study shows that betel leaves and herbal mouthwash have good potential as an anti-plaque agent. Research by Subashkumar et al (2013)[11] demonstrated the ability of betel leaf extract in inhibiting the growth of Streptococcus viridans, Staphylococcus aureus, and Streptococcus mutans which are the pathogenic bacteria in the oral cavity. Research conducted by Aggarwal et al (2011)[12] demonstrated that aloe vera has the ability to cure swollen, bleeding gums, antiseptic for periodontal pocket and antifungal for thrush. Arkayi et al (2013)[13] showed that lime contains phenols, coumarins and tannins. The content of phenol can damage the integrity of the bacterial cell membrane.

In terms of effectiveness, chlorhexidine is still superior than betel leaves and herbal mouthwash. Research by Chandrahars et al (2012)[14] showed that chlorhexidine significantly lowers the plaque than aloe vera mouthwash. Chlorhexidine is able to block the acid component of salivary glycoproteins that will reduce the absorption of these components on the surface of hydroxyapatite and pellicle formation. The resulting affinity bond between chlorhexidine with acid protein pellicle, plaque, calculus, oral mucosa and bacterial surface is greater than with hydroxyapatite. Plaque formation and reduced the number of bacteria can optimally (Mathur, 2011)[15].

However, the use of chlorhexidine in the long term can cause some side effects. Chlorhexidine is less preferred because it tastes bitter and can cause changes in taste perception. Chlorhexidine can also cause staining on the surface of the tooth and restoration. The use of chlorhexidine also trigger the onset of supragingival calculus. Suppression of asidogenic bacteria and increase in the oral pH causes the precipitation of calcium and phosphate. The inorganic salts will precipitate on the surface of the tooth pellicle layer[16].

5. Conclusion

Based on the results and the discussion that have been described previously, it can be concluded there is a significant difference in the effectiveness of betel leaves, herbal and chlorhexidine mouthwash to decrease plaque scores in the orphanage children. Betel leaves and herbal mouthwash have potential in reducing plaque, but still less effective than chlorhexidine.

References


Author Profile

Yetty Herdiyati (Indonesia) received DDS from Universitas Padjadjaran in 1979. She continued to specialist program in Pedodontics in Universitas Padjadjaran and graduated in 1995. She finished her doctorate degree from Universitas Padjadjaran in 2007. She is a lecturer in Pedodontics Department of Universitas Padjadjaran. She is also a member of Indonesian Dentist Association and Indonesian Pediatric Dentist Association.

Meirina Gartika (Indonesia) received DDS from Universitas Padjadjaran in 1991. She continued to specialist program in Pedodontics in Universitas Padjadjaran and graduated in 2000. She is a lecturer in Pedodontics Department of Universitas Padjadjaran. She is also a member of Indonesian Dentist Association from 1991 until now and Indonesian Pediatric Dentist Association from 2000 until now.

Ninda Kartikadewi (Indonesia) received BDS (Bachelor of Dental Surgery) from Universitas Padjadjaran in 2013. She continued to profession degree (DDS) in Universitas Padjadjaran from 2013 until now.

Fellani Danasra Dewi (Indonesia) received the BDS (Bachelor of Dental Surgery) from Universitas Padjadjaran in 2002. Continued taking profession degree and She has completed the DDS (Doctor of Dental Surgery) and together with Master of Management in Hospital Management from Universitas Padjadjaran, Bandung-Indonesia in 2005. She has worked as a Lecturer from 2005-2013 in Dentistry Faculty of AIMST UNIVERSITY-Malaysia. Currently she pursue her study as a Post Graduate Student in Orthodontic, Padjadjaran University, Bandung-Indonesia.