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The Effect of Administering Vitamin C Lozenges Towards the Increasing of Saliva Secretion of Hemodialysis Patient

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Abstract. Hemodialysis is a dialysis method to secrete bodily fluid when the kidneys are progressively or acutely unable to do it. This research aims to know the effect of administering vitamin C lozenges on the increasing saliva secretion of hemodialysis patients. The research used an experimental design with one group pre-test and post-test design. The T-test result was mostly dependent (paired sample test). A purposive sampling technique was used to acquire 30 hemodialysis patients. The result shows that 26 patients (86.7%) have an increase in saliva secretion while four patients (13.3%) have not. The p-value was 0.000 ($p<0.05$). It can be concluded that administering vitamin C lozenges to hemodialysis patients increases saliva secretion. This research suggests that Royal Prima Medan Public Hospital administer vitamin C lozenges as an alternative medicine to increase the saliva secretion of hemodialysis patients.

Keywords: chronic kidney disease; hemodialysis; vitamin c

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1. Introduction

Renal failure is a progressive and irreversible renal function disease in which the kidney's functions deteriorate in maintaining metabolism, fluid and electrolyte balance, causing uremia. Commonly, gradually losing the kidney's functions ends with renal failure (Ariani, 2016). Progressively losing the kidney's function causes the worst case and complications (Dhondup & Qian, 2017). *Pan American Health Organization* (2021) recorded 15,6 deaths per 100.000 people, 254.028 deaths. The death case is higher in men, with 131,008, while in women, 123,020. Indonesia Ministry of Health (2018) recorded that 2 per 1000 people suffer from renal failure (0,2%). Of that amount, 0.3% are men, and 0.2% are women. People aged 75 years old have a high prevalence of 0.6%. Complications of chronic kidney disease include hypertension, cardiovascular complications, anaemia, metabolic acidosis and electrolyte disorders (Bikbov et al., 2020). If it is not properly handled, it will worsen the patient's condition, even causing death (Li et al., 2021).

Hemodialysis is a dialysis method to secrete fluid and waste from the body when the kidneys are progressively or acutely unable to do the task (Muttaqin, 2011). It is a chosen treatment for chronic kidney disease patients (Sahathevan et al., 2020). From 2014, 95% of patients underwent regular HD treatment, 4% underwent acute HD treatment, and 1% underwent extra HD treatment in Indonesia. In terms of dialyzer users, Central Java took first place with 73,385 patients, followed by West Jawa (50,599 patients) and North Sumatra (2,163 patients) (*Indonesia Renal Registry*., 2017). Patients who undergo HD treatment suffer from xerostomia or saliva reduction. Commonly, 70% of patients undergoing hemodialysis treatment suffer from xerostomia (Hanim, 2022). *Saliva* is a biological fluid secreted by salivary glands. They are the parotid gland, submandibular gland, and sublingual gland (Martina et al., 2020). Saliva reduction will cause discomfort and oral hygiene problem in patient's mouths. It will affect the patient's nutrition status (Roblegg et al., 2019). To produce saliva, one can chew gum, put 2% citric acid under the tongue, and consume vitamin C (Łysik et al., 2019).

Vitamin C is a white crystal easily soluble in water. In dry conditions, it is stable. In a soluble state, it is easily damaged because of oxidation, mainly when heat affects it. Oxidation can be expedited with copper and iron. Vitamin C does not stabilize in an alkali solution. It is stable in an acidic solution. The sour taste of vitamin C will increase saliva production in salivary glands (Evans, 2000). Vitamin C contributes to the immune system by supporting various cellular functions of the innate and adaptive immune system (Carr & Maggini, 2017). It increases saliva secretion because the sour receptor sends an impulse to the afferent nerve. That information is sent to the medulla of the brainstem. Then, the impulse will be sent via the autonomic nerve to increase saliva in the salivary glands (Greenberg MS, 2015). Utoyo's research (2016) stated that when sour stimulates the mouth, the receptors send an impulse to the afferent nerve. The impulse will be sent to the brainstem's medulla via an autonomous nerve which orders the salivary glands

to increase saliva production. The innervation of parasympathetic nerves holds an important role in stimulating saliva secretion. The salivary glands will secrete saliva in an extensive quantity with low organic content.

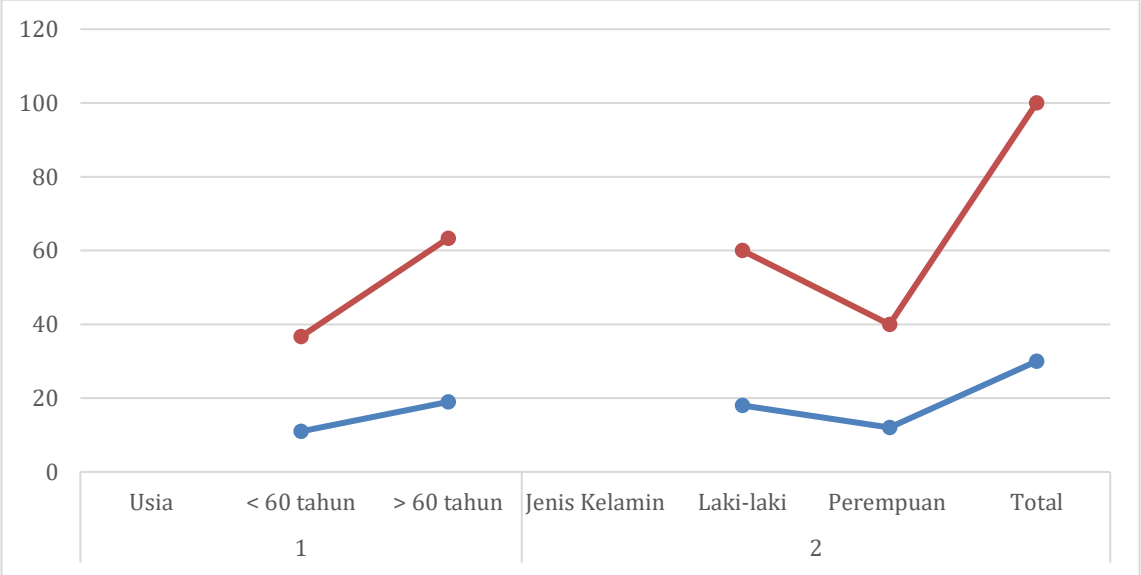
Based on the medical record data in the last three months in Royal Prima Medan Public Hospital, there are 167 chronic kidney disease patients. One hundred forty-four of them undergoes hemodialysis treatment. However, they did not receive the vitamin C administered. Based on that data, the researcher is keen to research the effect of administering vitamin C lozenges on the increasing saliva secretion of hemodialysis patients in Royal Prima Medan Public Hospital..

2. Research Methods

This research is quantitative research using a pre-experiment one-group pre-test post-test design. The population is all hemodialysis patients in Royal Prima Medan Public Hospital. Purposive sampling was used to acquire 30 respondents. The inclusion criteria are a) regular hemodialysis patients, b) patients who do not consume vitamin C during the research, and c) willing to be a respondent. Saliva was collected before and after administering vitamin C using a measuring cup to obtain the data. If the collected saliva is 288cc – 576cc/minute, the amount will not increase. If it is > 288cc – 576cc/minute, there is an increase in saliva amount. The vitamin C lozenge was administered three times every 10 minutes intervention. The intervention was conducted after the patient underwent hemodialysis treatment for six consecutive days. Then, the data were analyzed using univariate and bivariate analysis. The univariate analysis was used to see the distribution of variable frequency. In contrast, the bivariate analysis used a T-test (paired sample T-Test) to see the stimulating effect of administering vitamin C lozenge towards increasing saliva secretion of a hemodialysis patient.

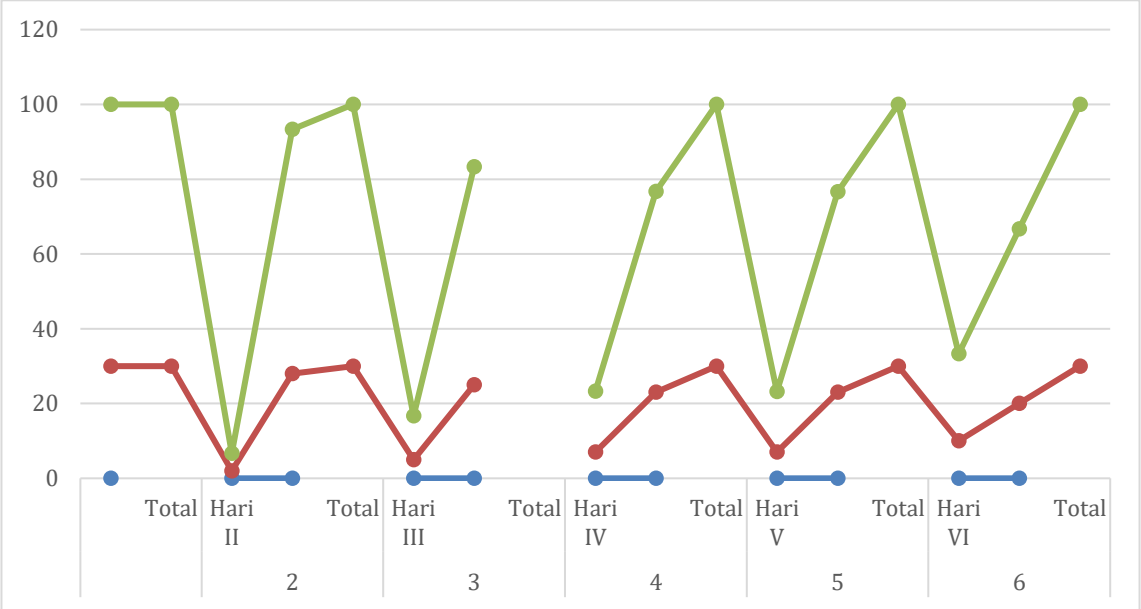
3. Research Results

Figure 1 Respondent's Characteristics



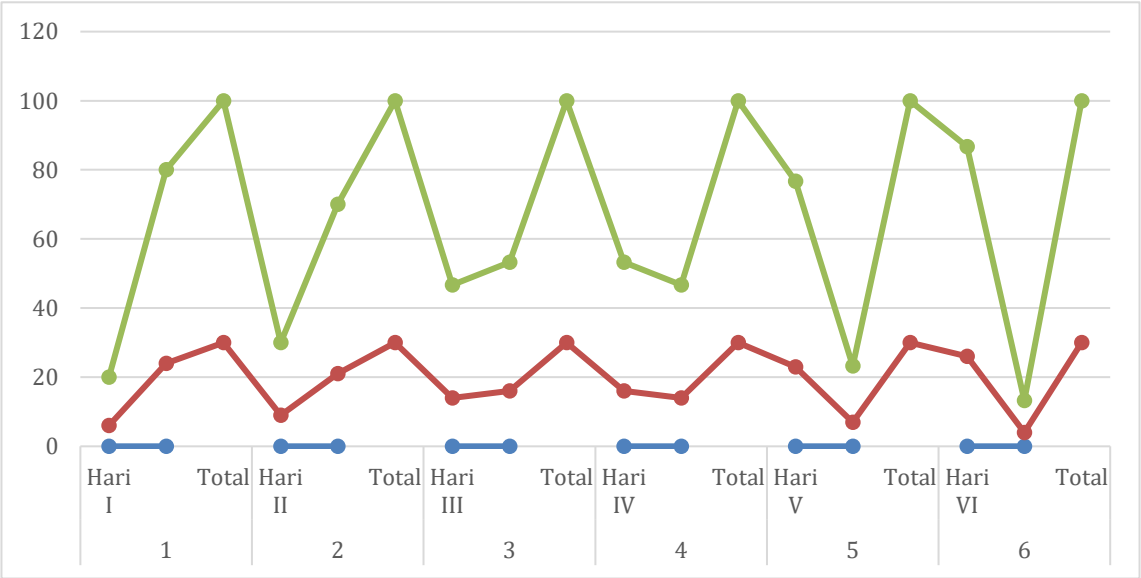
The above table showed 11 people (36.7%) aged < 60 years old and 19 people (63.3%) aged >60 years old. Eighteen people (60%) are male, and 12 (40%) are female

Figure 2 The Saliva Amount Before Administering Vitamin C Lozenge to Hemodialysis Patient



The above table shows no saliva increase on the first day before administering the vitamin C lozenge. On the second day, two respondents (6.7%) had an increase in saliva secretion, and 28 respondents (93.3%) had not. On the third day, five respondents (16.7%) had an increase in saliva secretion, and 25 respondents (83.3%) had not. On the fourth day, seven (23,3%) respondents %) had an increase in saliva secretion, and 23 (76,7%) respondents had not. On the fifth day, seven (23,3%) respondents had an increase in saliva secretion, and 23 (76,7%) had not. On the sixth day, 10 (33,3%) respondents had an increase in saliva secretion, and 20 (66,7%) had not.

Figure 3 The Saliva Amount After Administering Vitamin C Lozenge to Hemodialysis Patient



The above table shows that after administering vitamin C lozenges to the hemodialysis patients, six respondents (20,0%) had an increase in saliva secretion and 24 respondents (80,0%) had not on the first day. On the second day, nine respondents (30%) had an increase in saliva secretion, and 21 (70,0%) respondents had not. On the third day, 14 (46,7%) respondents had an increase in saliva secretion, and 16 (53,3%) had not. On the fourth day, 16 (53,3%) respondents had an increase in saliva secretion, and 14 (46,7%) had not. On the fifth day, 23 (76,7%) respondents had an increase in saliva secretion, and seven (23,3%) respondents had not. On the sixth day, 26 (86,7%) respondents had an increase in saliva secretion, and four (13,3%) respondents had not..

Table 1 The Effect of Administering Vitamin C Lozenges Towards the Increasing of Saliva Secretion of Hemodialysis Patient

	The Increasing of Saliva Secretion								
	Increasing		**Not Increasing**		**Total**		***Mean***	***Std. Deviation***	**Sig**
	n	**%**	**n**	**%**	**n**	**%**			
Pre test	-	-	30	100	30	100	2,00	0,346	0,000
Post test	26	86,7	4	13,3	30	100	0,867	0,346	

The above table shows that most 30 respondents who consumed vitamin C lozenges for six days in Royal Prima Medan Public Hospital had increased saliva secretion. From the first to the sixth day, 26 people (86.7%) had an increase in saliva secretion, while four people (13,3%) had not. Based on the T-test result, the p-value is 0.000 ($p<0.05$). It can be concluded that vitamin C lozenges affect the increase of saliva secretion in hemodialysis patients.

4. Research Discussion

a. The Saliva Secretion Before Administering Vitamin C Lozenge to Hemodialysis Patient

After conducting a six-day observation of the hemodialysis patients before they consumed the vitamin C Lozenge, there was no increase in saliva secretion on the first day. From the second to the sixth day, 20 respondents (66.7%) had no increase in saliva secretion, while ten respondents (33.3%) had. Most respondents suffered from xerostomia (dry mouth), and their saliva was less than 1 ml. It happened due to the diet limitation of fluid for the patient. Thus, administering vitamin C lozenge can increase saliva secretion. When saliva is unstimulated, it concentrates, so it stays longer in the mouth. In the swallowing process, the saliva coats the mucous membrane causing no friction during the swallowing process. Neuronal nerves control saliva secretion, such as autonomous parasympathetic and sympathetic nerves. Thus, the side effect of psychoactive substances can disrupt saliva secretion (Priyambodo, 2020).

b. The Saliva Secretion After Administering Vitamin C Lozenge to Hemodialysis Patient

After administering Vitamin C Lozenge to hemodialysis patients, there is a significant increase in saliva secretion starting from the first to the sixth day. On the first day, six respondents (20%)

had an increase in saliva secretion. From the second to the sixth day, 26 respondents (86.7%) had an increase in saliva secretion, and four respondents (13.3%) had not. According to Almatsier, Vitamin C is a white crystal easily soluble in water. In dry conditions, it is stable. In a soluble state, it is easily damaged because of oxidation, mainly when heat affects it. Oxidation can be expedited with copper and iron. Vitamin C does not stabilize in an alkali solution but is stable in an acidic solution. It is the most unstable vitamin. In Intan's research (Intan et al., 2017), she stated that administering vitamin C to hemodialysis patients would increase n amount of saliva secretion. Vitamin C is crucial in increasing the haemoglobin level in chronic kidney disease patients undergoing hemodialysis treatment (Andreyas & Putra, 2021). Girsang & Barus (2019)'s research stated that hemodialysis patients who consume vitamin C had an increase in saliva secretion.

c. The Effect of Vitamin C Lozenge Towards the Increasing of Saliva Secretion of Hemodialysis Patient

The result shows that before administering vitamin C to the 30 hemodialysis patients, most had not had an increase in saliva secretion. After administering vitamin C, 26 respondents (86.7%) had an increase in saliva secretion, and four (13.3%) had not. Based on the Paired Sample T-test, p-value = 0.000 (<0.05). It can be concluded that vitamin C lozenges affect the increasing saliva secretion of hemodialysis patients in Royal Prim Public Hospital Medan. The average increasing amount is 1.5-2.5 ml. The result aligns with Greenberg (2008)'s research. He stated that when the sour stimulates the mouth, the receptor sends an impulse to the afferent nerve. The impulse will be sent to the brainstem's medulla via an autonomous nerve, which orders the salivary glands to increase saliva secretion. Another research also supported the statement. In Utoyo's research(Utoyo et al., 2016), saliva secretion is incrementally different between intervention and control groups. The highest increase in saliva secretion happened in patients who consume vitamin C. Chronic kidney disease patients have a vitamin C deficiency due to a tight restriction diet of vegetables and fruits. The restriction was imposed to prevent hyperglycemia. The inflammation process causes a lack of intake due to uremia. The process also raises the in vivo catabolism of vitamin C (Isola et al., 2019)

5. Conclusions and Recommendations

Based on the result, it can be concluded that administering vitamin C lozenge to hemodialysis patients increases saliva secretion. That is, 26 respondents (86.7%) had an increase in saliva secretion. The statistical result shows that p-value = 0.000. It means that vitamin C lozenge increases saliva secretion in hemodialysis patients in Royal Prima Medan Public Hospital. This research suggests that medical workers in Royal Prima Medan Public Hospital administer vitamin C lozenge as an alternative for hemodialysis patients to increase their saliva secretion.

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