The Level of Knowledge and Decay Missing Filling -Teeth (DMF-T) Index in Children Aged 12-15 years old in Coastal Area of Southeast Minahasa Regency Indonesia

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Article Info	Abstract
	Plaque is a soft layer of a collection of bacteria and sticky that adheres to teeth. One of the efforts to control it is to brush your teeth regularly and regularly use mouthwash. Currently, many mouthwashes have been developed with traditional plant ingredients that have antiseptic and antibacterial properties with side effects. One of these traditional plants is Green Tea (Camellia sinensis) and Nutmeg (Myristica fragrans Houtt). The purpose of this study was to analyze the effect of gargling with steeping green tea (C. sinensis) and nutmeg (M. fragrans Houtt) on the decline in plaque index of adolescents aged 17-19 years. The type of research used is quasi-experiment research one group pre-post test. This research was conducted in October-December 2022. The subjects of this study were Polytechnic students of the Ministry of Health of the Republic of Indonesia Manado aged 17-19 years and willing to be research subjects. The number of samples obtained in this study was 42 people. The treatment given is gargling with steeping green tea (C. sinensis) and nutmeg flowers (M. fragrans houtt). The variable measured is the plaque index. This research instrument uses diagnostic tools and plaque index assessment format. The data obtained were analyzed using a paired sample t-test statistical test. The results of this study showed that the average plaque index before gargling steeping green tea (C. sinensis) was 2.09 and after that was 1.35, had a difference in decrease of 0.74 points. The average plaque index of steeping nutmeg (M. fragrans houtt) before was 2.03 and after that was 1.03, had a difference of 1.00. Based on analysis using paired sample t-test shows there is a significant difference seen from the value of p = 0.00 (0.00<0.05). It can be concluded that the gargling with steeping green tea (C. sinensis) and nutmeg flowers (M. fragrans houtt) can make the plaque index of adolescents aged 17-19 years better.

Introduction

Dental health is one aspect of all health that is the result of the interaction between physical, mental, and social conditions. Physical aspects are the state of dental and oral hygiene, tooth shape, and saliva that can affect dental and oral health. Dental and oral hygiene is the condition of the teeth that are in the oral cavity in a clean state free from plaque and other impurities that are above the surface of the teeth such as debris, tartar, and food waste (Setyaningsih, 2019).

Many dental and oral health problems are caries and periodontal disease. The main cause of such dental and oral disease is plaque. Plaque is a soft, sticky coating that adheres to teeth.

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Plaque consists of proteins and bacteria, bacteria are 70% derived from saliva. This plaque itself is formed after brushing your teeth, if the plaque has hardened caused by calcium, phosphorus and other minerals and will become tartar within 48 hours after its formation. Plaque attached to the surface of the teeth is the main source of nutrients for bacteria to grow and colonize and create acidic shades in the oral cavity which can cause enamel to dissolve and cause dental caries (Mumpuni & Pratiwi, 2013).

Plaque control that can be done is by brushing your teeth regularly and by regularly using mouthwash. Brushing your teeth regularly is more effective in plaque control, but gargling can be another alternative to inhibit the occurrence of dental plaque. Plaque control with gargle solution can use materials such as traditional plants. There are still many people who have not done the habit of brushing their teeth at the right time (Putri et al., 2012). Without brushing your teeth, the bacteria between the teeth are difficult to remove, therefore by gargling using water or traditional mouthwash can also be done for one of the efforts to prevent dental disease (Susanto, 2018).

Basic Health Research 2018 showed that the prevalence of the Indonesian population who experience dental and oral health problems, 51.9% found at the age of 15-24 years, mostly have the habit of brushing teeth inappropriately, namely brushing their teeth only when bathing. This is evidenced by that those who do the habit of brushing their teeth at the right time by 3.3%.

Currently, many mouthwashes have been developed with traditional plant ingredients that have antiseptic and antibacterial properties with side effects. Traditional mouthwash can be used by brewing ingredients from traditional plants. Ajisaka founded the brewing process is the process of separating components using water solvents. This is very important to be informed to the community as one of the traditional mouthwashes that people can use. Brushing your teeth is one way to control plaque mechanically and as for chemical plaque control by gargling (Ajisaka, 2012). As for traditional plants that can be steeped to become mouthwashes such as green tea (Camellia sinensis) and nutmeg (Myristica fragrans Houtt) flowers where these plants contain compounds that can be antibacterial (Badan Penelitian dan pengembangan Kesehatan Kementerian Kesehatan RI. Riset Kesehatan Dasar, 2018).

Tea contains a rich source of polyphenols (catechins) which are part of flavonoids that can slow the growth of bacteria Streptococcus muntans, Streptococcus sobrinus and Lactobacillus sp., which are bacteria that cause the formation of dental plaque (Noorfadhila, et al., 2019). Based on Putri, et al., that gargling with green tea solution effectively lowers plaque index, because green tea has antibacterial properties that are able to fight bacteria in dental plaque (Putri et al., 2020).

Indonesia is recognized as a major producer of nutmeg oil derived from the plant species Myristica fragrans. The potential applications of this particular essential oil in the food and pharmaceutical sectors are significant. However, it is worth noting that the antibacterial properties of Indonesian nutmeg oil have not yet been thoroughly examined or studied. The antibacterial activity of Myristica fragrans oil from two distinct regions, namely Sulawesi and Central Java, was examined. The essential oils were extracted using a water and steam distillation process. Subsequently, their antibacterial efficacy against pathogenic bacteria was evaluated, encompassing both gram-positive bacteria such as Staphylococcus aureus and Staphylococcus epidermis, as well as gram-negative bacteria including Shigella dysenteriae and Salmonella typhi. Two essential oils were shown to prevent the growth of all bacteria. The most significant inhibitory effect observed for Central Java nutmeg oil was shown at concentrations ranging from 60% to 100% for the bacteria strains S. aureus, S. epidermis, S. dysenteriae, and S. typhi (Nurjanah et al., 2017). Nutmeg is known to contain alkaloid chemicals that possess antimicrobial properties. The ethanol extract of the fruit flesh, mace,

and nutmeg seeds has been shown to include alkaloid chemicals, saponins, tannins, flavonoids, and terpenoids (Atmaja et al., 2017).

Adolescence is the transition period from childhood to adulthood. Late adolescents aged 17-19 years are teenagers who have entered college or are often called students. The initial survey conducted by researchers on students of the Department of Dental Health Poltekkes Kemenkes Manado there were 52 people where the number of male students was 8 people and women were 44 people. At the time of the initial survey conducted on 6 students, it was obtained that the average student had ≥ 2 cavities or dental caries. The results of the examination on 6 students using the PHP plaque index all had moderate dental hygiene, which ranged from 1.8-3.4. From the results of interviews with 6 students who were examined, on average they brushed their teeth only at bath time and did not have the habit of rinsing their mouths using mouthwash. This study aimed to analyze the effect of gargling with steeping green tea (Camellia sinensis) and nutmeg (Myristica fragrans houtt) to plaque index.

Methods

This is a quasi-experiment research with one group pre-post-test design. There are 2 types of treatment, namely gargling steeping green tea (Camellia sinensis) and gargling steeping nutmeg tea (Myristica fragrans Houtt). The indicator measured was the Plaque Index. This research was conducted in June-December 2022. The study used adolescents aged 17-19 years as research subjects. Adolescents aged 17-19 years were selected from Polytechnic students of the Indonesian Ministry of Health Manado who met the criteria, namely not doing dental work, not having dental and oral disorders and willing to be the subjects of this study. Based on this, 84 students were obtained. The number of students was divided into 2 groups, namely the group that gargled with steeping green tea (C. sinensi) and steeping nutmeg tea (M. fragrans), so each group consisted of 42 research subjects. Index plaque measurement, with the following research process; (1) Researchers ask for willingness from research subjects through informed consent; (2) After approval is given, the researcher conveys matters related to the procedures in this study so that the research steps can be carried out correctly by the research subjects; (3) The study subjects gave approval to understand the research procedure carried out, so the researcher measured the first plaque score before gargling steeping green tea and gargling nutmeg; (4) Respondents were given 15 ml of steeping green tea; (5) Respondents were given 15 ml steeping nutmeg flowers; (6) Then instructed to gargle once for 30 seconds on the entire surface of the tooth firmly and then discarded; (7) Recheck the plaque index after 1 hour and record the test results. The data from this examination was analyzed using a frequency distribution table. Testing the effect of treatment on plaque index using the t-test. This research has been declared ethically feasible by the research ethics commission of the Health Polytechnic Indonesian Ministry of Health Manado with the number KEPK.01/07/131/2022..

Results and Discussion

The categories of plaque index

The distribution of respondents based on the categories of plaque index with gargling steeping green tea (C. sinensis) and nutmeg tea (M. fragrans Houtt) can be seen Table 1.

Table 1. Distribution of Plaque Index Categories

Treatment (Gargling steeping)	Group	Categories of Plaque Index				Total
		Excellent	Good	Fair	Bad	
Green tea	Before	0	13	26	3	42
	After	1	32	9	0	42
Nutmeg	Before	0	14	24	4	42
	After	4	33	6	0	42

Table 1 showed that before being given treatment (green tea steeping) the most respondents fell into the "fair" plaque index category (26 respondents) and none fell into the "excellent" category. After being given treatment (green tea steeping) the most respondents fell into the "Good" plaque index category (32 respondents) and 1 respondent fell into the "Excellent" category.

Futhermore, before being given treatment (gargling steeping nutmeg tea) the most respondents fell into the "fair" plaque index category (24 respondents) and none fell into the "excellent" category. After being given treatment (gargling steeping nutmeg tea) the most respondents fell into the "Good" plaque index category (33 respondents) and 4 respondents fell into the "Excellent" category.

The Effect of Gargling Steeping Green Tea and nutmeg tea (M. fragrans Houtt) to Plaque Index

The effect of gargling steeping green tea (C. sinensis) and nutmeg tea (M. fragrans Houtt) to plaque index can be seen in Tables 2.

Table 2. The Effect of Gargling Steeping to Plaque Index

Group/ Garglin Steeping	n	Average Plaque Index		Difference in Plaque Index	p-value	t-calculate	t-table
		Before	After				
Green Tea	42	2,09	1,35	0,74	0,000	8,670	1,682
Nutmeg	42	2,03	1,00	1,03	0,000	14,067	

Table 2 showed that the average between the score of plaque index before gargling green tea which was 2.09 and after 1.35 the difference decreased by 0.74. The p-value obtained was 0.000 (p< 0,05) and the t-calculate was 8.670 (t-table= 1.682), this means that the gargling with steeping green tea has an effect on reducing plaque index. Futhermore, the average between the score of plaque index before gargling green tea which was 2.03 and after 1.00 the difference decreased by 1,03. The p-value obtained was 0.000 (p< 0,05) and the t-calculate was 14.067 (t-table= 1.682), this means that the gargling steeping with nutmeg has an effect on reducing plaque index.

The results showed that the plaque scores before gargling green tea steeping with the most are in the category "Fair" (26 respondents), "Good" (13 respondents) and Bad (4 respondents). The results of plaque scores after gargling the green tea steeping, mostly in category "Good" (32 respondents), "Fair" (9 respondents) and "Excellent" (4 respondents). Based on the results of the study above, it shows that gargling steeping green tea has an effect on reducing plaque index. The plaque index before gargling green tea steeping about 2.09 and after gargling steeping green tea about 1.35, there was a decrease in plaque index by 0.74. Besides that, according the statistical analysis the p-value obtained was 0.000 (p< 0,05) and the t-calculate was 8.670 (t-table= 1.682), this means that the gargling with steeping green tea has an effect on reducing plaque index.

The difference in the average plaque index formed due to gargling steeping green tea which has several ingredients such as polyphenols (catechins) and fluoride, fluoride has many benefits to strengthen teeth and prevent damage6. This is in line with previous research conducted by Maramis, et al, entitled the effect of gargling with steeping green tea on decreasing plaque index obtained an average result of plaque index before gargling steeping green tea of 2.33 and after gargling with steeping green tea water the average plaque index was 0.78, so the difference in decrease occurred 1.55 or 5.1%. This means that gargling with steeping green tea water has an effect on reducing plaque index.

Dental plaque is a collection of microorganisms on the surface of the teeth in the form of biofilms that can affect the oral cavity system. Bacterial colonies in biofilms are found in all parts of the body and can cause infection, and in the oral cavity there are more than 700 species of bacteria that colonize the biofilm and form plaques and are described as one of the most complex microbial ecosystems. Research from Lesmana, et al entitled the effect of green tea steeping gargle in reducing the dental plaque index of children of SD Inpres Antang II Makassar Students, the study obtained an average plaque score before gargling green tea steeping 3.19 and an average plaque score after gargling green tea steeping 1.74. This shows a decrease in plaque score by 1.45 and p-value (000-0,05) which means there is an effect of gargling with steeping green tea in lowering plaque index.

The results showed that the before being given treatment (gargling steeping nutmeg tea) the most respondents fell into the "fair" plaque index category (24 respondents) and none fell into the "excellent" category. After being given treatment (gargling steeping nutmeg tea) the most respondents fell into the "Good" plaque index category (33 respondents) and 4 respondents fell into the "Excellent" category. Futhermore, the plaque index was 2.09 and after gargling steeping green tea about 1.35, there was a decrease in plaque index by 0.74. The difference in the average plaque index is formed because nutmeg contains natural ingredients that are antibacterial such as saponins, alkaloid compounds and contain essential oils. Research conducted Kaawoan et al, states that nutmeg extract has inhibitory power against Porphyromonas gingivalis bacteria where the source of nutmeg flower extract produces better inhibitory power than other nutmeg fruit parts. These bacteria are one of the bacteria that cause periodontitis found in dental plaque.

Moreover, based on the statistical analysis, the obtained p-value was 0.000 ($p < 0.05$), and the calculated t-value was 8.670 (t-table = 1.682). These results indicate that gargling with steeped green tea has a significant impact on decreasing the plaque index. The reduction in plaque index may be attributed to the presence of natural compounds found in nutmeg blossoms, which possess inhibitory properties against bacterial growth, including those present in dental plaque. The nutmeg tree belongs to the genus Myristica, which encompasses many types of trees. One of the most significant commercial species is Myristica fragrans, a perennial tree that is native to the Banda Islands located in the Moluccas, often known as the Spice Islands, situated in Indonesia. The potential use of nutmeg extracts as antifungal and antibacterial agents has been identified. The observed selective targeting of harmful bacteria while sparing normal flora is a noteworthy aspect of the subsequent antibacterial activity. As an instance, it has been shown that the 157 E. coli strain exhibits sensitivity to nutmeg extract, but the non-pathogenic strains of E. coli do not display such sensitivity. An analogous occurrence takes place inside the oral cavity. Nutmeg extract has been shown to have bactericidal effects specifically against Streptococcus mutans, the pathogenic bacterium responsible for dental caries, while leaving non-pathogenic bacteria unharmed. Nutmeg has properties that may be used to create an effective pesticide specifically targeted at cockroaches. Nutmeg has been seen to provide protection to healthy cells against radiation-induced damage. However, the impact of nutmeg on cancer cells remains uncertain.

The pharmacological activities of volatile essential oil and different extracts derived from nutmeg seeds have been shown to include a range of effects, such as antioxidant, antibacterial, insecticidal, anti-amebic, and anticarcinogenic activity. Various chemical assays can be utilized to measure the antioxidant capacity of nutmeg seeds. These assays include estimating the total phenolic concentration, assessing the ability to scavenge the stable free radical DPPH (2,2-diphenyl-1-picrylhydrazyl), conducting the ferric reducing/antioxidant power assay (FRAP), evaluating the inhibition of lipid peroxidation, and examining the inhibition of bleaching of β-carotene. The antioxidant capabilities of a substance are attributed to its diverse range of active phytochemicals, which include vitamins, carotenoids, terpenoids, alkaloids,

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flavonoids, lignans, simple phenols, and phenolic acids. Numerous extracts and the essential oil derived from nutmeg seeds have shown potent antibacterial properties against both gram-positive and gram-negative bacteria, as well as a diverse range of fungi. Nutmeg has notable antioxidant and antibacterial properties, making it a noteworthy natural reservoir of antioxidants and antimicrobials. Due to its natural composition, nutmeg has inherent qualities that promote enhanced safety for both individuals and the environment. Moreover, nutmeg is seen as a comparatively lower risk factor for the development of resistance among harmful bacteria.

This decrease in plaque score occurs because in green tea which has several ingredients such as polyphenols (catechins) and fluoride, fluoride has many benefits to strengthen teeth and prevent damage. While the nutmeg in nutmeg contains natural ingredients that are antibacterial such as saponins, alkaloid compounds and contain essential oils. Nutmeg oil is composed of many monoterpenes, including -pinene, camphene, -pinene, sabinene, myrcene, a-phellandrene, a-terpinene, limonene, 1, 8-cineole, g-terpinene, linalool, terpinen-4-ol, safrole, methyl eugenol, and myristicin, which serve as its active constituents. The antimicrobial mechanism of action shown by these substances is closely associated with their capacity to disrupt microbial adhesion, enzymes, and cell membrane proteins.

The susceptibility of Gram-positive bacteria to antimicrobial chemicals found in spices was shown to be higher compared to Gram-negative bacteria. The degree of sensitivity exhibited variation across the isolates and was influenced by the environmental conditions applied. Specific spices have a direct influence on the fermentation rate by promoting the synthesis of acids in starting cultures. Phenols, alcohols, aldehydes, ketones, ethers, and hydrocarbons have been identified as significant antibacterial constituents found in spices.

Conclusion

It can be concluded that the effect of gargling with steeping green tea (Camellia sinensis) and nutmeg (Myristica fragrans houtt) on the decline in plaque index. Therefore, to improve the degree of dental and oral health through gargling with steeping green tea and steeping nutmeg.

Acknowledgement

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