



**COMPARATIVE EFFECTIVENESS OF CHEWING XYLITOL GUM VERSUS
SUCKING ICE CUBES ON REDUCING THIRST IN CHRONIC KIDNEY DISEASE
PATIENTS UNDERGOING HEMODIALYSIS**

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ABSTRACT

Background. One of the treatments for chronic renal failure is hemodialysis therapy. The effects of hemodialysis will cause a sensation of thirst that needs to be controlled, it becomes a trigger for patient non-compliance in limiting the amount of fluid due to increased thirst and the desire to drink continuously. Xylitol gum is a natural sweetener used as a sugar substitute, with a sweet taste equivalent to sucrose. Not only gum was used, this study used ice cubes to reduce thirst as a comparison. It is a common practice to suck on ice cubes to reduce thirst. **Objective.** Knowing the comparison of the effectiveness between chewing xylitol gum and swallowing ice cubes on reducing thirst in patients with chronic renal failure undergoing hemodialysis. **Methods.** The research used was Quasy experiment with pre test and post test non equivalent control group research design using DTI questionnaire sheet with a sample of 30 respondents divided into 3 groups. Data processed using spss with one way Anova method. **Results.** It was concluded that there was a highly statistically significant difference between the three groups studied ($F(2,27) = 30.459$, $p < 0.001$). The p-value of 0.000 which is well below the significance level of 0.05 indicates that there is one group that is significantly different from the other groups. **Conclusion.** There is an effect of chewing xylitol gum and swallowing ice cubes on reducing thirst in chronic renal failure patients undergoing hemodialysis.

Keywords : hemodialysis, ice cubes, thirst, xylitol gum

ABSTRAK

Latar Belakang. Salah satu penanganan gagal ginjal kronik dapat dilakukan terapi hemodialisa. Efek dari hemodialisa akan menimbulkan sensasi rasa haus yang perlu dikontrol, hal tersebut menjadi pencetus ketidakpatuhan penderita dalam membatasi jumlah cairan karena rasa haus yang terus meningkat dan keinginan untuk minum secara terus menerus. Permen karet xylitol merupakan pemanis alami yang digunakan sebagai pengganti gula, dengan rasa manis setara dengan sukrosa. Tidak hanya permen karet yang digunakan, penelitian ini menggunakan es batu untuk mengurangi rasa haus sebagai pembanding. Mengulum es batu merupakan praktik yang umum untuk mengurangi rasa haus. **Tujuan.** Mengetahui perbandingan efektivitas antara mengunyah permen karet xylitol dan mengulum es batu terhadap penurunan rasa haus pada pasien gagal ginjal kronik yang menjalani hemodialisa. **Metode.** Penelitian yang digunakan adalah *Quasy experiment* dengan rancangan penelitian *pre test* dan *post test non equivalent control group* menggunakan lembar kuesioner DTI dengan sampel sebanyak 30 responden yang terbagi dalam 3 kelompok. Data diolah menggunakan spss dengan metode one way Anova. **Hasil.** Disimpulkan bahwa terdapat perbedaan yang sangat signifikan secara statistik antara ketiga kelompok yang diteliti ($F(2,27) = 30.459$, $p < 0.001$). Nilai p-value 0.000 yang jauh di bawah tingkat signifikansi 0.05 menunjukkan bahwa ada satu kelompok yang berbeda secara signifikan dari kelompok lainnya.

Kesimpulan. Ada pengaruh mengunyah permen karet xylitol dan mengulum es batu terhadap penurunan rasa haus pada pasien gagal ginjal kronik yang menjalani hemodialisa.

Kata Kunci : hemodialisa, rasa haus, permen karet xylitol, es batu

INTRODUCTION

Chronic Kidney Disease (CKD) is a medical condition characterized by a gradual and permanent decline in kidney function that has persisted for at least three months. This condition results in the kidneys' inability to function optimally, leading to urea neuropathy with significantly high levels of nitrogen in the blood (Khalid et al., 2023).

According to 2023 WHO data, approximately 1 in 7 adults in the United States, equivalent to 35.5 million people (14%), suffer from chronic kidney disease. WHO data further indicates that one in three adults is unaware that they have this disease. Recent information shows that chronic kidney disease is more frequently found in individuals aged 65 and older (34%) compared to the 45-64 age group (12%) and the 18-44 age group (6%) (WHO, 2023). With Indonesia's current population in 2024 at approximately 282,477,584 people, as many as 504,248 individuals are recorded as suffering from chronic kidney disease. In 2020, the prevalence in Central Java Province showed that the incidence of chronic kidney disease was recorded at 17.3% of the total 34 provinces in Indonesia, placing the province in 18th rank (Jateng, 2020). In Pekalongan Regency in 2024, approximately 148 people were recorded as suffering from chronic kidney disease. Data shows that the majority of patients are aged 15-59 years and >59 years (Dinkes, 2024).

The management of chronic kidney disease can be conducted through various therapies, one of which is hemodialysis. For chronic kidney disease patients, life-saving efforts are carried out through hemodialysis therapy, accompanied by adherence to recommended medical procedures. Hemodialysis is a form of therapy that functions to replace the kidneys' role in filtering blood from metabolic waste products

and maintaining fluid and electrolyte balance in the body. Therefore, chronic kidney disease patients must strictly monitor their fluid intake while undergoing hemodialysis.

The effects of hemodialysis induce a sensation of thirst that needs to be controlled and cause dry lips, which can trigger patient non-compliance in limiting fluid intake due to increasing thirst and the continuous urge to drink. Excessive water intake in chronic kidney disease patients undergoing hemodialysis can lead to weight gain, edema, and shortness of breath. Consequently, fluid intake in kidney failure patients must be restricted (Hall, 2016). To help reduce thirst in patients undergoing hemodialysis, several methods can be applied, such as brushing teeth, rinsing with cold mouthwash, chewing low-sugar gum, and sucking on ice cubes (Arfany et al., 2014).

According to Ra'bung (2019), xylitol-containing gum is proven beneficial in stimulating saliva production and can improve dental plaque, where nerve stimulation triggers salivary gland secretion and reduces thirst, including its antibacterial effects and ability to stimulate saliva production. Meanwhile, research conducted by Lina & Wahyu (2019) suggests that sucking on ice cubes can reduce thirst. This practice provides a refreshing cold sensation; sucking on ice cubes for 4 minutes can decrease thirst in chronic kidney disease patients.

Based on the results of a preliminary study conducted on October 23, 2024, at Kraton Regional General Hospital (RSUD Kraton), there were 125 chronic kidney disease patients undergoing hemodialysis during October-November 2024. Therefore, the researcher is conducting a study regarding "which is more effective between chewing xylitol gum and sucking on ice cubes toward reducing thirst in chronic kidney disease patients undergoing hemodialysis." Thus, the objective of this study is to determine the comparison of effectiveness and

the influence between chewing xylitol gum and sucking on ice cubes on reducing thirst in chronic kidney disease patients undergoing hemodialysis.

METHODS

The design of this study is a quasi-experiment with a pre-test and post-test non-equivalent control group design. This research was conducted at the Dialysis Installation of Kraton Regional General Hospital, Pekalongan Regency, Jl. Veteran No.31, Dukuh, North Pekalongan District, Pekalongan City, from April to May 2025. The population in this study consisted of all patients with Chronic Kidney Disease undergoing Hemodialysis, totaling 125 patients. A sample of 30 respondents was involved, divided into three groups: Group 1, consisting of 10 respondents, was treated by chewing 2 pieces of xylitol gum (Lotte, MD 224710087041) for 10 minutes with an intervention frequency of 3 sessions per week; Group 2, consisting of 10 respondents, was treated by sucking on 10 ml of ice cubes for 5-10 minutes with an intervention frequency of 3 sessions per week; and Group 3, consisting of 10 respondents, received no intervention. The instrument used in this study was the Dialysis Thirst Inventory (DTI). This instrument is used to measure thirst before and after the hemodialysis procedure. The tools and materials used were 2 pieces of xylitol gum for 10 minutes (Lotte, 0 grams of sugar per serving, Lotte Xylitol Gum Bottle Lime Mint: MD 224710087041, with a glycemic index of 7) and 10 ml of ice cubes for 10 minutes. This study was declared ethically feasible with certificate number 016/B.02.01/KEPK/II/2025 on February 14, 2025. Data analysis was performed using the one-way ANOVA test following the data normality test (Shapiro-Wilk test).

RESULTS AND DISCUSSION

The results of this study consist of several parts, namely the results of univariate and bivariate data analysis. Univariate data analysis results include the distribution of respondent data based on age, gender, occupation, education, duration of hemodialysis, and medication consumption.

Tabel 1. Tabel distribusi frekuensi karakteristik responden di instalasi dialysis di RSUD Kraton

	Variabel	Frekuensi	%
1	Usia		
	18-44 tahun	10	33,3
	45-64 tahun	20	66,6
2	Jenis kelamin		
	Laki-laki	13	43,3
	Perempuan	17	56,6
3	Pekerjaan		
	Tidak bekerja/irt	21	70,0
	Guru	1	3,3
	Pedagang	1	3,3
	PNS	1	3,3
	Lainnya	6	20,0
4	Pendidikan		
	Tidak sekolah	3	10,0
	Tamat SD	8	26,6
	Tamat SMP	4	13,3
	Tamat SMA	11	36,6
	Perguruan Tinggi	4	13,3
5	Lama hemodialisa		
	< 1 tahun	8	26,6
	1-5 tahun	16	53,3
	> 5 tahun	6	20,0
6	Konsumsi obat		
	Penambah darah	29	96,6
	Diuretic	1	3,3

Table 1 explains that the majority of respondents were aged 45-64 years (66.6%), female (56.6%), and unemployed (70.0%). Based on education, the majority of respondents had only graduated from high school/equivalent (36.6%). Regarding the duration of hemodialysis, 53.3% had undergone treatment for 1-5 years, and 96.6% consumed blood-booster tablets.

Tabel 2. Rerata rasa haus sebelum dan sesudah diberikan intervensi mengunyah permen karet xylitol pada pasien Gagal Ginjal Kronik (n=10)

Variabel	N	Min	Mean	Max	P value
Pretest	10	17	22,70	26	0,001
Posttest	10	15	18,10	20	

Table 2 shows that the average thirst level of respondents before and after the intervention

of chewing xylitol gum was 22.70 and 18.10, respectively, with a p-value of 0.001. This indicates that chewing xylitol gum is effective in reducing thirst.

Tabel 3. Rerata rasa haus sebelum dan sesudah diberikan intervensi mengulum es batu pada pasien Gagal Ginjal Kronik (n=10)

Variabel	N	Min	Mean	Max	P value
Pretest	10	21	24,10	26	<0,001
Posttest	10	15	19,00	21	

Table 3 shows that the average thirst level before and after the ice cube sucking intervention was 24.10 and 19.00, respectively, with a p-value < 0.001. This indicates that sucking on ice cubes is effective in reducing thirst.

Tabel 4. Rerata rasa haus pada pasien Gagal Ginjal Kronik tanpa pemberian intervensi (n=10)

Variabel	N	Min	Mean	Max	P value
Pretest	10	21	26,60	25	0,269
Posttest	10	21	23,40	25	

Table 4 shows that the average thirst level of respondents without intervention (control group) was 26.60 initially and 23.40 at the end, with a p-value of 0.269. This indicates that the control group did not show better results due to the absence of intervention.

Tabel 5. Uji one way Anova

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	160.867	2	80.433	30.459	<,001
Within Groups	71.300	27	2.641		
Total	232.167	29			

Table 5, representing the results of the one-way ANOVA test, allows the conclusion that there is a statistically significant difference between the three groups studied ($F(2,27) = 30.459$, $p < 0.001$). The p-value of

0.000, which is well below the significance level of 0.05, indicates that at least one group differs significantly from the others. The magnitude of the difference between groups (Between Group Sum of Squares = 160.867) compared to the variation within groups (Within Groups Sum of Squares = 71.300) shows that the interventions provided had a meaningful effect on the measured variables. To identify specific group differences, a post-hoc test is required.

Tabel 5. Uji PostHoc

(I) Kelompok	(J) Kelompok	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound
permen karet xylitol	Es batu	-.900	.727	.679	-2.75
	Kontrol permen karet xylitol	-5.300*	.727	<.001	-7.15
Es batu	Kontrol permen karet xylitol	.900	.727	.679	-.95
	Kontrol permen karet xylitol	-4.400*	.727	<.001	-6.25
Kontrol	Es batu	5.300*	.727	<.001	3.45
	Es batu	4.400*	.727	<.001	2.55

Table 5 also shows the results of the Bonferroni post-hoc test, indicating that the control group had a significantly lower influence compared to both intervention groups, with a difference of 5.300 points ($p < 0.001$) compared to xylitol gum and 4.400 points ($p < 0.001$) compared to ice cubes. Meanwhile, there was no significant difference between the xylitol gum group and the ice cube group (difference of 0.900 points, $p = 0.679$). This study ranks the effectiveness of the interventions as follows: xylitol gum, ice cubes, and finally the control group. This signifies that both interventions are statistically more effective than the control group but possess equivalent effectiveness to each other; thus, both can be considered as non-pharmacological intervention options.

Characteristics of Respondents

Based on the research findings regarding thirst in chronic kidney disease patients undergoing hemodialysis, it was found that the majority of respondents were aged 45-64 years (66.6%). This is supported by research

(Hasibuan, 2021) stating that chronic kidney disease tends to increase in adulthood due to the chronic and progressive nature of the disease. With increasing age, the functions of the kidneys, urinary tract, and renal tubules—including reabsorption capacity—decline. After the age of 40, the glomerular filtration rate gradually decreases to less than 50% of the normal value by age 70.

The results also showed that 56.6% of respondents were female. Females are noted to have a higher CKD prognosis because they are less able to maintain blood sugar levels and often lack daily physical activity, while males are less able to control proteinuria (Wijaya & Putri, 2013). Essentially, the disease can affect anyone regardless of gender. However, in several types of diseases, frequency differences exist based on sex, generally influenced by causative factors. Nevertheless, based on an analysis of several journals, no significant relationship was found between gender and the incidence of chronic kidney disease.

Regarding occupation, 70.0% of respondents were unemployed or housewives. Occupational status is known to influence patients with chronic kidney disease. This is reinforced by research (Wibowo et al., 2020), which states that some respondents choose not to work because they fatigue easily and are unable to perform activities as before. Furthermore, family factors also influence this decision due to concerns over the patient's health condition. The advanced age of most respondents is also a consideration due to physical limitations. This indicates that occupation can impact the level of fatigue felt by chronic kidney disease patients undergoing hemodialysis therapy.

Regarding educational characteristics, the majority had only graduated from high school/equivalent (36.6%). This finding is consistent with (Peri, 2024), stating that respondents with a secondary education level dominate. Based on these results, it can be concluded that hemodialysis patients come from various educational backgrounds, and no direct relationship was found between education level and the incidence of chronic

kidney disease. However, (Nurhidayah et al., 2024) mentions that individuals with higher education tend to have better knowledge and are accustomed to understanding complex information, including fluid management, which ultimately affects the quality of life of chronic kidney disease patients.

For the duration of hemodialysis, 53.3% of respondents had undergone treatment for 1-5 years. Detailed observations found that some respondents had only been undergoing hemodialysis for a few months to under five years. This data indicates an increase in the number of chronic kidney disease patients over time, aligning with data from the Ministry of Health (2019) showing that cases continue to rise alongside the increasing elderly population (Ariyani, H., Hilmawan, R. G., S et al., 2019).

Regarding medication, 96.6% consumed blood-booster tablets. This is due to disruptions in the erythropoiesis process, iron deficiency resulting from hemodialysis procedures, shorter erythrocyte lifespan, folic acid deficiency, gastrointestinal or uterine bleeding, and the effects of hemodialysis therapy itself, all of which can lead to anemia. The primary indicator of this anemia is low hemoglobin levels (Insani et al., 2024).

Average Thirst Levels Before and After Xylitol Chewing Gum Intervention in Chronic Kidney Disease Patients

Based on research results at RSUD Kraton, Pekalongan Regency, it was found that in chronic kidney disease patients undergoing hemodialysis, the average thirst level of respondents before and after the xylitol chewing gum intervention was 22.70 and 18.10, respectively, with a p-value of 0.001. This indicates that chewing xylitol gum is effective in reducing thirst. Xylitol itself is a compound from the sugar alcohol group with the chemical formula $C_5H_{12}O_5$ and a molecular weight of 152.1. Several countries have recommended its use as a sugar substitute due to its sweeter characteristics and better profile compared to other sweeteners like sorbitol. Xylitol also has a lower caloric content, approximately 2.4 calories per gram, which is 40% lower than sucrose at 4 calories per gram. Furthermore, when dissolved, xylitol has a negative heat of solution ten times

greater than sucrose, thereby providing a cooling sensation in the mouth (Zuliani et al., 2019).

Average Thirst Levels Before and After Ice Cube Sucking Intervention in Chronic Kidney Disease Patients

Based on the research results at RSUD Kraton, Pekalongan Regency, chronic kidney disease patients undergoing hemodialysis had an average thirst level of 24.10 before the ice cube sucking intervention, which decreased to 19.00 after the intervention, with a p -value < 0.001 . This shows that sucking on ice cubes is effective in reducing thirst. The cold sensation produced by ice cubes provides a refreshing effect on the mouth and throat, thereby suppressing the patient's urge to consume excessive fluids. Based on the research findings, the average thirst intensity after the ice cube therapy decreased, falling into the mild thirst category. The effectiveness of this intervention is attributed to the refreshing sensation caused by the ice cubes when sucked in the mouth (Fajri et al., 2020). Given its ease of implementation and low cost, ice cube sucking therapy can be an effective and safe non-pharmacological intervention option that can be routinely applied in nursing practice.

Average Thirst Levels in Chronic Kidney Disease Patients Without Intervention

Based on research results at RSUD Kraton, Pekalongan Regency, chronic kidney disease patients undergoing hemodialysis in the control group had an average thirst level of 26.60 before and 23.40 after the observation period, with a p -value of 0.269. This indicates that the control group did not show better results due to the absence of intervention. Research conducted by Rantepadang & Taebenu (2019) showed that because this group received no therapy (such as chewing gum), the post-test thirst scores remained high, staying within the severe thirst category. These findings indicate no significant change in thirst levels. This is caused by reduced salivary secretion, a result of fluid intake restriction and increased

blood urea levels. Both factors contribute to the sensation of dry mouth and persistent thirst. This suggests that without specific intervention, patient thirst only experiences a minimal decrease that may be temporary and clinically insignificant. In contrast to the intervention groups (xylitol gum and ice cubes), the decrease in thirst was more significant due to direct taste stimulation and increased comfort in the oral cavity. Thus, non-pharmacological interventions are proven to be more effective in controlling thirst compared to no intervention at all.

Influence of Xylitol Gum, Ice Cube, and Control Group Interventions

The Bonferroni post-hoc test results showed that the control group had a significantly lower influence compared to the two intervention groups, with a difference of 5.300 points ($p < 0.001$) relative to xylitol gum and 4.400 points ($p < 0.001$) relative to ice cubes; meanwhile, no significant difference was found between the xylitol gum and ice cube groups (difference of 0.900 points, $p = 0.679$). The results indicated differences in effectiveness levels between the xylitol gum group, the ice cube group, and the control group in reducing thirst in chronic kidney disease patients undergoing hemodialysis. The group given the xylitol chewing gum intervention experienced a significant decrease in thirst scores post-intervention. This aligns with the theory that chewing xylitol gum can stimulate sympathetic and parasympathetic nerves, thereby increasing saliva production and providing a sensation of moisture in the oral cavity, which indirectly lowers the perception of thirst (Said & Mohammed, 2013). Meanwhile, the ice cube group also showed a significant reduction in thirst levels. The cold sensation from ice cubes is proven effective in providing a refreshing effect and stimulating oral mechanisms to relieve thirst. Sucking on ice cubes for several minutes provides a cooling effect on the mouth and throat, reducing the physiological drive to drink (Lina & Wahyu, 2019). Conversely, the control group showed no significant change in thirst scores between pre-test and post-test measurements. This indicates that oral stimulation interventions, through either xylitol

gum or ice cubes, influence thirst perception, whereas no change occurs without intervention.

Overall, although both interventions were proven effective—with the xylitol gum group decreasing from 22.70 to 18.10 ($p = 0.001$) and the ice cube group decreasing from 24.10 to 19.00 ($p < 0.001$)—further analysis showed that sucking on ice cubes provided a slightly larger reduction in thirst scores in comparison to xylitol gum. This may be due to the direct physiological cold effect of ice cubes that immediately addresses the sensation of dry mouth, unlike the indirect effect of chewing gum which depends on increasing saliva production. This study is consistent with Fajri et al. (2020), which showed that after ice cube therapy, average thirst scores decreased to the "occasionally thirsty" category. This indicates a significant difference between thirst levels before and after ice cube therapy, leading to the conclusion that this therapy is effective in reducing thirst in chronic kidney disease patients undergoing hemodialysis. Therefore, both methods can be used as safe and practical non-pharmacological interventions for reducing thirst in chronic kidney disease patients undergoing hemodialysis. However, the choice of method can be adjusted according to individual patient preferences and tolerance.

CONCLUSION

Based on the results of the research conducted at RSUD Kraton, Pekalongan Regency, it is concluded that there is a statistically highly significant difference between the three groups studied ($F(2,27) = 30.459$, $p < 0.001$). The p-value of 0.000, which is well below the significance level of 0.05, indicates that at least one group differs significantly from the others. The findings show that both chewing xylitol gum and sucking on ice cubes have an effect on reducing thirst in chronic kidney disease patients undergoing hemodialysis, with a p-value of 0.001. Furthermore, there is a significant difference between both intervention groups and the control group (p

$= 0.001$). The ice cube intervention proved to be more effective than xylitol gum in reducing thirst scores in chronic kidney disease patients undergoing hemodialysis. This is demonstrated by a larger mean reduction and higher intervention effectiveness, as reflected in the larger effect size (3.628) with a p-value < 0.001 in the ice cube group. The recommendation from this study is that these findings can serve as alternative therapies that chronic kidney disease patients can apply independently at home to help reduce thirst while undergoing hemodialysis.

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