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Comparison of Gargling Forest Honey Solution and Chlorhexidine to Decrease the Number of Oral Bacteria

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Abstract: *Oral hygiene is largely determined by caries experience. In special circumstances a person is not advised to brush their teeth so they maintain their oral hygiene with gargling antiseptic solution. However, long-term and continuous use of antiseptic mouthwash will have an impact on soft tissue damage of the mouth. Honey has been known to have various health benefits, especially as an antiseptic. Honey is the choice in this study is forest honey produced by apis dorsata bee high water content of 15-20%. Forest honey is thought to contain higher and varied bioactive compounds because it is produced by multiplication of bee activity.* ***Methods****: The respondents of this research are 60 students of FKG USU. This research method is pre and post test control group compare the effectiveness of forest honey 15%, 20% and 50% with chlorhexidine as positive control. The analysis used is one-way Anova test.* ***Result****: The results showed that there was a significant difference between gargling honey and chlorhexidine solution to decrease the number of oral bacteria (p-value = 0.0001). In post-hoc analysis, 50% honey solution was the most effective solution in reducing the number of oral bacteria than chlorhexidine (p-value = 0.0001).* ***Conclusion****: Gargling 50% honey forest solution can be an alternative to killing oral bacteria bacteria (antiseptic).*

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I. Introduction

The oral cavity is the easiest place for the microbe to colonize the human body. Bacteria are the most common microbes found in the human oral cavity.[1] Bacteria in the oral cavity will ferment carbohydrates and then produce acids that lower the pH. Decreasing acidity below 5.5 causes demineralization of the dental matrix organic material and then a carious lesion occurs.[2] Dental caries is caused by the teeth (host), substrate, time, and microorganisms.[3] The cariogenic microorganisms that predominate in the oral cavity are Streptococcus mutans. In addition there are also Lactobasillus organisms that have an impact in the formation of caries.[4] Streptococcus plays a role in the early stages of caries by damaging the outside of the email, then Lactobasillus will take over the role of a deep caries.[3]

According to data from the National Health and Nutrition Examination Survey, 2011-2012 in the United States as many as 91% of adults aged 20-64 years suffering from caries.[5] Basic Health Research (RISKESDAS) in 2013 showed a national caries caries prevalence (DMF-T) of 4.6 lower than in 2007 which amounted to 4.85 decreased around 0.2. This is still far from the targets set by WHO that the prevalence of dental caries index in 2020 is ± 1.[6]

Individual oral hygiene is determined by the experience of caries it has. It is known that precautions other than by brushing can be done with a rinse technique especially in certain cases. One of the mouthwash manufacturers that has been widely known is Chlorhexidine. Chlorhexidine is a mouthwash capable of reducing plaque formation, inhibiting plaque growth and preventing the occurrence of periodontal disease. Chlorhexidine has a greater antibacterial effect than other antiseptics in the oral cavity.[7] Chlorhexidine has very low toxicity and strong affinity with epithelial tissue and mucous membranes. In addition to its effect as antiplaque, chlorhexidine may reduce the level of microorganisms in the saliva by up to 90% within a few hours.[8] This is also supported by a study comparing chlorhexidine mouthwash with povidone iodine showing chlorhexidine resulting in a 19.4 mm inhibitory zone to streptococcus mutans compared to povidone iodine with a 7.6 mm inhibit zone.[9]

Today, the utilization of natural ingredients is in demand, especially for the health benefits of the body such as honey. Honey has been used as an effective remedy since ancient times in Egypt, Assyria, China, Greece and Rome utilizing honey for wounds and illness.[10]

Honey has been used for 2000 years to treat infected wounds before bacteria are found to cause infectious diseases.[11] Apis dorsata is one of the bees habitat in Asian forests. Honey produced by bees is still natural because it is obtained from forests that are not exposed directly by air pollution so that the high water

content is 24% -26%. Patel RV, Thaker VT, Patel VK in 2011 study on the effectiveness of honey with ginger showed that honey produced a larger drag (20.0 ± 0.5 mm) compared with ginger (18.0 ± 0.5 mm).[12]

The antibacterial substances contained in forest honey are glucose oxidase, which is the most potent antibacterial agent formed when dissolved in water.[13] The presence of gluconic acid and hydrogen peroxide is a natural preservative in forest honey. When honey is diluted, this activity becomes 2500 to 50000 times better and provides slow antiseptic properties without causing tissue damage.[14]

In general, honey is divided into two types, namely monoflora honey is a honey produced by bees that the food is dominant from one plant. The water content in this honey is 15-20%. Mineral content in this honey there is 0.2 grams in 100 grams. Examples of monoflora bees are Apis mellifera, Apis florea, Apis indica, Apis cerana that produces honey ie apple honey, kapok honey, manuka honey, and others.[13,15] Then another type is multiflora honey also called honey forest is honey produced by bees who take food from various sources and there is no dominant plant. An example of a multiflora bee is Apis dorsata. Apis dorsata is one of the bees that habits in Asian forests. Honey produced by bees is still natural because it is found from forests that are not exposed directly by air pollution so that the high water content is 15% -20%. Mineral content in multiflora honey is 0.9 grams in 100 grams of honey.[13,15]

However, there was limitation research which compared the most effective gargling of vary concentration of forest honey solution. Therefore, this research was done to evaluate which concentration was the most effective

II. Material And Methods

This experimental research was carrieed out on student of Faculty of Dentistry USU 2012-2017 selected by random sampling in accordance with the inclusion criteria of not smoking, not taking antibiotics, and mouthwash in the last 2 weeks.The number of samples obtained for 60 subjects and divided into 4 groups, each group consists of 15 respondents. Groups 1, 2, and 3 are gargling groups with 15%, 20% and 50% honey, while the fourth group is a gargling group with chlorhexidine or a positive control group.

Study Design: Pre and post test control group study

Study Location: This study was done in dental public health clinic, Faculty of dentistry, University of Sumatera Utara, Medan, Indonesia

Study Duration:Februari to Desember 2019

Sample size: 60 patients

Sample size calcualtion: This sample is calculated using the formula of the two different average hypothesis test samples. The target population from which we randomly selected our sample was considered 500. We assumed that the confidence interval 95%. The sample size actually obtained for this study was 60 subjects (Group I, Group II, Group III, Control Positive of 15 patients for each group) with 10% drop out rate.

Subjects & selection method: Study populations were obtained from active dentistry faculty students who were selected by random sampling technique. The sample was divided into 4 treatment groups as follows:

Group I (N= 15 patients) – gargling with 15% of honey solution
Group II (N=15 patients) – gargling with 20% of honey solution
Group III (N= 15 patients)- gargling with 50% of honey solution
Group IV (N=15 patients) – gargling with chlorhexidine

Inclusion criteria:

1. Respondents free of caries or a maximum of one superficial carious tooth
2. Not taking antibiotics in the last two weeks
3. Physical Health
4. Willing to be a sample

Procedure methodology:

Subjects were randomly divided into 4 groups of 15 people/ groups. Group I was given 15% honey forest solution, group II was given 20% honey forest solution, group III was given 50% honey forest solution and group IV was given chlorhexidine. Subjects were instructed to rinse for 30 s and then saliva was collected and sealed for calculation of bacterial count after treatment (post-test).

Saliva samples were stored and immediately taken to PTKI Laboratory Medan to calculate the number of bacteria before and after gargling by method.

Data analysis was performed using spss ver 20.0 program with t-paired test to see the average difference of bacterial count before and after rinse. Anova test to see the average difference in the number of bacteria between treatment groups.

Statistical Analysis

Data was analyzed by using computer. Univariate test was used to calculate the average value of the number of bacteria before and after rinsing honey solution `15% 20%, and 50%, chlorhexidine 0.2%. In addition, Bivariate testwas used to see the significance before and after treatment with 15%, 20% and 50% forest honey solution and 0.2% chlorhexidine t-paired test. Anova test was used to see which treatment group was effective.

III. Result

The observation results obtained in Table 1. The number of bacterial colonies of the oral cavity before and after rinse in all four groups decreased. In the forest honey concentration group concentration of 15%, the mean colony count was 36.73 ± 18.83 CFU/ml before rinsing to 31.13 ± 19.06 CFU/ml after rinsing and showed statistically significant results ($p < 0.05$). In the 20% honey solution group the mean colony count was 46.53 ± 17.83 CFU / ml before rinsing and 36.27 ± 15.01 after rinsing and the results of the analysis showed significant differences ($p <0.05$). Likewise with the 50% honey solution group in which the average colony counted 70.27 ± 19.27 CFU / ml before rinsing and 44.27 ± 14.94 CFU / ml after rinse and showed a significant difference ($p <0.005$). In the chlorhexidine group, the mean colony count before rinsing was 59.13 ± 24.32 and 42.67 ± 21.26 CFU / m after gargling with a significant difference ($p <0.05$) .

Table 1. Number of Bacterial Colonies In Forest Honey Solution Group 15%, 20%, 50% And Chlorhexidine

Group	Before Treatment		After Treatment		*p*
	n	mean±SD	n	mean±SD	
15%	15	36,73±18,83	15	31,13±19,06	0,0001
20%	15	46,53±17,83	15	36,27±15,01	0,0001
50%	15	70,27±19,27	15	44,27±14,94	0,0001
Chlorhexidine	15	59,13±24,32	15	42,67±21,26	0,0001

In the Table 2 was obtained the result of comparison of the average difference of the bacterial colony in the four treatment groups. showed a significant difference ($p <0.05$). The greatest decrease was in the 50% honey solution group of 26.00 ± 4.27 CFU/ml compared to the other groups.

Tabel 2. Analysis of Bacterial Colonies Number by Treatment Group and Control Group

Group	n	Mean difference	*p*
		mean±SD	
15%	15	5.60±2,38	0,0001
20%	15	10.27±4,43	
50%	15	26.00±4,27	
Chlorhexidine	15	16.47±5,84	

In table 3 showed there was a difference between 50% Forest Honey Solution and Chlorhexidine significantly.

Table 3. Analysis of Bacterial Colonies Number by 50% of Forest Honey Solution and Chlorhexidine

Group	n	Mean difference	*p*
		mean±SD	
Forest Honey Solution Group 50%	15	26.00±4,27	0.0001
Chlorhexidine	15	16.47±5,84	

IV. Discussion

In this study there was a decrease in the number of bacterial colonies of the oral cavity between the fourth treatment groups. The biggest decrease was in the 50% honey solution group. This is due concentration, The higher the concentration, the lower the water content will cause an unfavourable environment for bacteria growth.

Honey is a sugar mixture with a very high bacterial growth.[16] Gluconic acid and hydrogen peroxide are natural preservatives in honey. When honey is diluted, this activity becomes 2500 to 50000 times better and provides slow antiseptic properties without causing tissue damage.[17] Chlorhexidine has long been known as an antiseptic mouthwash that is often used in certain conditions based on a doctor's

praescription. In this study showed that the 50% honey solution group was more effective in decreasing the number of bacterial colonies of the oral cavity than chlorhexidine.

V. Conclusion

Based on the results of this study it can be concluded that the higher concentration of honey solution will increase its effectiveness in decreasing the number of colonies of oral cavity bacteria in which 50% honey solution is the most effective compared to other honey concentrations and chlorhexidine.

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