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# Debris Index before and after gargling with moringa leaves

**Zahra Aulia Putri[1], Syifa Yulia Lestari[2*], Ngatemi[3]**

[1,2,3] Department of Dental Health, Polytechnic Health of Jakarta I, Indonesia

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**ABSTRACT**

Background: Dental and oral hygiene is one of the factors that trigger dental caries. Preventive efforts can be made to anticipate oral health problems, one of which is gargling. The chemical mouthwash ingredient that is often used is chlorhexidin, while if used for a long time it can cause side effects in the form of bacterial resistance and discomfort. Therefore, the need for natural ingredients to minimize side effects that can arise cheap, safe and effective natural ingredients for gargling, one of which is moringa leaves. Objective: The purpose of this study was to determine the debris index before and after gargling with moringa reduce water in TPQ Al-Barokah Bojonggede students in 2024. Methods: This research method is quasi experiment research. This study was conducted with a sample of 30 students obtained using purposive sampling technique. The instrument used was the debris index examination sheet. Results: The difference of the debris index score before and after gargling with moringa reduce water is 0.43. With an average debris index score before gargling is 1,56 and the average debris index score after gargling is 1,13. Conclusion: It can be concluded that after gargling with moringa reduce water can reduce the debris index score.

## INTRODUCTION

Oral health is always related to body health. Oral health is very influential on body health. If oral health is not optimal, it can lead to a decrease in the quality of body health, which affects daily human activities (Mahmoud et al., 2017). The following is data on the prevalence of people experiencing oral and dental disease in Indonesia according to Riskesdas 2018, showing a significant increase from 25.9% in 2013 to 57.6% in 2018 (Riskesdas, 2018). One of the most common oral diseases among Indonesians is dental caries (Tarigan, 2016).

Dental caries, or more commonly known as dental cavities, is the most common oral health problem in the community, there were 2 billion people experiencing caries in permanent teeth and 514 million people experiencing caries in primary teeth. Children are a vulnerable group that experiences a lot of dental caries. Based on data taken from the World Health Organization, it is recorded that 60-90% of children in the world experience dental caries (WHO, 2023).

Based on survey data from the Ministry of Health of the Republic of Indonesia in 2018, it was found that the most common oral health problem in Indonesia is dental cavities, with 88.8% of Indonesian people experiencing dental caries. While in West Java Province itself, the prevalence of dental caries is 45.7%. In children aged 5–14 years, 83% have dental caries (Riskesdas, 2018).

The level of dental and oral hygiene in children is usually lower than that of adults. Dental and oral hygiene are two of the factors that trigger dental caries (Purnama, 2023). If someone ignores dental and oral hygiene, there will be a buildup of food residue on the teeth, which can trigger dental caries. The accumulation of tooth debris can produce acid, which is a factor in the occurrence of dental caries, and can cause tooth demineralization, which is the initial process of caries (Nabila et al., 2024; Utami, 2013).

Debris is food debris and microorganisms that collect on the surface of the teeth in the form of biofilm, which can affect the oral system. Bacteria that colonize biofilms can be found on all parts of the body and can cause infection. Biofilms are formed from bacteria that are bound together and tightly attached to the tooth surface. Bacteria can be bound together in a matrix produced by extracellular polymeric substances. The extracellular polysaccharide matrix is mainly produced by Streptococcus

*Corresponding author.
E-mail addresses: lestarisyifa05@gmail.com

mutans bacteria. About 65% of infectious diseases that occur in the oral cavity are associated with biofilms, such as caries and other periodontal diseases (Kusuma, 2016; Nurjannah et al., 2012).

Children are one of the vulnerable groups who experience a lot of dental caries, and at this time there is a period of change from primary teeth to permanent teeth (Kasihani et al., 2021). It is at this time that further attention and care are needed because newly grown teeth must be maintained. Foods consumed by children tend to contain a lot of sugar, such as biscuits, candy, cakes, and others, which can trigger dental caries (Nurilawaty et al., 2021). The lack of information children have about dental health compared to adults affects tooth cleaning activities. Preventive efforts can be made to anticipate oral health problems. One preventive method that is easy to do besides brushing your teeth is gargling (Chung, 2020; Erdiyani et al., 2023). The use of mouthwash is easy to use and can remove bacteria or food debris found between teeth that are difficult to reach by a toothbrush. Gargling can also increase the effectiveness of hygiene in the oral cavity because it can reach more places (Gunawan & Wuisan, 2016). Mouthwash can be made from herbal or traditional plants or from synthetic chemical drugs (Rahayu & Salikun, 2020). One of the synthetic chemical mouthwashes that can be used is chlorhexidine digluconate 0.2% because of its effectiveness as an antimicrobial that can reduce gingival inflammation (Balagopal & Arjunkumar, 2013). Some chemicals are not always safe to use in the long term, for example, chlorhexidine gluconate 0.2%, which will cause side effects, namely bacterial resistance, staining of the teeth, and the onset of discomfort (Dianastri et al., 2021). Therefore, other alternatives are needed to reduce side effects as little as possible. One alternative that can fulfill the requirements, namely antimicrobials, is herbal ingredients. One of them is an herbal medicinal plant, namely moringa leaves.

Moringa leaves have a several of important contents related to antibacterials, namely flavonoids, alkaloids, saponins, tannins, and phenols. Flavonoid compounds are polyvenol compounds that contain antioxidants that have high potential and can disrupt the integrity of cell membranes in bacteria, especially in bacteria that colonize the mouth. Meanwhile, the younger Moringa leaves have the highest phytochemical content (Nugraha, 2013). The most abundant content in moringa leaves is phenol. The phenol compound in fresh moringa leaf content is 3.4%, while in the extracted moringa leaf content there is a phenol content of 1.6% (Wibowo & Sugiyanto, 2022). Phenol compounds and fatty acids in moringa leaves are proven to inhibit the growth of Streptococcus mutans bacteria. Based on in-vitro tests, moringa leaf extract added to toothpaste and mouthwash can increase the effectiveness of the product in preventing bacteria (Jwa, 2019). The results of research conducted by Wibowo and Sugiyanto (2022) at Panti Werda Trisno Mukti Turen with a sample of 20 people given moringa leaf mouthwash with a concentration of 30% twice a day for 1 week found a decrease in the debris index from 2.08 to 1.44. This shows that gargling with moringa water decoction can improve dental and oral hygiene, along with a decrease in the debris index.

The results of an initial survey conducted on 2 TPQ Al-Barokah students showed the presence of accumulated debris and poor oral health conditions in several TPQ Al-Barokah students, as evidenced by the lack of students' ability to maintain oral health. The age range of 7–12 years old cannot maintain their oral health independently to the fullest, and in this age range, children are more cooperative. Therefore, this activity is one of the efforts to improve the level of dental and oral hygiene in students by using natural ingredients, namely moringa leaf water decoction, to avoid oral and dental diseases.

## METHOD

This research uses a quasi-experimental method in its research design. The definition of quasi-experiment. This design includes a control group that has limitations in controlling external variables that can influence the overall implementation of the experiment(Sugiyono, 2018). In this study, to determine the debris index before and after gargling with Moringa leaf decoction water at TPQ Al-Barokah Bojonggede in 2024. Respondents of this study were TPQ Al-Barokah Bojonggede students aged 7-12 years.

The sampling method used in this research was purposive sampling. Purposive sampling technique is a method where researchers select and take samples based on special considerations. Inclusion criteria: Registered as a student at TPQ Al-Barokah Bojonggede; Willing to be a respondent; Respondents were present during the pretest and posttest for 5 days.

This study uses primary data obtained from intraoral examination using dental examination instruments. and collecting data on target knowledge using a debris index examination sheet. The data used is primary data, which was collected directly from students at TPQ Al-Barokah Bojonggede. This data was collected by measuring dental hygiene directly to determine the debris index both before and after rinsing with moringa decoction water then recorded in debris index examination sheet. The data collection stages carried out by researchers are as follows:

1. Respondents were advised to brush their teeth first at home.
2. Before being given the treatment, respondents were measured the initial examination debris score. By using a disclosing solution that is dripped under the tongue and applied independently using the tongue and examined using a mouth glass. After that, the debris score was accumulated and divided by the number of index teeth examined.
3. Rinsing activities were carried out alternately for every 5 students after the initial debris score data was obtained. Moringa leaf decoction water that has been made is used for rinsing. Then the sample was invited to rinse with 20 ml of moringa solution for one minute. To prevent unwanted events from occurring, the sample was advised not to swallow the moringa water. After that, the researcher monitored the gargling process of the sample so that the results were optimal and the goal of minimizing debris by gargling with moringa leaf decoction could be achieved. Then waited for 5 minutes.
4. Next, the same treatment was carried out for the final examination after gargling with moringa decoction water.
5. Conduct treatments 1-4 for 5 days to see the comparison of debris index every day in TPQ Al-Barokah Bojonggede students.

**RESULT**

**Table 1.** Frequency distribution of Debris Index Before Gargling with Moringa

| No | Criteria | Debris Index | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Day-1 | | Day-2 | | Day-3 | | Day-4 | | Day-5 | |
| | | n | % | n | % | n | % | N | % | n | % |
| 1 | Good | 0 | 0% | 0 | 0% | 0 | 0% | 0 | 0% | 0 | 0% |
| 2 | Moderate | 26 | 87% | 26 | 87% | 26 | 87% | 25 | 83% | 29 | 97% |
| 3 | Bad | 4 | 13% | 4 | 13% | 4 | 13% | 5 | 17% | 1 | 3% |
| | **Total** | **30** | **100%** | **30** | **100%** | **30** | **100%** | **30** | **100%** | **30** | **100%** |

Based on table 1 data collection conducted before being given the treatment of gargling with moringa leaf decoction water from 30 samples examined before treatment on the first day, the results of the debris index with the most criteria were moderate criteria as many as 26 students (87%). The second day, the results of the debris index with the most criteria were moderate criteria as many as 26 students (87%). The third day, the results of the debris index with the most criteria were moderate criteria as many as 26 students (87%). The fourth day, the results of the debris index with the most criteria were moderate criteria as many as 25 students (83%). The fifth day, the results of the debris index with the most criteria were moderate criteria as many as 29 students (97%).

**Table 2.** Frequency distribution of Debris Index After Gargling with Moringa

| No | Criteria | Debris Index | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Day-1 | | Day-2 | | Day-3 | | Day-4 | | Day-5 | |
| | | n | % | n | % | n | % | N | % | n | % |
| 1 | Good | 3 | 10% | 2 | 7% | 1 | 3% | 1 | 3% | 1 | 3% |
| 2 | Moderate | 27 | 90% | 27 | 90% | 29 | 97% | 27 | 90% | 29 | 97% |
| 3 | Bad | 0 | 0% | 1 | 3% | 0 | 0% | 2 | 7% | 0 | 0% |
| | **Total** | **30** | **100%** | **30** | **100%** | **30** | **100%** | **30** | **100%** | **30** | **100%** |

Based on table 2 of 30 samples examined on the first day after rinsing with moringa water decoction, the results of the debris index with the most criteria were moderate criteria as many as 27 (90%) students. The second day the results of the debris index with the most criteria were moderate criteria as many as 27 (90%) students. The third day, the results of the debris index with the most criteria were moderate criteria as many as 29 (97%) students. The fourth day, the results of the debris index with the most criteria were moderate criteria as many as 27 (90%) students. The fifth day, the results of the debris index with the most criteria were moderate criteria as many as 29 (97%) students.

**Table 3.** Differences in Debris Index Before and After Gargling with Moringa

| Day | Debris Index Before | Debris Index After | Difference of Debris Index |
|---|---|---|---|
| **Day-1** | 1.52 | 1.13 | 0.39 |
| **Day-2** | 1.55 | 1.13 | 0.42 |
| **Day-3** | 1.57 | 1.11 | 0.46 |
| **Day-4** | 1.61 | 1.18 | 0.43 |
| **Day-5** | 1.55 | 1.09 | 0.46 |
| **Mean** | **1.56** | **1.13** | **0.43** |

Table 3 showed that before gargling with moringa water decoction, the average debris index on the first day was 1.52 with moderate criteria, while after gargling with moringa water decoction decreased to 1.13 with moderate criteria with a debris reduction rate of 0.39. Whereas on the second day the average debris index before gargling was 1.55 with moderate criteria, and after gargling with moringa water decoction decreased to 1.13 with moderate criteria with a decrease in debris of 0.42. Whereas on the third day the average debris index before gargling was 1.57 with moderate criteria, and after gargling with moringa leaf water decoction decreased to 1.11 with moderate criteria with a decrease in debris of 0.46.

On the fourth day, the average debris index before gargling was 1.61 with moderate criteria, and after gargling with moringa water decoction decreased to 1.18 with moderate criteria with a decrease in debris of 0.43. Whereas on the fifth day the average debris index before gargling was 1.55 with moderate criteria and after gargling with moringa leaf water decoction decreased to 1.09 with moderate criteria with a decrease in debris of 0.46. The average debris for 5 days before gargling was 1.56 and the average debris for 5 days after gargling with moringa water decoction was 1.128 with an average decrease in debris of 0.43.

## DISCUSSION

Research that has been conducted on May 6-10, 2024 regarding the Debris index before and after gargling with Moringa leaf decoction water at TPQ Al-Barokah Bojonggede in 2024. Based on the results of research on TPQ Al-Barokah students in 2024, data were obtained as many as 30 students became research samples. At the time of data collection, it was carried out for 5 consecutive days from May 6-10, 2024 at 16.00 WIB.

The debris index examination carried out on 30 TPQ Al-Barokah Bojonggede students for 5 days showed that the average debris index before rinsing was 1.56 with moderate criteria. The most debris index criteria during the examination were moderate criteria, this was caused by several factors. Before examining the debris index on each respondent, the researcher first asked about the status of brushing teeth, from the results of the identification of researchers, the average respondent had brushed their teeth. However, because the brushing activities carried out by the respondents were not carried out together at the Al-Barokah Mosque and were only carried out independently at their respective homes so that the oral hygiene status of each respondent could not be controlled, causing an unfavorable debris index score. And there are some respondents who have brushed their teeth from home but some of these respondents eat first before the debris index examination is carried out, this causes debris to accumulate. Another factor that caused the debris index on the fourth day to be greater than the other days, because on the fourth day it was a red date so many respondents did not brush their teeth because on that day some respondents who came to TPQ Al-Barokah had not taken an afternoon shower so they had not brushed their teeth before the debris index examination so that their oral hygiene was not good.

In the results of the debris index examination that has been carried out for 5 consecutive days after being given the treatment of gargling with Moringa leaf decoction water for 1 minute, it can be seen that there is a decrease in the debris index from 1.56 to 1.13, indicating a difference of 0.43 decrease in debris index which is not significant due to different techniques and strength of gargling for each student. However, despite the insignificant decrease, the effect of moringa leaves on this decrease is evidenced by the presence of flavonoids, alkaloids, saponins, tannins and phenols. Flavonoid compounds in moringa leaves are antibacterial compounds and phenol compounds and fatty acids in moringa leaves can inhibit bacterial growth (Balagopal & Arjunkumar, 2013).

The results of this study are in line with research conducted by Wibowo & Sugiyanto, (2022) with 20 respondents at Panti Werda Trisno Mukti Turen showing the average results that after gargling with moringa leaf water decoction the debris index number decreased from 2.08 to 1.44. There is a significant effect of moringa-based mouthwash due to the presence of antimicrobial content in moringa leaves, namely phenol content, flavonoids and tannins.

This study agrees with the results of research conducted by Duarte et al., (2022) with the criteria of respondents suffering from gingivitis as many as 20 people participated in this study, namely with the criteria of people aged 23 years, showing the average results that after using products with moringa leaf extract the plaque rate decreased from 25.92% to 19.14%. The decrease in plaque numbers that occurs is due to the presence of flavonoid content which acts as an antibacterial compound against several pathogenic bacteria in the mouth besides flavonoids also act as antibiofilm compounds.

The above research is also in line with research conducted by Fajriani & Intania, (2019)with 30 respondents participating in Al Abrar Kindergarten Makassar showing the average results that after using mouthwash with Moringa leaf extract the plaque rate decreased from 2.514 to 1.829. This can occur due to the content of flavonoids, acetic acid and phenols which act as antimicrobial and antioxidant compounds. In its function as an antibacterial, phenol compounds interact with bacterial cells through an absorption process involving hydrogen bonds. This disrupts cytoplasmic membrane functions, including stopping active transport and proton forces (Sitorus et al., 2020).

## CONCLUSION

Based on the results of the research that has been done, it can be concluded that there is the moringa water reduce are effective to decrease debris index scores for children ages 7-12 years old.

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