# CHAPTER 1

# INTRODUCTION

## A. Background Research

Dental and oral health needs to be considered because the mouth is a gateway to germs and bacteria that can interfere with the health of other organs. Dental and oral diseases are the diseases that affect of many people of Indonesia. The lack of knowledge and information about oral and dental health are causes public awareness of maintaining oral and dental health to be relatively low. Indonesian people, such as dental caries and mouth ulcer, often experience several dental and oral diseases.[1]

Dental caries is the most common disease in the oral cavity, which is a significant problem in dental and oral health. Dental caries is a pathological process in progressive tooth decay caused by a combination of dietary factors, hosts, microorganisms, and the other affect. Diet is carbohydrate intake. The host is in the form of quantity and quality of saliva and quality of teeth. Microorganisms on mouth are acidogenic bacteria colonized on the surface of the teeth such as *Streptococcus mutans* and *Staphylococcus aureus* bacteria. Time is when the tooth is exposed to acids produced by bacteria from dental plaque.[2]

Prevention of caries can be done by modifying the causative factors of caries. Modifying microorganism factors can be choose as preventive treatments such as mouthwashs. Antibacterials in oral cavity is currently used is mouthwashs by containing chlorhexidine. The advantages of mouthwashs by containing chlorhexidine is to

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[1] Ehigbai I. Oikeh et al., "Phytochemical, Antimicrobial, and Antioxidant Activities of Different Citrus Juice Concentrates," *Food Science & Nutrition* 4, no. 1 (January 2016): 105, https://doi.org/10.1002/fsn3.268.

[2] Anonim, *Farmakope Indonesia Edition V* (Jakarta: Ministry of Health of the Republic of Indonesia, 2014), 200.

perfect mechanical cleaning of oral cavity and prevent the occurrence of gingivitis. However, long-term use of chlorhexidine can cause side effects like staining on teeth.[3]

In addition to dental caries, the other dental and oral chequer is mouth ulcer. Mouth ulcer is an infection caused by excessive growth of the fungus *Candida albicans*. Mouth ulcer is known as aphthous stomatitis, a lesion or small wound that begin with a burning or stinging sensation in the oral mucosa, such as in the cheeks, tongue, lips, gums, and palate.[4] The disease is generally treated with a synthetic drug, albothyl. Using of albothyl in humans has a tendency to hypersensitivity or allergies, relatively high prices, and side effects that can be caused make people look for an alternative, safer, but still effective treatments. The use of herbal ingredients for making mouthwash has been proven safe and effective to use as a remedy for gingivitis, halitosis, mouth ulcer, and to preventing tooth decay.

Traditional plants are natural ingredients that have been used for generations to help overcome health problems. The development of traditional herbal medicines attracts attention because they contain many elements that are beneficial to the human body and are considered safer than chemical drugs. Secondary metabolites shared by traditional plants, such as alkaloids, tannins, and flavonoids, show potential antimicrobial activity. In previous study, state the honey, mint leaves, lemon, brine, and ginger have antimicrobial activity in vivo against the bacteria Pseudomonas aueroginosa, *Staphylococcus aureus*, and *Streptococcus pyogenes*.[5]

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[3] Nagappan Nagappan et al., "Antimicrobial Efficacy of Herbal and Chlorhexidine Mouthrinse against Staphylococcus Aureus - An in Vitro Microbiological Study," *Journal of Pharmacy And Bioallied Sciences* 14, no. 5 (2022): 318, https://doi.org/10.4103/jpbs.jpbs_821_21.

[4] Mohammad A. Javaid et al., "Saliva as a Diagnostic Tool for Oral and Systemic Diseases," *Journal of Oral Biology and Craniofacial Research* 6, no. 1 (January 2016): 151, https://doi.org/10.1016/j.jobcr.2015.08.006.

[5] Maneesha, Vijayanand Alphy, and Thomas Maria, "Comparison of the Effect of Traditional Methods and Synthetic Medicines Against Three Selected Species of Bacteria Causing Throat Infection," *Research Lines* 12, no. 1 & 2 (December 2019): 42.

One example of a plant that has antibacterial abilities is mint leaves (*Mentha piperita*). Mint leaves can be used as an ingredient in food processing to give food a distinctive and fresh aroma. Mint leaves contain by 12% essential oil, 80-90% menthol, menthone, dispersion, hexanol phenylacetate, ethylamylcarbinol, and neomenthol. The content of mint leaves is 12% of essential oils can be suppressed the growth of bacteria and menthol, which can be used as a fresh aroma in manufacturing natural mouthwashes.[6] One of the ways to use it as a medicine is to boil it. Dakota or decoction is the extraction process of Simplicia or fresh plants using water solvents at a heating temperature of 90-100 °C while stirring. This method is widely used because the tools are simple and the operational costs are relatively low.[7]

Mint leaf extract has antioxidant abilities and, in vitro, can inhibit pathogenic bacteria (*Escherichia coli and Salmonella sp*.) and non-pathogenic BAL (Lactic Acid Bacteria).[8] Meanwhile, the gargling using decoction of mint leaves for bacteria in dental caries and *Candida albicans* in mouth ulcer has never been. Therefore, this research needs to be carried out the project.

## B. Research Problems

The formulation of the problem in this study is as follows:

1. How does gargling using a decoction of mint leaves affect bacteria on dental caries and *Candida albicans* on mouth ulcer?
2. Wich concentration of decoction of mint leaves used for gargling, which has an optimal effect on bacteria in dental caries and *Candida albicans* in mouth ulcer?

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[6] Riski Farma Testiningsih, "Antioxidant Activity of Avocado Leaf Tea With Variations In The Addition Of Mint Leaves And Stevia Leaves," *University of Muhammadiyah Surakarta*, 2015.

[7] Rudolf Voigt, *Pharmaceutical Technology Textbooks* (Yogyakarta: University of Gajah Mada Press, 1995), 224.

[8] Aris Karma Andhika, Irfan H Djunaidi, and Eko Widodo, "Active Compounds of Leaf Mint (Mentha Piperita) Extract and In Vitro Antibacterial Inhibitory Effect," *International Research Journal of Advanced Engineering and Science* 5, no. 1 (2020): 113.

## C. Research Objectives

The objectives of this study are::

1. It was knowing the effect of gargling using decoction of mint leaves on bacteria in dental caries and *Candida albicans* on mouth ulcer.
2. Knowing the concentration of mint leaves decoction used for gargle has an optimal effect on bacteria in dental caries and *Candida albicans* in mouth ulcer.

## D. Research Benefits

1. Theoretical Benefits

   The results of this study can be used to add science and as a reference material for further research, especially about mint leaves as an antibacterial in dental caries and mouth ulcer.

2. Practical Benefits

   The results of this study can add a information abouth mouth ulcer and dental caries, to use herbal plants, namely mint leaves, as a treatment with low side effects.

## E. Authenticity Research

Several researchers have researched the use of mint leaves as an antibacterial, as shown in table 1, regarding the authenticity of this study.

**Table 1 Authenticity Research**

| Research Title | Research Methods | Variable | Result | Difference Research |
|---|---|---|---|---|
| *Active Compounds of Leaf Mint (Mentha piperita) Extract and In vitro Antibacterial* | Experimental | Dependent: antibacterial activity in vitro | The study's results on the content of flavonoids, phenols, and antioxidants of mint leaf water extract were 3.5%, | Dependent: bacteria in dental caries and *Candida albicans* in mouth ulcer |

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| *Inhibitory Effect.*[9] | | Independent: mint leaf extract. | 6.0%, and 56%. The inhibitory power of mint leaf extract showed a noticeable effect (P<0.01) on BAL, *Salmonella sp*, and *Escherichia coli*. | Independent: rebusan daun mint |
| *Antibacterial and antioxidant activities of Mentha piperita L.*[10] | Experimental | Dependent: antibacterial and antioxidant activity<br><br>Independent: essential oil and extract of *Mentha piperita* | These results showed the antibacterial activity of the high concentration of *Mentha piperita* essential oil inhibited the growth of microorganisms. The results were compared with the antibiotic gentamicin commonly used in therapy and showed less intense inhibition for Gram-negative and noticeable inhibition for Gram-positive bacteria. | Dependent: bacteria in dental caries and *Candida albicans* in mouth ulcer<br><br>Independent: decoction of mint leaves |

[9] Andhika, Djunaidi, and Widodo, 112–14.

[10] Rajinder Singh, Muftah A.M. Shushni, and Asma Belkheir, "Antibacterial and Antioxidant Activities of Mentha Piperita L.," *Arabian Journal of Chemistry* 8, no. 3 (May 2015): 322–28, https://doi.org/10.1016/j.arabjc.2011.01.019.

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|---|---|---|---|---|
| *Antibacterial activity of peppermint (Mentha piperita) extracts against some emerging multi-drug resistant human bacterial pathogens.*[11] | Experimental | Dependent: Antibacterial effect<br><br>Independent: mint leaves extract | The inhibitory activity of mint leaf extract using ethyl acetate against all Gram-negative pathogens is higher than chloroform (10–80 mg/mL), methanol (10–> 80 mg/mL), and ethanol (40–> 80 mg/mL). The lowest MIC values were seen in *Streptococcus pyogenes* (1.25 mg/mL for mint leaf extract using ethyl acetate), followed by methicillin-resistant *Staphylococcus epidermidis* (MRSE) and *Enterococcus faecalis* (2.5 mg/mL for mint leaf extract using ethyl acetate). The KBM value of all quotes is higher than the corresponding MIC value for most pathogens. | Dependent: bacteria in dental caries and *Candida albicans* in mouth ulcer<br><br>Independent: decoction of mint leaves |

[11] Mohammed Helmy Faris Shalayel et al., "Antibacterial Activity of Peppermint ( *Mentha Piperita* ) Extracts against Some Emerging Multi-Drug Resistant Human Bacterial Pathogens," *Journal of Herbal Medicine* 7 (March 2017): 27–30, https://doi.org/10.1016/j.hermed.2016.08.003.