The Effect of Tea Tree Oil *(Melaleuca alternifolia)* Mouthwash on Salivary pH

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ABSTRACT

Backgrounds: One of preventive way to prevent plaque is using mouthwash. The use of essentials oil in mouthwash has proven reducing *Streptococcus mutans.* Teatree oil is kind of essentials oil extracted from *Melaleuca alternifolia* leaves containing terpinene-4-ol**,** that has antimicrobial, antibacterial, and antifungal action.

Objectives: Provide information about the effect of gargling with tea tree oil *(Melaleuca alternifolia)* mouthwash on salivary pH**.**

Methods: This type of research is clinical experimental with pretest-posttest control group design. Normality test used Shapiro-Wilk, and statistical test using Paired T-test.

Results: Statistical test showed increased salivary pH (P=0.004) after gargling with tea tree oil *(Melaleuca alternifolia)* mouthwash.

Conclusion: Tea tree oil *(Melaleuca alternifolia)* mouthwash can increased salivary pH.

Keywords: Salivary pH, Mouthwash, *Tea Tree Oil, Melaleuca alternifolia.*

INTRODUCTION

Oral health is part of overall health. Oral health is a healthy state starting from hard tissue and soft tissue of the teeth and related components in the oral cavity, so a person can eat, talk, and interact with others without experiencing aesthetic or comfort problems.[1] Poor oral health can cause problems both locally and health in general, such as: affecting nutrition, eating, sleeping, psychological status to social interaction, work and school.[2,3] Based on data from the World Health Organization (WHO) in the Global Goals For Oral Health in 2020, it shows that 57.6% of Indonesians have problems with their teeth and mouth.[1] The results of the Basic Health Research (Riskesdas) in 2018 stated that the biggest problem of oral health in Indonesia is dental caries, which is 43.5%, especially in children.[3]

Dental caries is a multifactorial disease caused by biofilm formed by carbohydrate fermentation on the tooth surface over a period of time. Dental caries occurs due to various factors such as host, time, carbohydrate diet and microorganisms. Dental plaque or biofilm is a soft deposit that accumulates on the tooth surface. Dental plaque generally consists of extracellular matrix, water, and bacteria. Some bacteria in biofilms metabolize carbohydrates to produce energy and produce organic acids. If these organic acids are present in the biofilm for a certain period of time, it can cause the pH to drop to a critical state (5.5 for enamel and 6.2 for dentin). If there is an imbalance in pH over a period of time, it can lead to an imbalance in the microbiome in the oral cavity. Furthermore, this change will result in an increase in the acidity of the oral cavity. The low pH state of the oral cavity can result in the release of potassium and phosphate in the teeth which will further cause the teeth to lose minerals or what is called demineralization.[4]

Saliva is one of the components that has a role in maintaining homeostasis in the oral cavity.[5] Saliva is very important in maintaining the level of acidity in the oral cavity. Saliva is a biological fluid secreted by major salivary glands and minor salivary glands. Saliva has various uses such as: Lubrication, helps chewing, digestion, and taste, as an antimicrobial agent, functions as a buffer, prevents tooth

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demineralization and protects teeth from caries.[6] Maintaining the balance of acids and bases in the oral cavity is one way to prevent plaque formation, as a preventive care, there are two ways that can be done, by mechanically and chemically. Mechanical preventive way for example by using a toothbrush, while chemical preventive way can be carried out by using mouthwash.[2]

Essentials oils are a type of oil generally extracted from plants that are used as blends because they have various pharmacological effects on the human body. Their properties vary depending on the ingredients, ranging from antioxidant, antibacterial and antifungal. The use of essentials oil as an additional ingredient in mouthwash is reported to reduce the number of Streptococcus mutans in the oral cavity because it has strong antibacterial properties. Tea tree oil is a type of essentials oil extracted from the leaves of the *Melaleuca alternifolia* plant. Tea tree oil contains terpinene-4-ol, which has antimicrobial, antiviral, antibacterial, and antifungal properties. Tea tree oil has been shown to have an antibacterial effect when used as an additional ingredient in mouthwash.[7] Research conducted by Saranya et al. in 2021 showed that tea tree oil mouthwash can affect changes in salivary acidity (pH). This is indicated by the results of the average value of salivary pH measurements after rinsing with mouthwash containing tea tree oil, which increased salivary pH. Based on this, it can be seen that tea tree oil mouthwash has an effect on salivary pH.[8] Based on these studies, researchers want to further examine changes in salivary acidity (pH) after gargling with tea tree oil mouthwash.

MATERIALS AND METHODS

In this study, the type of research used was clinical experimental and the research design used was pretest-posttest control group. This design is used to determine the difference in salivary pH before and after gargling using tea tree oil mouthwash. The samples used in this study were saliva from 20 preclinical students of the Faculty of Dentistry, Prof. Dr. Moestopo University (Beragama). Data analysis obtained in this study was processed using the SPSS (Statistical Package for the Social Science) program by conducting a normality test, using the Shapiro Wilk test. The results of this study included normal distribution with a significance value of $P > 0.05$. The next step, the Paired T-test was conducted.

RESULTS AND DISCUSSION

The results of the study can be seen through the following table:

Table 1. Frequency Distribution of Pretest - Posttest of Tea Tree Oil (*Melaleuca alternifolia*) Mouthwash

Variable	Mean	Minimum	Maksimum	SD
Pretest gargling *tea tree oil (Melaleuca alternifolia)* mouthwash	7.1030	6.67	7.57	0.26176
Posttest gargling *tea tree oil (Melaleuca alternifolia)* mouthwash	7.2175	6.60	7.68	0.28058

Table 2. Normality Test

Group	Saphiro Wilk		
	Statistic	*df*	*P(sig.)*
Pretest gargling *tea tree oil (Melaleuca alternifolia)* mouthwash	0.971	20	0.786
Posttest gargling *tea tree oil (Melaleuca alternifolia)* mouthwash	0.955	20	0.443

Table 3. Paired T-test Result

	P (*Sig. 2-tailed*)
Pretest – Posttest gargling *tea tree oil (Melaleuca alternifolia)* mouthwash	0.004
P<0.05,CI 95% (Paired T-Test)	

Descriptive data analysis in table 1 shows that the pH of saliva before gargling tea tree oil mouthwash (*Melaleuca alternifolia*) has a mean value of 7.1030 with a minimum value of 6.67 and a maximum value of 7.57. The pH value after gargling tea tree oil mouthwash (*Melaleuca alternifolia*) has a mean value of 7.2175 with a minimum value of 6.60 and a maximum value of 7.68. The standard deviation of salivary pH before gargling tea tree oil mouthwash (*Melaleuca alternifolia*) is 0.26176 and the standard deviation of pH after gargling tea tree oil mouthwash (*Melaleuca alternifolia*) is 0.28058. Based on the results of descriptive data analysis in table 1, the standard deviation of salivary pH before gargling tea tree oil mouthwash and the standard deviation of pH after gargling tea tree oil mouthwash have smaller values than the mean of the two data groups, which means that the mean data value can be used as a representation of the entire data.

Based on table 2, the data normality test results are categorized as normal because they have a $p > 0.05$ value. The pretest normality test result for tea tree oil (*Melaleuca alternifolia*) mouthwash is 0.786 and the posttest normality test result for tea

tree oil (*Melaleuca alternifolia*) mouthwash is 0.443.

Based on table 3, the results of the Paired T-Test pretest - posttest test have a P value <0.05, which is 0.004. The Paired T-Test test results show that there is a significant difference between the mean salivary pH before and after gargling tea tree oil mouthwash (*Melaleuca alternifolia*).

Based on the research, the results of Paired T-test, have a value of P = 0.004 where P <0.05, which means that there is a significant increase in the average pH of saliva after gargling tea tree oil mouthwash (*Melaleuca alternifolia*), from score of 7.1030 to 7.2175. Tea tree oil (*Melaleuca alternifolia*) is a type of essential oil consisting of terpinene hydrocarbons, generally monoterpenes, sesquiterpenes and other substances. Terpinene-4-ol and 1,8 cineole are the main components of tea tree oil.[9] Essential oils are compounds derived from aromatic plants that have volatile properties. In general, monoterpene and sesquiterpene components are the main components that make up essential oils in plants.[10] Essential oils have a sharp aroma so that they can increase salivary secretion and increase salivary pH.[11] This consistent with research conducted by Saranya et al. entitled Comparative Evaluation of The Effect of 0.2% Chlorhexidine, 2% Lemon Grass Oil, and 2% Tea Tree Oil Mouth Rinse on Salivary pH: An In Vivo Study in 2021. The study showed that tea tree oil mouthwash can increase the degree of acidity (pH) of saliva. Research by Saranya et al. compared the effect of three different types of mouthwash, which are chlorhexidine, lemongrass oil, and tea tree oil on salivary pH with the results that tea tree oil mouthwash gave a greater increase in salivary acidity (pH) than other types of mouthwash. Tea tree oil has high antimicrobial properties, proven effective against a number of gram-positive and gram-negative bacteria and fungi. Tea tree oil also inhibits plaque formation on the tooth surface.[8]

CONCLUSION

In this study, it was concluded that tea tree oil mouthwash can increase the potential of hydrogen (pH) of saliva. Tea tree oil mouthwash (*Melaleuca alternifolia*) can reduce the risk of dental caries by restoring the acid-base balance in the oral cavity, and tea tree oil has various benefits that are good for oral health.

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