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Review Article

Effect of Chewing Gum on Thirst in Kidney Failure Patients: Review

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Abstract

Aims: Complaints of thirst accompanied by dry mouth are the main complaints of hemodialysis patients with poor compliance due to excess fluid intake, inability to restrict fluids, and high interdialytic weight. The interventions carried out to overcome thirst include sucking ice cubes, gargling with boiled water, and chewing gum. The effectiveness of chewing gum for people with CKD is still debated.

Objectives: The purpose of this study was to determine the benefits of chewing gum in overcoming thirst in CKD patients on hemodialysis.

Methods: The electronic databases used in this research are PubMed, ProQuest, MEDLINE (EBSCO), and Google Scholar. A search for reading materials was carried out to identify discussions that fit the inclusion criteria. The keywords used were "chewing gum", "hemodialysis," and "thirst."

Results: We found 2350 articles based on the keyword, and seven articles meet the inclusion criteria after going through a series of article selection actions.

Conclusions: This review recommended chewing gum as an alternative therapy for overcoming the thirst of kidney failure patients.

Keywords:

Chewing gum, hemodialysis, Thirst

INTRODUCTION

Chronic Renal Failure or CRF is stated to be the cause of more deaths than breast cancer or prostate cancer based on the National Vital Statistics System report data 2018. (1). This is a health crisis that is not paid enough attention to by the public. Kidney disease is suffered by about 37 million people in the U.S. (15% of the adult population; more than 1 in 7 adults) (2). Until now, CKD has not had a major role in providing public health promotion, which aims to increase public awareness of maintaining kidney health. We estimate that More than 850 million people worldwide have a wide range of kidney diseases, estimated to be about twice as many as

people living with diabetes (422 million) and 20 times more than the prevalence of cancer worldwide (42 million) (3) . Thus, CRF is the most occurrence health problem affecting all parts of the world that require a focus on public health plans and programs.

In Indonesia, According to the results report Riset Kesehatan Dasar (4) The overall number of CRF cases become greater in amount to 0.38 percent. This number has almost doubled compared to 2013 which was only 0.2 percent (5). According to the 2018 United States Renal Data System (USRDS) report, for patients who started dialysis in 2011, the adjusted five-year survival from day one was 52 percent for patients undergoing peritoneal dialysis and

42 percent for those undergoing hemodialysis (6).

Renal dialysis is divided into 2, namely: hemodialysis and peritoneal dialysis (7). Each of the kidney replacement therapies has its advantages and disadvantages. The selection of dialysis modalities is influenced by various considerations such as availability and comfort, comorbid conditions, socio-economics, dialysis centers, patient home situations, clinical surgical methods, and the ability to tolerate fluid amounts (8).

Hemodialysis therapy is one way for people with FMD to survive. To remove metabolic waste products from the human blood circulation through a semipermeable membrane or so-called dialyzer. CRF sufferers make hemodialysis a routine and patients undergoing hemodialysis must maintain restrictions on the fluid intake so that body fluid balance is achieved that excess fluid does not occur (9).

CRF patients experience xerostomia or thirst but on the other hand, their body also experiences excess fluid which can cause weight gain, edema, increased blood pressure, shortness of breath, and heart problems which also have an impact on reducing the decline of the heart the quality of life of the patient, therefore fluid restriction must be carried out in hemodialysis patients to occur fluid balance (10). On the other hand, therapy hemodialysis is not done every day which causes CRF patients who undergo hemodialysis to experience fluid accumulation problems between the two dialysis times so it is necessary to limit fluid. As a result of fluid restriction, it causes thirst, if the thirst is not overcome, it will cause an increase in fluid intake which results in excess fluid problems, causing various complications (11).

Complaints of thirst accompanied by dry mouth are the main complaints of hemodialysis patients with poor compliance due to excess fluid intake, inability to restrict fluids, and cause high interdialytic

weight. Interdialytic weight gain (IDWG) should be lower than 4.0-4.5% of dry weight. Regrettably, not a few CRF patients have IDWG exceeding this value, even some have IDWG 10-20%. High IDWG may be associated with a higher risk of all-cause cardiovascular death as well as an increased amount of such illness, such as major causes of ventricular hypertrophy, and cardiac and cerebrovascular disorders. On the other hand, a high IDWG leads to additional weekly dialysis sessions that result in decreased quality of life and increased costs. Therefore, the information of thirst in CRF patients on hemodialysis is considered completely necessary to encourage good enough in quality regulation of IDWG in routine clinical practice (12).

Interventions carried out to overcome thirst include: sucking ice cubes, gargles of boiled water, and chewing gum. Many previous studies have revealed the effectiveness of sucking ice cubes (13) and boiled water gargles (14) in people with CRF. However, the effectiveness of chewing gum in people with CRF is still quite not very great in amount. The aim of this study was discover the facts about the benefits of chewing gum in overcoming thirst in CKD with Hemodialysis.

METHODS

Searching Strategies

The results of the review of these reference materials are built upon an electronic database: PubMed, ProQuest, MEDLINE (EBSCO), and Google Scholar January. The keyword used was "chewing gum", "chronic kidney disease" and "thirst

Eligibility Criteria

The study included the following criteria (1) Free full-text article available in English (2) research about gum chewing interventions in overcoming thirst (3) study respondents were CRF patients with hemodialysis (4) experimental design (5) Original Research (6) Used the eEnglishlanguage.

Data Extraction

The paper tracing process was carried out from July 1 to August 30, 2022. PICO is used in careful planning to achieve the goal of finding articles from supporting journals. Hemodialysis patient with thirst sensation are the population. The action is chewing gum and the comparis is the usual management to overcome thirst. Efek yang terlihat adalah mengurangi skala haus. Keywords used used in this study are chewing gum, hemodialysis and thirst. To improve the achievement of the basic data sought, researchers use, the word 'AND' is used. The initial selection of article was carried out by scrutinizing the suitability of the title and abstract with the research purposes. Articles not comprising a combination of keywords are set aside from

the chosen article results. Further, we are to learn the related articles by the inclusion criteria, starting from the introduction, methods, and results, to decide compatibility with the research topic and do the quality appraisal. Articles that do not meet the criteria are excluded, while the relevant articles are maintained.

RESULTS

After choosing the articles, 2350 articles were acquired based on keywords. A total of 1283 articles were not included because they did not fulfil the inclusion criteria, and 362 were not included because they did not fulfil the purpose of the research. As a final result, seven articles fulfil the inclusion criteria.

Figure 1. The process of article selection in the literature review

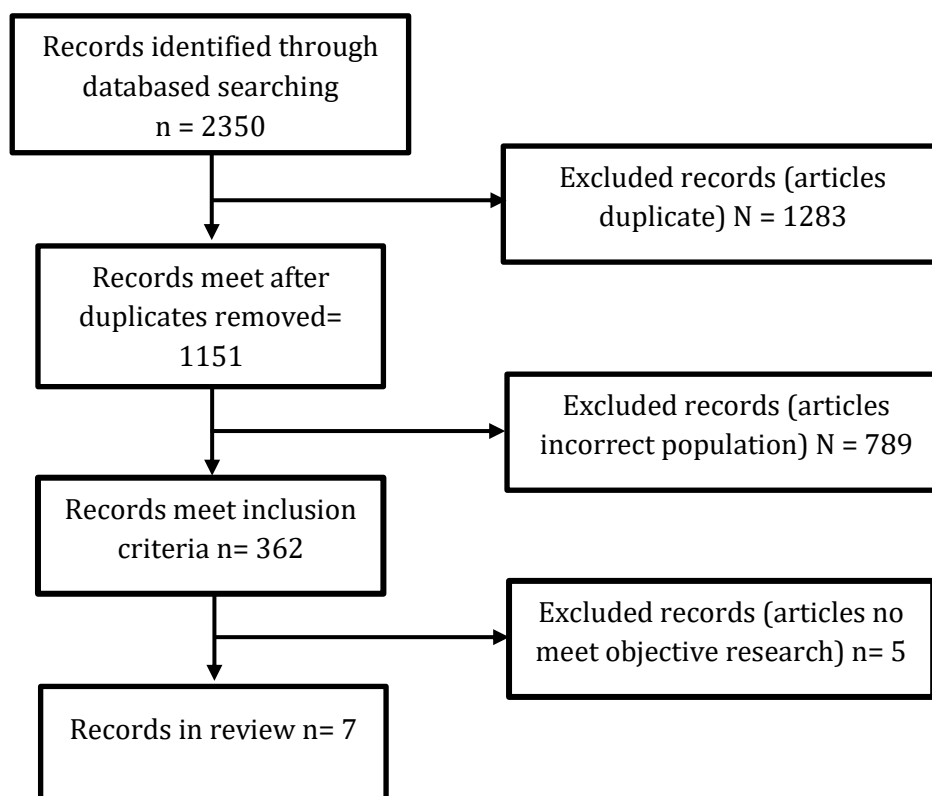


Table 1. Key characteristics of included studies

No.	Author/Year	Participant and location	Design	Intervention	Follow up	Outcome
1	Tadao Akizawa ¹ et al/2014 (15)	63 respondent/ Japan	a multi-center, randomized, double-blind, placebo controlled, parallel-group, comparative study	Respondents were divided into 2 groups, the intervention group consumed HS219 gum (n = 35) and the control group consumed a placebo (n = 28) three times a day for 30 minutes,	3 weeks	There were no important enough to have an effect impacts of chewing HS219 on an act of making something less of salivary phosphorus, and serum calcium.
2	Yenny, Yohanes.G.T.A/2021 (16)	64 respondent/ Indonesia	quasi-experiment with pretest-posttest	The researcher gave xylitol gum (mint flavor and low sugar) to the treatment group. The treatment group was asked to chew gum at least 1-2 items every day and may chew more than two items according to the level of thirst that triggers the desire to drink (there is no maximum limit on the number of chewed gums). In the control group, respondents were not given chewing gum but were asked to write down the action taken when they felt thirsty	4 weeks	There is the effectiveness of chewing gum to feeling thirsty sensation and IDWG on hemodialysis patients
3	Nurten OZEN/2020 (17)	44 respondent/ Turkey	prospective randomized controlled single-blind s	Respondents were asked to chewing gum for 6 times a day in duration of 10 minutes and when respondents felt thirst or dry mouth	3 month	Assessment using Visual Analogue Scale at month two and month three to assess dry mouth found respondents who chewed gum statistically had lower values than control group respondents with values $P = 0.014$, $P < 0.001$. Then the assessment of salivary flow rate in the third month in respondents who chewed gum had a higher value than the control

						group respondents (P < 0.001)
4	Nazike Duruk, PhD, RN n I 'smet Es,er, PhD, RN/2016 (18)	61 respondent/ Turkey	a randomized, controlled, single-blind, crossover experimental study	The patient chews gum during hemodialysis and is observed every hour for 4 hours of hemodialysis therapy	3 month	Chew gum for 15 minutes every hour hemodialysis action does not increase the amount of saliva , keep the pH value of saliva in normal Range, or control of dry mouth symptoms
5	Ali Mansour, et al / 2018(19)	60 respondent/ Iran	a quasi-experimental study.	Actions taken to relieve thirst were distinguished into 2 groups of respondents. The first group of respondents overcame thirst by chewing sugarless gum while the second group respondents overcame thirst by consuming sugarless candy	2 week	significant difference was found in complaints of dry mouth patients before and after the intervention in both interventions group (p <0.05), while there was no enough effect difference in the control group (p > 0.05)..
6.	Sadegh Dehghanmehr, et al 2018 (20)	50 respondent/ Iran	quasi-experimental	Respondents were divided into 2 groups, namely the intervention group who chewed sugar-free gum within 1 week to overcome thirst and the control group who did not get any action.	1 week	The result is the effect of sugar-free gum on reducing thirst and dry mouth. The impact of chewing sugar-free gum is a lower-cost intervention and can be found easily
7	Sabine M. Allida,et al/2020 (21)	71 respondent/ Australia	Randomised Controlled Trial	Respondents of the intervention group were given 14 packages of pappermint xylitol epic dental LLC flavored gum, then for 14 days respondents were instructed to chew the gum gently for at least 10 minutes for 6 x in 1 day and also when respondents felt thirsty and experienced dry mouth	4 week	The results found chewing gum can overcome thirst in the long and short term

Based on the literature discussed, the main cause of non-compliance in CRF patients with hemodialysis is fluid consumption that exceeds the limit. This is due to dry mouth symptoms, which are subjective feelings or interpreted as xerostomia. The literature discusses a lot about thirst management, one of which is chewing gum. Thirst management by chewing gum, according to Nurten Ozen in 2020, states that chewing gum does not carry serious risks for patients. However, this is more specifically explained in the research of Sadegh (22) which stated that the use of sugar-containing gum can have a bad impact on diseases, so it is recommended to consume gum containing no sugar.

Related to the timing of the implementation in the eight articles, chewing gum intervention is given for 1 week to 3 months. Within 1 week of chewing gum, results were found by (22) There were significant differences before and after the chewing gum action taken in the intervention group ($P = 0.001$). After all, there were no significant differences between the dry mouth of patients before and after the intervention in the control group ($P = 0.44$). This suggests that there is a significant reduction in thirst and dry mouth in CRF patients on hemodialysis who chew sugar-free gum. Consumption of sugar-free sweets is highly recommended for all patients who experience oral complications, particularly dry mouth and thirst suffered by CRF patients on hemodialysis. Based on the length of time spent chewing gum for 3 months, it was found that the patient's saliva flow rate increased in amount during the first hour of the day when the gum was chewed, and this increased statistically, but no significant difference was found between the saliva flow rate at a time point of 0 and 4 hours on the day when the gum was chewed. In addition, the pH value of saliva was within the normal range on both days. However, based on the duration of consuming gum for 15 minutes per hour all through a hemodialysis session, it did not increase the

amount of saliva or reduce dry mouth symptoms.

Based on its implementation, the intervention of chewing gum will produce maximum results to eliminate thirst, namely when the patient is analyzed to chew gum for 10 minutes six times a day, and when the patient feels dry mouth or thirst.

Overall, of the 7 articles studied, 4 stated that chewing gum can overcome thirst, characterized by lowering dry mouth, increasing saliva flow rate, and increasing adherence to fluid control (17). The act of chewing gum also relieves thirst in the short and long term. The instrument used to measure thirst in patients was the Dialysis Thirst Inventory questionnaire, which had seven questions aimed at identifying thirst.

DISCUSSION

About 60% to 80% of hemodialysis patients die from excess fluid (23). Excess fluid in hemodialysis patients can impact further complications, such as hypertension, arrhythmias, cardiomyopathy, heart failure, uremic pericarditis, uremic lungs, pericardial effusion, pulmonary edema, pleural effusion, uremic pleuritis, and shortness of breath (24). Therefore, Indicators of success of hemodialysis patients are fluid management through fluid restriction and overcoming thirst. Thirst is a physiological response from within the human body in the form of a desire to drink to meet the fluid needs in the body. Thirst or dry mouth, which causes discomfort and suffering in hemodialysis patients so that it can affect the quality of life (25) Schematically, thirsty on hemodialysis patients especially osmometric, including intake salt, increased osmolarity of extracellular fluid, and shrinking of the osmoreceptor cells inside the hypothalamus trigger the desire to drink. The occurrence of thirst is an important phenomenon where basic mechanism experienced by the human body is a signal or indication of the need for

internal fluids body to maintain its fluid nutrient needs (26).

One of the interventions given to overcome thirst is chewing gum. Giving gum without side effects will cause stimulation of the salivary glands, where impulse will run to the nucleus in the medulla coupled with the movement of the oral muscles so that the chewing process will stimulate increased saliva production (27). Mechanical stimulus in the form of chewing gum for 10 minutes twice per day, chemical stimulus in the form of sweetness and menthol and mechanical thymus can stimulate increased saliva secretion while the sensation of tasting sweetness and gum menthol is a chemical stimulus that can increase saliva flow. Chewing gum containing xylitol and sucrose has a spicier menthol flavor than chewing gum containing probiotics, so that saliva volume is less and saliva viscosity is thicker in probiotics (28).

The Instruments used to assessment of the sensation of thirst was carried out utilize the Dialysis Thirst Inventory questionnaire consisting of 7 questions with the following statements thirst is a problem for me, I am thirsty during the day, I am thirsty at night, my social life is affected because of my thirst, I am thirsty before dialysis, I am thirsty during dialysis, I am thirsty after dialysis. The answer choices given are never to very often. The answer given is never to be very frequent (29).

However, there are several studies that state chewing gum has no impact on restraining thirst in research (15) states that chitosan chewing candy does not affect salivary levels in hemodialysis in Japan. This is also supported also by research (18) no substantial difference was found between the saliva flow rate at a time point of 0 and 4 hours when the gum was chewed. This recommendation highly recommends using sugar-free sweets for all patients who experience complications in the mouth, especially with complaints of dry mouth and thirst in CRF patients on hemodialysis.

LIMITATION

This research is only an experiment The study with the chewing gum intervention was conducted by the researcher only. The limitation of this research is that there is one article in a foreign language, namely Chinese, is excluded because the article does not have an English translation, and we have funding constraints to pay for a Chinese translator.

CONCLUSION

Chewing gum intervention is a therapy that has limited studies. We identified seven articles that examined chewing gum intervention for specific problem namely reduce the sensation of thirst among kidney failure patients. This review showed that chewing gum intervention needs a long time, on average 1-3 months, to obtain a satisfactory effect in reducing the sensation of thirst but this treatment is safe and easy to apply. Finally, although it is still arguably therapy on thirst among chronic kidney failure patient, we found in this review report there impact of chewing gum to the reduce sensation of thirst among chronic kidney failure patient.

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