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Cinnamon Extract Potential as Disinfectant Materials on Dental Equipment

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Abstract:-

- ***Background:***

Infectious diseases are still the main cause of high morbidity and mortality in the world. The instrument must be kept sterile to reduce infection. Dental Nursing Department students in conducting field work practice in dealing with many patients with a very short change of time between patients. The number of patients is not proportional to the number of tools available, so the disinfection process on the equipment must be carried out. Common disinfection material used is alcohol 70%. Equipment that is usually disinfected with alcohol can cause corrosion in metal equipment; this is because of the chemical content in alcohol. Natural alternative ingredients that have the same ethanol content as alcohol is cinnamon.

- ***Objective:***

Objective: to analyse the effectiveness of cinnamon extract as a disinfectant in dental equipment.

- ***Method:***

This research using a quasi-experimental design, this research design is a post-test with control group. Samples were divided into three groups, namely the smear group with 70% alcohol, the 5% cinnamon extract group, and the non-smear group. Then the number of bacterial colonies was calculated.

- ***Result:***

Based on the research results obtained, disinfectant using cinnamon 5% had the lowest average number of bacterial colonies of 7.1CFU / cm2. This was because cinnamon was more concentrated, so ethanol was stickier for a long time compared to alcohol which quickly evaporated. Cinnamon had ethanol; ethanol and water are soluble content. Solubility of protein in water decreased, little by little the protein underwent denaturation, due to protein denaturationin bacteria could not work, then there was destruction of bacterial cells.

- ***Conclusion:***

Cinnamon has proven to be useful as a natural disinfectant, so it can be used as a reference as a safe alternative disinfectant.

Keywords:- *Cinnamon Extract, Alcohol 70%, Disinfectant.*

I. INTRODUCTION

Infection is a very real danger in the practice of dental services. Infections in dental health services are transmitted from one person to another through infections causing direct contact with microorganisms at the source of infection, for example the patient's mouth and indirectly with the surface of inanimate objects, such as instruments, tools and contaminated surfaces.[1]Dental equipment is used as a device to complete dental care by dental health personnel. Sterilization in dentistry is often used equipment's disinfection, because dental equipment is in direct contact with patients. [2]

Dental Nursing Department students in conducting field work practice, in dealing with patients with changing time between patients with the next patient is very short. The number of patients is not proportional to the number of equipment available, so the process of sterilization and disinfection of the equipment must be carried out. Ideally, the equipment used must be sterile, but during the implementation in the field the situation is certainly different. The usual disinfecting material used is 70% alcohol with the chemical name Ethyl Alcohol or ethanol[3].

The usual material commonly used is by using 70% alcohol concentration applied in a cotton swab soaked in alcohol to medical devices.[4]Alcohol work by denaturing proteins by dehydration and dissolving fat so that the cell membrane is damaged and the enzymes will be activated by alcohol.[5]Equipment that is commonly disinfected with alcohol can cause corrosion in metal equipment, this is because of the chemical content in alcohol. Therefore, it is necessary to make an alternative natural substitute which is safer and does not cause corrosion.[5]Cinnamon has a high phenol content. Antimicrobial compounds owned by cinnamon include polyphenols, tannins, flavonoids, phenols, cinnamaldehydes, and eugenols.[6] 1:10The active composition of cinnamon bark can be obtained by extraction. The use of infeudation and decoction is a simple method of extraction with a water solvent, the ratio of the weight of material to water is 1:10.[7]The production of antimicrobial compounds in cinnamon can kill or inhibit bacterial development.[8]Based on the description above, it is necessary to do research on the effectiveness of cinnamon extract as an infectious material for dental equipment.

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II. RESEARCH METHOD

This type of research uses a quasi-experimental design.[9]. The population in this study is a dental equipment that has been used in the dental care clinic of the Dental Nursing Department (Jurusankeperawatan Gigi). Determination of the sample in this study using a purposive sampling technique, that the equipment used is a mouth mirror that has been used in the care service clinic. The population used is a dental equipment in the Dental Care Clinic of the Dental Nursing Department of the Ministry of Health Semarang (PoltekkesKemenkes Semarang). The sample used was 30 glasses of mouth mirrors with 10 mirror each treatment. The research began by collecting cinnamon powder. Powdered cinnamon is soaked with 70% ethanol. The ethanol extract of cinnamon was concentrated using a rotary evaporator so that a thick extract was obtained. Cinnamon extract needed for disinfectant of 5% concentration. The next step after the cinnamon extract becomes liquid is to prepare 30 pieces of mouth mirrors, which have been used for examination and then washed with soap. The mouth mirrors was divided into 3 groups consisting of a smear group with 5% cinnamon disinfectant, 70% rubbing alcohol disinfectant, and without smearing. Intake of bacteria with a tool swab. The results of the swab are counted for germs.

The data obtained were then analysed. Data were tested for normality with Saphiro-Wilk and homogeneity test with Levene's Test. If the distribution of data between groups is normal and the variation of data is homogeneous, then one-way anova parametric test is performed because it compares three groups of unpaired samples.

III. RESEARCH RESULT AND DISCUSSION

Based on the research that has been done, it wa found that the average number of bacterial colonies on the mouth mirrors by applying cinnamon extract, alcohol, without topical as follows:

Treatment	Bacterial Colony
	Mean ± SD
Cinnamon extract 5%	7,1 ± 8,07
Alcohol 70 %	11,04 ± 11,3
Without application	15,0 ± 13,27

Table1 Mean Disinfectant Bacteria Counting Test Results

From table 1 above it was known that the average number of bacterial colonies in the disinfectant group was 7,1 ± 8,07, lower than 70% alcohol and no application.

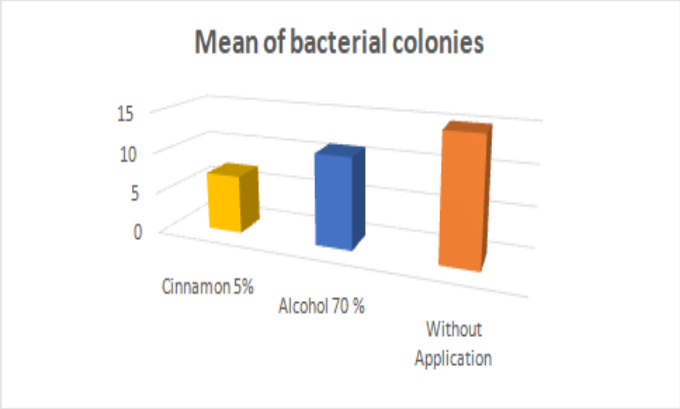

Fig 1:- Mean of bacterial colonies

From the graph above, it can be seen that the lowest number of bacterial colonies in cinnamon disinfectants is 5%. To prove the effectiveness of cinnamon extract disinfectant on the number of bacterial colonies, statistical tests were performed. The normality test results are as follows:

Group		Sig	note
Test of normality	Cinnamon extract 5%	0,076	Data distributed normally
	Alcohol 70 %	0,10	Data distributed normally
	Without application	0,20	Data distributed normally
Test of Homogeneity	Cinnamon extract 5%	0,514	Data homogeny
	Alcohol 70 %		
	Without application		

Table 2:- Normality test results for the number of bacterial colonies of cinnamon extract, alcohol, and without application

Based on the results of normality tests in the group of cinnamon extract 5%, 70% alcohol, and without application, a normal data distribution was obtained (p> 0,05). Homogeneity test result indicated that the data in the three groups were homogeneous (p> 0,05), thus the one-wayanova test requirements could be met (normally distributed data), anova test results are as follows:

Group	Mean ± SD	*p-value*	*Note*
Cinnamon extract 5%	7,1 ± 8,07	0,298	No significance
Alcohol 70%	11,04 ± 11,3		
Without application	15,0 ± 13,27		

Table1:- Anova test ressult

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Based on the table above, it can be seen that the analysis of the One Way Anova test results obtained a p value of 0,298 which indicated no significant difference between the treatment groups given disinfectants with cinnamon, alcohol, and without application.

Based on the results of the study in Figure 1, the use of disinfectant using cinnamon as an intervention group, had the least number of bacterial colonies compared to alcohol control and without application. Disinfectant using cinnamon extract 5% concentration were found to have the smallest average number of bacteria, because cinnamon contains ethanol which can function as a disinfectant because it can kill or inhibit bacterial development. (Novita, 2013). The content is mechanized and reacts with bacterial colonies in the mouth, and there is inhibition of bacterial colonies that cause a decrease in the number of bacterial colonies after chemical sterilization using cinnamon.

Ethanol in cinnamon functions as a disinfectant by dissolving lipids in the cell membrane of microorganisms and also denaturing the proteins owned by these microorganisms (Pratiwi, 2008). Ethyl alcohol (ethanol) kills bacteria in 2 ways, by denaturing proteins and dissolving fat membranes. Protein is a constituent of bacterial cells. Protein plays an important role in cells. When likened, proteins are the engine of cells. Protein in these bacterial cells will work well if it dissolves in water.When there is ethanol in the bacterial cell environment, protein solubility will decrease because ethanol can dissolve in water by any comparison. The force between ethanol molecules and water molecules will experience a strong interaction.This interaction tends to be stronger than the force between ethanol molecules themselves. The strong interaction between ethanol and water is caused by the -OH cluster contained in it. These -OH cluster cause ethanol to be hydrophilic (like water). Although in the ethanol molecule itself there is a hydrocarbon chain (CH3CH2-) which also causes interactions between the ethanol molecules themselves, but the interaction is not so strong between water and ethanol.Finally, ethanol and water can dissolve completely. With the presence of ethanol, the solubility of protein in water decreases. Little by little the protein is denatured. As a result of denaturation, the protein in bacterial cells cannot work. As a result, important processes in the bacterial cell are inhibited (Effendi, 2008).Apart from denaturation of proteins, destruction of bacterial cells also through dissolving lipid membranes (fats). Bacterial cells are surrounded by lipid membranes. This membrane protects bacterial cells from the outside environment. When there is ethanol, the lipid membrane begins to be affected due to the presence of a hydrophobic group (doesn't like water) in ethanol. The hydrophobic cluster on ethanol is found in the hydrocarbon chain (CH3CH2 -), the hydrophobic cluster and the lipid membrane begin to coalesce, however, as a result the guarding power of the lipid membrane begins to weaken and the work of the bacterial cell starts to be inhibited.

IV. CONCLUSION

Cinnamon proved to be useful as a natural disinfectant. Based on the results of a descriptive study, there are a number of bacterial colonies in 3 different groups, the number of bacterial colonies treated with cinnamon has an average number of bacterial colonies of 7,1 CFU/cm2, this result is smaller than 70% alcohol application (11,04 CFU/cm2) and without application (15,0 CFU/cm2)

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