

## The Difference Between Gargling Using Betel Nut Seed (*Areca Catechu*) Extract and Chlorhexidine 0.2% Solution in Chronic Gingivitis Healing

I Gusti Agung Ayu Putu Swastini<sup>1</sup>, I Gusti Agung Ayu Dharmawati<sup>1</sup>,  
Ni Nengah Sumerti<sup>2</sup>, Tjokorda Gde Bagus Mahadewa<sup>3\*</sup>  
and I Putu Eka Widyadharma<sup>4</sup>

<sup>1</sup>Health Polytechnic Denpasar, Bali, Indonesia.

<sup>2</sup>Department of Dental Nursing, Health Polytechnic Denpasar, Bali, Indonesia.

<sup>3</sup>Department of Neurosurgery, Faculty of Medicine, Udayana University,  
Sanglah General Hospital, Bali, Indonesia.

<sup>4</sup>Department of Neurology, Faculty of Medicine, Udayana University,  
Sanglah General Hospital, Bali, Indonesia.

\*Corresponding author E-mail: tjokmahadewa@unud.ac.id

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The use of mouthwash is an effective way to help cure gingivitis. Mouthwash that is often used is mouthwash containing antiseptic. Recently, there has been increasing use of traditional medicines that are considered safer such as areca nuts compared to chemically synthesized agents. The aim of this study was to calculate the difference in the healing of chronic gingivitis due to calculus between gargling using areca nut (*Areca catechu*) extract and using Chlorhexidine 0.2% solution. This was an experimental test with pre and post-test control group design and involved two treatment groups. A total of 30 subjects with grade 2 gingivitis were being admitted. The first group was given mouthwash with areca nut (*Areca catechu*) extract and another group with Chlorhexidine 0.2% twice daily for three days. The mean gingival index in the group which gargled using betel nut seed (*Areca catechu*) extract on the first day was  $1.93 \pm 0.704$  followed by  $0.40 \pm 0.507$  on the second day, and  $0.00 \pm 0.00$  on the third day, on the other hand the mean gingival index in the group which gargled using Chlorhexidine 0.2% solution was  $1.93 \pm 0.704$  on the first day,  $0.40 \pm 0.507$  on the second day, and  $0.00 \pm 0.00$  on the third day. The mean gingival index decreased significantly during observation period in both treatment groups but when being compared to each other there was no significant difference in the healing time of chronic gingivitis in group which gargled using betel nut seed extract (*Areca catechu*) and Chlorhexidine 0.2% solution.

**Keywords:** Gingivitis; betel nut seed extract; Chlorhexidine; gargling.

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Chronic marginal gingivitis is one type of inflammation in the gingiva which includes the gingival margin and can include the part adjacent to the attached gingiva. One way to measure the level of inflammation in the gingiva is by assessing the bleeding that occurred during the probing<sup>1</sup>.

Gargling is one method of cleaning teeth and mouth. This is mostly be done after brushing teeth. Mouthwash is not only considered as a breath freshener solution that has an aroma or no effect on the health of the oral cavity but mouthwash can also reduce plaque in gingivitis<sup>2</sup>.

Many types of mouthwashes that contain antimicrobial ingredients may help control the growth of supragingival plaque and gingivitis, but there are several chemicals on mouthwashes that can cause side effects such as cancer because they contain alcohol<sup>3</sup>. Alternatives to the use of natural ingredients as a substitute for chemical mouthwash are still the people's choice because they are cheaper and have fewer side effects compared to synthetic ingredients<sup>4</sup>. The use of traditional herbal medicines has often been used for the treatment of other infectious diseases. The World Health Organization (WHO) has given policies to developing countries to use traditional herbal medicines as the first treatment or treatment when sick. Indonesia is the second richest country in the world after Brazil for biodiversity. The use of medicinal plants is an alternative for treatment approach in this area, with betel nut (*Areca catechu*) as one example<sup>5</sup>.

Betel nut has been widely used by the people of Indonesia, since long ago it has been used as a mixture of betel nut. People believed that eating betel nuts can strengthen their teeth, even though they are already old. The betel nut contains antimicrobial substances that interfere with the metabolism of microorganisms. The most abundant and effective substances used in mouthwash products are Chlorhexidine which contains Chlorhexidinedigluconate. The way these mouthwash works is by changing the composition of oral bacteria, this effect is considered meaningful but it only lasts when the product is being used<sup>6</sup>. The results of the study done by Sugianitriin 2011 showed that areca seed extract can inhibit the growth of microorganisms (*Candida albicans* colonies), which was carried out in soaking denture stomatitis<sup>7</sup>.

Based on the background described, the researcher wanted to know the difference in the healing of chronic gingivitis because of calculus between gargling using areca seed extract and Chlorhexidine 0.2%.

## MATERIAL AND METHODS

### Material

The areca seeds (*Areca catechu L.*) was collected from young fruits. The areca nut was peeled, then the seeds were air-dried under the sun.

The dried seeds were mashed using a dry blender into powder form. A total of 250 grams of dry powder was put into the macerator, a 96% ethanol as much as 7 ½ times the weight of the powder was added and the mixture was stirred evenly. The concoction was left for 5 days in a closed macerator with constant stirring every day. A Buchner funnel was used to strain the solution, then left precipitated for 2 days, carefully separating the liquid from the precipitate. At the final stage, the macerate was evaporated in a porcelain dish on top of a water bath or by rotary evaporator at a temperature of 45-50° C with low pressure ( $\pm$  15 mmHg) to obtain a thick, brownish yellow extract<sup>8</sup>.

### Methods

#### Research subjects selection

This research was conducted in June-October 2015, at the Department of Nursing Dental Clinic, Health Polytechnic of Denpasar. The examination was conducted on Ganesha Junior High School students in Denpasar to obtain students with a diagnosis of Grade 2 gingivitis. Subjects who met the inclusion criteria were randomized into two equal groups with 15 subjects in the treatment group (mouth rinsing with betel nut seed extract) and 15 subjects mouth rinsing with Chlorhexidine 0,2% solution.

#### Preparation for Gargling

Gargling was done two to three times a day according to the package instruction of the Chlorhexidine 0.2% solution. Each rinse used 10 mL solution and should be performed for 30 seconds. After expelling the solution, let stand for 15-30 minutes. This procedure was done at each subjects' residences, monitored by the respective parents or friends appointed by the researchers. The entire procedure was then recorded. On the following day, the subjects visited the JKG Clinic to perform back the mouth rinsing (done after teeth brushing). The gingival index was assessed then photographed to compare changes in the gingiva<sup>9</sup>.

The aforementioned steps were performed repeatedly until the gingival index reached 0, which showed signs of occurring healing. Data normality test was conducted using the Shapiro-Wilk test with significance level  $\alpha = 0.05$ . The non parametric Friedman test was done to analyze the differences in the decrease of gingival index between the treatment and control groups.

## RESULTS

A total of 30 subjects were enrolled in this study. The characteristics of eligible subjects are presented in Table 1.

In the present study the number of students who meet the requirements to be included on this study was 30 people, consisting of 15 men and 15 women. The mean gingival index of the studied patients before and after mouth washing with betel nut seed extract decreased significantly during observation ( $p < 0.05$ ) as presented in Table 2.

Table 3 displayed the gingival index decreased significantly during observation period in the group that rinse with Chlorhexidine 0.2% solution.

Table 4 shows that the mean gingival index in the two different treatment groups on day one of study did not differ significantly ( $p > 0.05$ ). There was no significant difference in the mean gingival index between the two treatment groups in the second ( $p > 0.05$ ) and third day ( $p > 0.05$ ) of the study as depicted consecutively in Table 4 and Table 5.

There was complete recovery on all of the study subjects on the third day as shown in Table 7. Statistical analysis using Wilcoxon test showed

that the mean healing time on both groups did not differ significantly ( $p > 0.05$ ), the result is displayed in Table 8.

## DISCUSSION

The results of this study showed a significant decrease in the gingival index after mouth rinsing with betel nut extract and Chlorhexidine 0.2% solution. Gargling will produce a mechanical and chemical cleansing effect. Mechanical effects are obtained from dynamic movements of gargling, while the chemical effects results from the active ingredients of the mouthwash containing antibacterial agents. The decrease of gingival index after gargled using areca fruit extract was likely to occur since betel nuts contain several substances including polyphenols, tannins, fats, sugar, water, and oil which contains alkaloids, flavans, phenolic compounds, gallic acid, sap, lignin, and salt<sup>10</sup>. The catechins and polyphenols possess both bacteriostatic and bactericidal functions against *Streptococcus mutans* bacteria<sup>11</sup>.

Catechins work by inhibiting the adhesion of *Streptococcus mutans* so that the activity of the glucosyltransferase enzyme is inhibited and the acid product is not formed. Catechins damage bacterial cell walls and cytoplasmic membranes and cause protein denaturation<sup>12</sup>.

The biological activities of flavonoids on bacteria damage bacterial cells, which consist of lipids and amino acids react with alcohol groups in flavonoids so that the cell wall will be damaged and these compounds enter the nuclei of bacterial cells and contact with DNA in the nuclei of bacterial

**Table 1.** Characteristics of the studied patients

Junior High School Grade	Gender		Students Number
	Male	Female	
7 <sup>th</sup> grade	5	5	10
8 <sup>th</sup> grade	5	5	10
9 <sup>th</sup> grade	5	5	10
Total	15	15	30

**Table 2.** The mean gingival index before and after gargled using betel nut seed extract

Variable	Betel Nut Seed Extract			$\chi^2$	P
	Day 1	Day 2	Day 3		
Gingival Index	1.93±0.704	0.40±0.507	0.00±0.00	18.17	0.000

**Table 3.** The mean gingival index before and after gargled using Chlorhexidine 0.2% solution

Variable	Chlorhexidine 0.2% Solution			$\chi^2$	P
	Day 1	Day 2	Day 3		
Gingival Index	1.20±0.561	0.20±0.414	0.00±0.00	25.41	0.000

**Table 5.** The mean gingival index between the two treatment groups on Day Two

Treatment Group	Number	Mean Gingival Index	SD	Z	P-value
Betel nut seed extract	15	0.40	0.507	-1.18	0.24
Chlorhexidine 0.2% solution	15	0.20	0.414		

**Table 6.** The mean gingival index between the two treatment groups on Day Three

Treatment Group	Number	Mean Gingival Index	SD	Z	P-value
Betel nut seed extract	15	0.00	0.00	0.00	1.00
Chlorhexidine 0.2% solution	15	0.00	0.00		

**Table 7.** The frequency of subjects with complete healing on the third day of the study

Treatment groups	Number	Frequency of complete healing
Betel nut seed extract	15	100%
Chlorhexidine 0.2% solution	15	100%

cells. The difference in polarity between lipid compilers of DNA and alcohol groups in flavonoid compounds damages the structure of lipid DNA and cell nucleus<sup>13</sup>.

In the Chlorhexidine group the decline in the gingival index were statistically significant ( $p < 0.05$ ), this is may be caused by the ability of Chlorhexidine to bind bacteria, interactions between

**Table 8.** The mean gingival healing time between the two treatment groups

Treatment groups	Number	Mean Healing Time	SD	Z	P-value
Betel nut seed extract	15	2.35	0.45	-1.38	0.902
Chlorhexidine 0.2% solution	15	2.29	0.66		

the positively charged Chlorhexidine molecules with negatively charged bacterial cell walls. This interaction will increase the permeability of the cell wall of the bacteria that cause penetration into the cytoplasm causes the death of microorganisms. Certain streptococci can be bound by Chlorhexidine in polysaccharides media, thus increasing the sensitivity of streptococci in the oral cavity against gingivitis cure Chlorhexidine. In both treatment groups, the healing process after the third day of treatment were equal (15 subjects in each group, 100%). Further statistical analysis showed that the average healing time using the gingival index after the third day in both groups was not significant ( $p > 0.05$ ).

While Chlorhexidine is a cationic biguanide, with a very broad antimicrobial

activity, its antimicrobial effects are associated with the interaction between Chlorhexidine 0.2% and bacterial cells that are negatively charged. After Chlorhexidine is absorbed in the surface of the bacterial cell wall, Chlorhexidine will reduce the resilience of the cell membrane and cause the release of intracellular materials. There was a study showing that using Chlorhexidine 0.2% as a mouthwash for a week could reduce the plaque index as much as 72% on the third day, and 85% on the seventh day. This resulted from the binding of Chlorhexidine with the tooth surface molecules such as polysaccharides, proteins, glycoproteins, saliva, mucous pellicles, as well as the hydroxyapatite surface, inhibiting the plaque formation as the main cause of gingivitis<sup>6</sup>.

## CONCLUSION

Based on the result from the research it can be concluded that mouthrinsing with either betel nut seed extract and Chlorhexidine 0.2% solution has the ability on the healing of second grade chronic gingivitis. The mean healing time between both groups was not significantly different.

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