RESEARCH ARTICLE

THE IMPROVEMENT OF SALIVA FLOW RATE BY GARGLING GREEN TEA STEPPING IN MENOPAUSE WOMEN WITH XEROSTOMIA

Kiki Erika Tampubolon[1], Wilda Hafny Lubis[1] and Awaluddin Saragih[2]

1. Oral Medicine Departement, Faculty of Dentistry, University of Sumatera Utara, Jl. Alumni No. 2 Kampus USU Medan, 061-821611 Ext 37.
2. Pharmaceutical Departement, Faculty of Pharmacy, University of Sumatera Utara, Jl. Alumni No. 2 Kampus USU Medan, 061-821611 Ext 37.

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Manuscript Info

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Abstract

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Endocrine and biological changes occur in postmenopausal women, the production of steroid sex hormones that affect the health of the oral cavity, with the reduction of all or part of estrogen resulting in xerostomia (dry mouth). The treatment of Xerostomia was carried out using local, mechanical and chemical stimulation. The purpose of this study was to determine the effect of gargling of green tea steeping on salivary flow rates in postmenopausal women with xerostomia at Darussalam Public Health Center in Medan.This is an experimental study using the design of control group, pretest-posttest and the non-probability of purposive sampling. Fourty menopausal women with xerostomia were used as sample. The treatment group gargled with green tea steeping while the control group gargled with distilled water. Saliva was collected into the pots for three minutes before and after treatment by spitting method. The analytical test used was the paired T-test and the unpaired.The results showed that there was an increase in salivary flow rate with green tea brushing rinse by 0.281750 ml/min and with aquades rinsing by 0.03335 ml/min. Furthermore, there was an effect of gargling with green tea steeping, namely an increase in the flow rate of saliva and this research can be an alternative treatment to relieve xerostomia in menopausal women.The green tea gargling was better in stimulating salivary flow rate.

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Introduction:-

Saliva has important effects and have a role to play in maintaining a healthy environment in the oral cavity (1). Some characteristics of saliva are protective agent against bacteria and fungi, the transportation of nutrients, digestive enzymes in the system, oral cavity lubrication, remineralization of teeth, as well as helping in chewing, swallowing and speaking (2). Reduction of salivary flow by 40%-50% makes patients symptomatic and experience xerostomia.

Xerostomia is a sign or symptom of dry mouth however it is not related to salivary gland hypofunction (2, 4). Generally, 14%-46% of the population suffers from xerostomia and there are general complaints among the elders. It also has a strong correlation with menopause (1). During menopause, women experience biological and endocrine

Corresponding Author:-Wilda Hafny Lubis
Address:- Oral Medicine Departement, Faculty of Dentistry, University of Sumatera Utara, Jl. Alumni No. 2 Kampus USU Medan, 061-821611 Ext 37.

changes, especially in the production of steroid sex hormones that affect health. There is a reduction of all or part of the estrogen resulting in hyposalivation and xerostomia.(3,5)

The research performed by Santosh et al (2013) in 365 postmenopausal women and 365 men showed that the prevalence of xerostomia was 27.1% in women and 5.2% in men (6). In addition, the prevalence of xerostomia in postmenopausal women by Mojabi KB et al. (2006) was 50.7% (7). Further more, the research carried out by Raudah et al in 86 menopausal women showed that 45.3% had xerostomia (8).

Oral manifestations due to xerostomia are classified into three, namely; the mild, without complaints or severe consequences, have a significant impact on oral health and quality of life of the patient (2,8). In addition, Azambuja et al in 2012 stated that in 71 patients suffering from xerostomia, 42.3% had difficulty in chewing and swallowing food and 67.6% reported an increase in fluid intake (9).

Xerostomia is characterized by hyposalivation of the oral cavity, in which the total flow rate of saliva with stimulation is ≤0.7 ml/min and the total non-stimulation is ≤0.2 ml/min (2). In addition, the mechanism of saliva secretion is the reflex activity of the oral cavity. The stimulation can be a mechanical stimulus by gargling, and kimiawi will be carried out by testing (10).

Some stimulus mechanisms are alternatives for stimulating the flow rate of saliva. In addition, Mohammed et al (2013) examined the effect of chewing gum on hemodialysis patients with xerostomia. The results of this study showed that it can relieve thirst, xerostomia and increase salivary flow rate (11). Rossi et al (2014) stated that natural tea formulations containing catechins improve salivary function in xerostomia patients by increasing the flow rates (12). Furthermore, Hervina (2014) studies stated that green tea extract of 3% was effective in increasing salivary secretion in men between the age of 18-23 years (13).

The use of natural ingredients like active mouthwash has been widely developed. It is easy to prepare because the raw material is easy to find. One of the herbs with various benefits is tea, and there are three different types based on the processing, namely black, oolong and green tea (14). Polyphenol compounds or catechins contain in most green tea because they are not fermented, and it is a chemical content with many health benefits (14,15). Green tea is an herbal product from a plant with the Latin name Camellia sinensis (L.) O.K. In addition, Theaceae has the ability to increase salivary secretion and increase the pH. The catechin content in tea causes sepate to stimulate the central nervous system resulting in an increase in salivary secretion (13, 14). Green tea also have an antibacterial and anticariogenic effect which reduces the acidity of saliva and plaque therefore, it is effective in preventing caries. Furthermore, green tea is relatively inexpensive, widely circulated in Indonesia, easily found and served.

From the description above, it can be concluded that research is needed to be carried out in order to know the effect of gargling with green tea stepping on the rate of salivary flow in postmenopausal women with xerostomia.

Method and Material:-
This is an experimental research using a pretest-posttest control group design and was approved in 2017 by the Health Research Ethics Commission License number 205. The sample consists of menopausal female visitors of Medan Darussalam Health Center that meet the criteria. The sampling was carried out by purposive technique on 40 people in 2 groups randomly namely 20 research subjects or treatment groups gargling with green tea stepping and a control group gargling with distilled water. The Criteria for the sample were menopausal women of age 45-65 years, salivary flow rate of less than 0.2 ml/min, normal BMI (18.5-25), which is not undergoing radiotherapy or chemotherapy, or have systemic diseases such as DM controlled, kidney failure and willing to follow research.

The tools used in the study are digital scale to determine 3 g of green tea, cups, spoons, tea filters, scales and height gauges, salivary pots, stopwatches, stationery, gloves and masks. The material used are dried green tea leaves, mineral water and distilled water (H2O). The preparation of brewed greentea was carried out using 3 grams of dried green tea leaves, which was placed in a glass with the addition of 20 ml of hot water, stirred and allowed to stand for 5 minutes, then filtered until the volume is 20 ml.

Following the agreement, the samples were asked to sign an informed consent. The study took place at 08.00-12.00 WIB. Respondents were asked to remain seated, therefore, patients are not worried as it affects the flow rate of saliva, while, the back position is straight and upside down, with the aim of facilitating the collection of saliva, and

this was carried out using the spitting method. Instructing the patient to hold the saliva for 3 minutes and spitting out every 60 seconds into the pot.16

In the Treatment group, the respondents were first asked to swallow the saliva in their oral cavity, then the salivary collection was carried out before stimulation. In the next step, the subjects were instructed to gargle green tea for 1 minute and then throw it away. Furthermore, respondents were instructed to swallow all saliva in the oral cavity, and the saliva sample were re-newed. In the control group, the first step subjects were asked to swallo the saliva in the oral cavity, and the collection of saliva was performed before stimulation. The next step was, the respondent was instructed to gargle with distilled water/H2O for 1 minute then throw it away. Subjects were instructed to swallow all saliva in their mouth cavity, and the collection of saliva was repeated. The salivary volume was collected, measured and recorded. Data analysis was carried out by the Univariate test, a paired and an independent T-test.

Result:-
Table 1 explains the distribution and frequency of respondents based on the age analyzed by the univariate test, which was obtained by 4 people in the age group of 45-49 (10%), 14 people in the age group of 50-53 (35%), 10 people in the age group of 55-59 (25%), and 12 people of over 60 years old (30%).

Table 1:-The distribution and frequency based on the age of menopausal women with xerostomia in Darussalam Medan Health Center.

Age (year)	Number (n)	Percentage (%)
45-49	4	10%
50-54	14	35%
55-59	10	25%
≥60	12	30%
Total	40 people	100%

Table 2 explains the distribution of subjects based on the menopause period, obtained 11 people with menopause period 1-3 years (27.5%), 13 people with 4-6 years (32.5%), 4 people with 7-9 years (10%), and 12 people with ≥10 years (30%).

Table 2:- The Distribution and frequency of subjects based on menopause period in women with xerostomia in Darussalam Health Center, Medan

Menopause Period (Year)	Number (n)	Percentage (%)
1-3	11	27.5%
4-6	13	32.5%
7-9	4	10%
≥10	12	30%
Total	40 people	100%

The measurements result of the average salivary flow rate before was 0.14825 ml/min and the average after gargling aquades was 0.18160 ml/min as explained on table 3 below.

Table 3:- Average salivary flow rates before and after gargling with distilled water in postmenopausal women with xerostomia in Darussalam Health Center Medan.

Control Group	Number (n)	The average of salivary flow rate ± SD (ml/min)
Before gargling with aquades	20	0,14825 ± 0,036708
After gargling with aquades		0,18160 ± 0,043117

The measurement results of the average salivary flow rate before was 0.14605 ml/min and the average after gargling with green tea steeping was 0.42780 ml/min as explained.

Table 4:- The average salivary flow rates before and after gargling with green tea steeping in postmenopausal women with xerostomia in Darussalam Health Center, Medan

Treatment Group	Number (n)	The average of salivary flow rate ± SD (ml/min)
Before gargling with green tea stepping	20	0,14605 ± 0,042504

gargling with green tea stepping	0,42780 ± 0,125555

The paired T-test results showed that there was a significant difference in the control group between the salivary flow rate before and after gargling with distilled water with a value of p = 0,000 (p <0.05), and there was an increase in salivary flow rate of about 0.03335 ml/min, and there was also a significant difference in the treatment group between the salivary flow rate before and after gargling of green tea steeping with a value of p = 0,000 (p <0.05), and there was an increase of about 0.28175 ml/min as explained.

Table 5:- Analysis of the results of the measurements of salivary flow rates before and after gargling with green tea steeping and distilled water using the paired T-test.

Group	TheAverage Difference	P Value
Before gargling with aquades	0,03335	0,000
After gargling		
with aquades	0,28175	0,000
Before gargling with green tea stepping		

The results of the independent T-test showed that there was a significant difference in the average salivary flow rate between the treatment group and the control group with a p value of 0,000.

Table 6:- Analysis of results of the measurements of the average difference in salivary flow rates in the treatment and control groups using independent T-tests.

Group	n	The Average Difference ± SD(ml/min)	Group differences	P value
Gargling with aquades	20	0,033350 ± 0,0215144	0,24840	0,000
Gargle with green tea steeping	20	0,281750 ± 0,0961993		

Discussion:-

In this study, menopausal women that experienced xerostomia were most prevalent in the age group of 50-54 years by 35%. The theory states that the age of menopause varies among individuals, around 45-55 years due to many factors, such as; age, the first menstruation circle, heredity, smoking habits, and general health conditions (8). The results of the study by Mojabi et al in 2007 showed that menopausal women between the age of 50-70 years had 50% xerostomia (7).

In this study, respondents with menopause between 4-6 years experienced the most xerostomia by 32.5%. The theory states that the symptoms of xerostomia peaked in the first 1-2 years after menopause, this is due to a high increase in FSH level in response to the failure of ovarian function resulting in the decrease of estrogen production (17). physiologically, decrease in the blood level of estrogen in menopausal women result to the changes of the condition of the oral cavity. Estrogen, a steroid hormone that has receptors in the salivary glands and oral mucosa, function biologically in the mouth and salivary glands. In conclusion, the presence of estrogen receptors in the salivary gland is very influential in the composition and rate of salivary flow, and there is a decrease in partial or total production of estrogen which causes a decrease in salivary flow (5, 8).

There are two research groups namely gargling with green tea steeping and distilled water. In the gargling group with distilled water, the average salivary flow rate before gargling was around 0.14825 ml/min and after gargling, it increased to 0.1816 ml/min. In addition, Gargle is a mechanical stimulus that stimulate salivary flow. The gargling movement will expand the touch surface between compressed receptors, which are spread in the oral cavity thereby increasing stimulation (13). The results are in accordance with previous studies performed by Pratiwi et al in 2011 which stated that an increase in salivary flow rate will increase after gargling with distilled water for 30 seconds (18).

In the gargling group with steeping green tea, the average salivary flow rate before rinsing was around 0.14605 ml/min and after was around 0.42780 ml/min. The results indicate an increase in the average salivary flow rate after gargling with green tea steeping, due to mechanical stimulation in the form of gargling and chemical stimulation (14). Mechanical stimulation occurs through receptors found in the mastication muscles, temporomandibular joint, and oral mucosa, which detect the muscle movement and transmit occurred impulses to the parasympathetic nervous system resulting in an increase in the flow rate of saliva. In addition, green tea can also stimulate salivary secretion

due to chemical stimulation of polyphenols, namely: the catechins that play a role in giving a bitter taste. This reaction affects the taste of perception received by chemoreceptors in the bud of the tongue to form nerve impulses increasing the flow rate of saliva (13, 14).

The analysis of the paired T-test showed that the measurement of salivary flow rate before and after gargling of aquades with an increase of about 0.03335 ml/min, while gargling of green tea steeping showed an increase of about 0.28175 ml/min. The data shows that there was a significant increase in salivary flow rate in each group. The results are consistent with the research performed by Hervina (2014), which states that an increase in the rate of salivary flow after gargling with green tea extract 3% for 1 minute, and the difference before and after gargling of green tea extract is around 0.92 ml/minute (13). There was differences in terms of age and sex, and the study uses male subjects between the age of 18-23 years with different mouth gargling period.

The analysis of the independent T-test showed that there was a difference in the average salivary flow rate between the control and the treatment group, which is equal to 0.24840 ml/min. The results of the study were in accordance with Hervina's statement in 2014 that the stimulation of gargling with green tea extract is better than gargling with distilled water in salivary flow rate, because it does contain active ingredients. The increase in flow rate occured due to mechanical stimulation of gargling movements in the oral cavity. Conversely, gargling treatment groups with steeping green tea containing active ingredients increases in salivary flow rate and this was caused by two types of stimulation namely: mechanical stimulation in the form of gargle and chemical in the form of bitter taste. Green tea, which creates better salivary reflexes when receptors in the oral cavity are chemo and compressive receptors and both respond to stimulation. The receptor produces impulses of afferent nerve fibers carrying information to the salivary nucleus in the medulla of the brain stem, and they send impulses through the extrinsic autonomic nerve to the salivary glands to increase secretion (19).

The result of this research showed that there was an effect of gargling green tea brewing (Camellia sinensis (L.) O.K) on the rate of salivary flow in postmenopausal women with xerostomia. In addition, drinking activities of green tea is mostly carried out by the community, therefore this research is expected to increase the utilization

Conclusion:-
There is an effect of gargling with green tea infusion on salivary flow rate in menopausal female with xerostomia visitors of Medan Darusalam Health, in the form of an increase in salivary flow rate after gargling with steeping green tea.

Conflicts of Interest:-
The authors declare that they have no conflicts of interest

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