EFFECTIVENESS OF USING HERBAL AND NON-HERBAL TOOTHPASTE ON REDUCING PLAQUE INDEX

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ABSTRACT
Dental plaque is a soft layer that adheres to the surface of the teeth if a person neglects dental and oral hygiene, which is a microorganism that reproduces in an intercellular matrix. One simple, effective way to remove plaque is to brush your teeth with toothpaste. The addition of herbs in toothpaste is expected to inhibit the growth of dental plaque, this is related to the ability of several types of herbs to inhibit microbial growth. This research is analytical, using a quasi-experimental design with a pre-test and post-test control group design, and aims to determine the effectiveness of herbal and non-herbal toothpaste in reducing the plaque index of female students of the Midwifery Study Program at Polkesmed. This research examined 42 Midwifery students. The research obtained that the average plaque index through the post test in the herbal group was 1.59 ± 0.617, and in the non-herbal group it was 2.29 ± 0.561. Mann-Whitney analysis showed a difference in the average plaque index through the post test in the two groups, where p = 0.000. The conclusion of this study is that herbal and non-herbal toothpastes are both effective in reducing the dental plaque index significantly with a p value <0.05. Statistically, herbal toothpaste has more potential to reduce the dental plaque index than non-herbal toothpaste with a p value <0.05. It is recommended that people use herbal toothpaste in their daily lives, because this toothpaste is more effective in reducing the plaque index and can help reduce the factors that cause caries in Indonesia.

Keywords : *Herbal Toothpaste, Non Herbal Toothpaste, Plaque Index*

INTRODUCTION

Dental and oral health is part of overall body health and cannot be separated from general body health. Dental and oral health can affect a person's quality of life because it disrupts speech, chewing, and aesthetic functions[1]. One indicator of dental and oral health is the level of oral hygiene. This can be seen from the presence or absence of organic deposits such as pellicle, alba matter, food debris, calculus, and dental plaque [2]. Based on the 2018 Basic Health Research (Riskesdas) data, the percentage of Indonesian people who experience dental and oral health problems is quite high, namely 57.6%, who receive services from dental health workers of 10.2%, the percentage who brush their teeth correctly is only 2.8% and the percentage of caries rates for adolescents aged 15-24 is 38.1% while for the province of North Sumatra, the percentage of people who experience dental and oral health problems is 60%, while the percentage of brushing teeth correctly for the province of North Sumatra is only 1.8% and for

the percentage of caries rates for ages 15-24 is 36.35% [3]. This indicates that the level of awareness of the Indonesian people regarding dental health is still low [4].

Dental and oral health problems generally occur due to dental plaque. Dental plaque is a soft deposit that adheres to the surface of the teeth consisting of microorganisms that multiply in an intercellular matrix if someone neglects their dental and oral hygiene[1]. Unlike the previous layer, dental plaque cannot be cleaned perfectly by mechanical means. Plaque usually begins to form on one third of the gingival surface and on defective and rough tooth surfaces [4].

One simple and effective way to remove plaque is to brush your teeth with toothpaste [5]. Currently, there are various brands of toothpaste on the market and almost all of those displayed contain more than one active ingredient that provides various benefits for consumers. Not only conventional toothpaste that appears with various brands on the market, herbal toothpaste is now also starting to appear with various types and brands on the market [6].

The addition of herbs to toothpaste is expected to inhibit the growth of plaque on teeth. This is related to the ability of several types of herbs to inhibit microbial growth. In addition, because herbs come from plants, these ingredients are safe and natural [2]. Herbal ingredients contained in toothpaste that are often found on the market include tea tree oil (Melaleuca alternifolia), Red algae, Chrysantheum cinerariaefolium, betel leaves, and lime [7]. Similar research on the effectiveness of using herbal and non-herbal toothpaste on reducing plaque index showed that the use of herbal toothpaste was more effective in reducing plaque index compared to non-herbal toothpaste [5]. Based on an initial survey conducted by researchers regarding the effectiveness of using herbal and non-herbal toothpaste on reducing plaque index in female students of the D-III Midwifery study program at Polkesmed, it was found that some of the research samples found as many as 6 female students used herbal toothpaste, the rest used non-herbal toothpaste. Based on the description above, researchers are interested in knowing how effective the use of herbal and non-herbal toothpaste is in reducing plaque index in female students of the D-III Midwifery study program at Polkesmed.The introduction section contains the background, a clear formulation of the problem, literature review and research objectives. In the background there must be a gap analysis, so that it can describe originality with other research. The entire introduction is presented in an integrated manner in the form of several paragraphs; 15-20% of the content of the article.

METHOD

This study used a quasi-experimental design with a pre-test and post-test control group design. This study was to determine the effectiveness of using herbal and non-herbal toothpaste on reducing plaque index in female students of the D-III Midwifery study program, Polkesmed in 2024. Sampling was taken using a purposive sampling technique, namely determining samples based on certain considerations made by the researcher himself, based on the characteristics or properties of the population that were previously known.

The selected sample must meet the inclusion and exclusion criteria. The inclusion criteria in this study were female students of the D-III Midwifery study program, semester II, class 1A who were willing to follow the research procedure from start to finish, had index teeth that would be examined. The exclusion criteria were using fixed orthodontics. The number of samples selected in this study was 42 people. The following is the research procedure:

a. The sample was divided into two groups, each group consisting of 21 people. The first group used herbal toothpaste and the second group used non-herbal toothpaste.

b. Samples are advised to brush their teeth for 7 days using herbal and non-herbal toothpaste

c. Conducting a pre-test plaque index examination using a disclosing agent with the Personal Hygiene Performance plaque index examination method

d. After using toothpaste for 7 days, the researcher returned to conduct a post-test plaque index examination conducted on the 8th day. The researcher recorded and calculated the difference in plaque index before and after using herbal betel leaf toothpaste and non-herbal on female students [8].

The data in this study were analyzed statistically using the SPSS Version 29 application. Data analysis in this study includes: the Saphiro-Wilk test to determine data normality. The paired samples t-test test to compare the average pre-test and post-test plaque index scores of the non-herbal group. The Wilcoxon test to compare the average pre-test and post-test plaque index scores of the herbal group. The Mann-Whitney test to compare the average post-test of the herbal and non-herbal groups.The method section contains an explanation of the research design, population, sample, variables, time and place, data collection tools and techniques, and data analysis; 15-20% of articles. Explain the research design in detail in order to describe the research process as a whole. The implementation of the research involves anyone with what kind of role and in what way. This research has passed the ethical review and is attached at the time of article submission.

RESULTS

This study was conducted on 42 people. Each respondent was given a dental plaque sample before intervention (before using toothpaste) and after intervention (after using toothpaste) and the results of this study are presented in the following table:

Table 1 : Evaluation of Plaque Index Changes

Index plaque	Herbal Toothpaste (n=21)	Non Herbal Toothpaste (n=21)
Plaque Index Before Treatment (Mean±SD)	2.75 ± 0.522	2.75 ± 0.538
Plaque Index Before Treatment (Mean±SD)	1.59 ± 0.617	2.29 ± 0.561
p-value	0.000	0.000

Based on Table 1, it can be seen that the results of both groups before and after the intervention showed a decrease in the plaque index. In the herbal toothpaste group, the average plaque index before the intervention was 2.75 and after the intervention decreased to 1.59. Based on the results of the Wilcoxon signed ranks test, p = 0.000 (p <0.05) was obtained, this means that there is a significant difference in plaque index between before and after the use of herbal toothpaste. In the non-herbal toothpaste group, the average plaque index before the intervention was 2.75 and after the intervention decreased to 2.29. Based on the results of the paired samples test, p = 0.000 (p <0.05) was obtained, this means that there is a significant difference in plaque index between before and after the use of non-herbal toothpaste.

Table 2 : Difference in Plaque Index Change

Sample	Mean±SD	p-value
Herbal Toothpaste (n=21)	-0.81 ± 0.388	0.000

Based on Table 2, it can be seen that the p value = 0.000 (p<0.05), this shows that herbal toothpaste shows a significantly different potential from non-herbal toothpaste in reducing dental plaque index.

DISCUSSIONS

The change in plaque index before and after the intervention showed a significant value of p <0.05 (Table 1). Plaque is a thin, soft, sticky, colorless layer that contains bacteria. Plaque is the main cause of dental and oral diseases such as dental caries (cavities), calculus (tartar), gingivitis (gum inflammation), and so on [9]. Therefore, the plaque formation process cannot be avoided, to minimize plaque formation, it can be done mechanically, namely by brushing teeth using toothpaste [6]. The group using herbal toothpaste had an average plaque index before the intervention of 2.75 and after the intervention decreased to 1.59. Based on the statistical test, the p value <0.05 was obtained, this means that there is a significant difference in plaque index between before and after the intervention. The group using non-herbal toothpaste had an average plaque index before the intervention of 2.75 and after the intervention decreased to 2.29. Based on the statistical test, the p value <0.05 was obtained, this shows that there is a significant difference in plaque index between before and after the intervention. It can be concluded that herbal toothpaste is more effective in reducing plaque index.

Statistical testing on 42 respondents using the Saphiro Wilk normality test with a 95% confidence level, the non-parametric Wilcoxon signed ranks test and Mann-Whitney, paired samples test. Based on the normality test, the herbal toothpaste data was not normally distributed so it was continued with the non-parametric Wilcoxon signed ranks test. The results of the statistical analysis showed that there was a significant difference in plaque index between before and after the intervention in the herbal toothpaste group with a p value <0.05. For non-herbal toothpaste data normally distributed, it was continued with the paired samples test. The results of the statistical analysis showed that there was a significant difference in plaque index between before and after the intervention in the non-herbal toothpaste group with a p value <0.05.

Furthermore, a statistical analysis test was carried out on the sample using the Mann-Whitney test or a paired test of two groups after using herbal and non-herbal toothpaste with a p value <0.05, which means there is a significant difference between the herbal and non-herbal toothpaste groups (Table 2). This shows that herbal toothpaste has the potential to reduce plaque index.

The results of this study are supported by research conducted by Wulandari et al. (2020), and Lusiani et al. (2022) which stated that the use of herbal betel leaf toothpaste is more effective in reducing the plaque index compared to non-herbal toothpaste [5, 10]. This proves that toothpaste containing herbs is effective in reducing the plaque index.

The use of herbal and non-herbal toothpaste has similarities, namely that it can reduce the plaque index [11]. There is an abrasive content in both types of toothpaste which functions to clean, remove plaque and polish the tooth surface without damaging the enamel. However, herbal toothpaste is more effective in reducing the plaque index because it contains additional natural ingredients, namely betel leaf extract and green tea, which have anti-bleeding properties[5].

Betel leaves are known as an ingredient in herbal toothpaste which plays a very important role in inhibiting plaque growth because the essential oils in betel leaves have antibacterial properties, one of which is against Streptococcus mutans bacteria. The content of betel leaves is essential oil, the main components of which consist of phenol and its derivative compounds such as kavikol, chavibetol, carvacrol, eugenol, and allylpyrocatechol. In addition to essential oils, betel leaves also contain carotene, thiamine, riboflavin, nicotinic acid, vitamin C, tannin, sugar, starch, and amino acids[12].

Another study according to Susanto et al. (2020) also explained that there is a difference in the effectiveness of the plaque index between brushing teeth using herbal toothpaste and non-herbal toothpaste on the plaque index. Changes in the results of the plaque index study were also caused by the toothpaste containing abrasives and cleaning agents that function to reduce surface tension and loosen the bonds of debris with teeth which will help the tooth cleaning movement. The pressure of the bristles produced by brushing teeth causes food residue and plaque on the tooth surface to disappear or decrease [13].

CONCLUSION

Herbal and non-herbal toothpastes are equally effective in significantly reducing the dental plaque index with a p value <0.05. Statistically, herbal toothpaste has more potential in reducing the dental plaque index compared to non-herbal toothpaste with a p value <0.05.

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