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ORIGINAL RESEARCH

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INFLUENCE OF LOW-SODIUM DIET MANAGEMENT ON THIRST RESPONSE IN END STAGE RENAL DISEASE PATIENTS WITH HEMODIALYSIS

Lisbet Gurning*, Jenny Marlindawani Purba, Cholina Trisa Siregar

Faculty of Nursing, Universitas Sumatera Utara, Medan, Indonesia

*Corresponding author:

Lisbet Gurning

Faculty of Nursing, Universitas Sumatera Utara

Jalan Prof. T. Maas No.3, Padang Bulan, Medan Baru, Kota Medan, Sumatera Utara 20155, Indonesia

E-mail: lisbet_gurning@yahoo.com

Abstract

Background: Patients with hemodialysis often have difficulty in controlling their fluid intake although the obedience to follow fluid and dietary restriction is the key of hemodialysis success management.

Objective: The aim of this study was to examine the effect of low-sodium diet management on thirst response in end stage renal disease patients with hemodialysis.

Methods: This was a quasi-experimental study with pre-posttest with control group design. Using consecutive sampling 88 respondents were selected, which 44 assigned in each group. Thirst distress scale and visual analog scale questionnaire were used for data collection. Wilcoxon and Mann Whitney test were used for statistical analysis.

Results: Of the total of respondents, thirty-seven respondents experienced a decrease in thirst distress scale with $p=0.000$ ($p<0.05$); and 30 respondents experienced a decrease in visual analog scale with $p=0.000$ after given low sodium diet management. There was difference of thirst distress scale score ($p=0.008$) and visual analog scale of thirst score ($p=0.048$) between intervention and control group. The importance of continuous of diet education with counseling and home visit can increase self-management behaviors.

Conclusion. Low sodium diet management could reduce the thirst response in end stage renal disease patients with hemodialysis.

Keywords: hemodialysis; low sodium diet; thirst

INTRODUCTION

Hemodialysis is a modalities therapy of renal replacement for renal failure patient. Renal failure is a condition in which the kidneys are unable to adequately filter toxins and waste products from blood with progressive and irreversible ([Dorgalaleh et al., 2013](#)). Hemodialysis is widely used worldwide and its prevalence increases every year ([Cleemput & De Laet, 2013](#); [Ebrahimi, Sadeghi, Amanpour, & Dadgari, 2016](#); [Yusop, Mun, Shariff, & Huat, 2013](#)). The prevalence of hemodialysis in the United States in 2012 is 451,000 and is expected to increase to

632,000 by 2025 ([Wetmore & Collins, 2016](#)), whereas based on data from the Indonesian Renal Registry ([IRR, 2014](#)) there are 28,882 patients reporting hemodialysis in Indonesia with 957 people are located in North Sumatra Province.

Hemodialysis depends on the patient's level adherence to participate in following the fluid and dietary restriction of the recovered fluid ([Chironda & Bhengu, 2016](#)). The obedience of fluid restriction is the most complex thing on hemodialysis patients. Fluid restriction

makes excessive thirst leads to excessive intake of water, moreover patients who live in the country with the temperature exceeds 35 degrees will find difficulty to manage their water drink intake. Some studies report that 39-95% of hemodialysis patients have experience of thirst with six major factors affecting thirst is potassium depletion, acute increase in plasma urea, hyperglycemia, plasma sodium concentration, angiotensin II and psychological factors ([Kara, 2013](#); [Sacrias, Rathinasamy, Elavally, & Arjunan, 2016](#)). Bruzda-Zwiech, Szczepanska and Zwiech also add other factors which can influence thirst such as lack of saliva secretion, changes in biological as well as biochemical, hormonal abnormality and the side effect of medicine ([Bruzda-Zwiech, Szczepańska, & Zwiech, 2014](#)).

In critical ill patients, thirst is a common source of distress ([Zehm, Mullin, & Zhang, 2016](#)). Thirst causes oral dryness due to decreased flow and salivary production so that the viscosity of saliva increase and raises various problems such as burning mouth, increased thirst, loss of taste, difficulty of chewing, swallowing, speaking, oral breathing, halo cytosis, unpleasant taste and odor, sensitive teeth, increased risk of lesions in mucosa, gums, and tongue, as well as an increased risk of candidacies, tooth decay, periodontal disease, as well as bacterial and fungal infections of the mouth ([Al-yassiri, 2014](#); [Bossola & Tazza, 2012](#)).

National Kidney Foundation-Kidney Disease Outcomes Quality Initiative (NK- KDOQI) Guidelines recommends that hemodialysis patients intake of sodium is <2400 mg/day or equivalent to 5-6 gram/day of table salt to prevent cardiovascular complications, while European Nutrition Guide recommends as amount 2000 – 2300 mg/day of sodium intake or equivalent to 5-6 gram/day of table salt and based on Kidney Organization Guide recommended amount of sodium are 1500-2000 mg/day. In fact, many hemodialysis patients do not carry out that recommendation.

Previous study shows that average daily salt intake of hemodialysis patients in Japan is 12.6 gram (~5,5 gram or 240 mmol natrium), while hemodialysis patients in Spain as amount 10 gram (~4.3 gram or 189 mmol natrium) and patient in America counted 9.7 gram (~4.2 gram or 183 mmol natrium) ([Mc Causland, Waikar, & Brunelli, 2012](#)). Another study indicates the average daily sodium consumed on hemodialysis patients in Brazil is amount 8.6 gram/day resulting from use of salt and food additives that contain salty in their diet and causing increased of thirst, IDWG and blood pressure ([Nerbass et al., 2013](#)).

The amount of daily intake of sodium intake is strongly influenced by the ability of the patient in maintaining himself (self-management) in order to control the symptoms and disease processes. Li et al. in their study stated that self-management is interpreted as a task that must be done by patients from day to day in controlling or reducing the impact of disease on physical health status. The components of self-management include the acceptance of information, drug management, symptom management, psychological consequences management, lifestyle changes, social support, and communication. Adherence to special diets such as low-salt diet as well as fluid restriction is one kind of the symptom management component in hemodialysis patients ([Li, Jiang, & Lin, 2014](#)).

It is concluded that fluid restriction can make the hemodialysis patient complain of thirst and dry mouth, thus requiring non-pharmacologic therapy to overcome the problem. Therefore, this study aimed to examine the influence of management of low-salt diet on thirst in hemodialysis patients.

METHODS

Study design

This was quasi-experimental study with pre-posttest control group.

Sample

The ESRD patients with thirst problem were recruited from 11 September to 11 October 2017. This study enrolled men and women with ESRD with 44 respondents for each group (study and control). The inclusion criteria in this study were: 1) aged over 18 years, 2) performed routine hemodialysis therapy over 6 months, 3) patient and family can communicate and read using Indonesian language, 4) willing to cooperate in doing research (shown by filling out the width of the participant's consent). The study exclusion criteria include: 1) has a history of mental disorders, 2) orientation disorder, 3) treatment using psychotropic drugs.

Instrument

Welch Thirst Distress Scale was used for this study ([Welch & Molzahn, 2002](#)). Thirst Distress Scale (TDS) have 6 questions with Likert scale measurement, 1: strongly disagree, 2: disagree, 3: neutral, 4: agree, 5: strongly agree. Totally score interpretation 1-10: mild thirst, 11-20: moderate thirst and 21-30: worst thirst. For intensity of thirst measurement, visual analogue scale (VAS) was used, with interpretation 0-3: mild thirst, 4-6: moderate thirst, 7-10: worst thirst.

Data analysis

Analysis of data used Wilcoxon test for within group and Mann Whitney test between groups ($p < 0.05$).

Ethical consideration

This study has been approved by the Research Ethics Committee from the Commission of Health Research Ethics Faculty of Nursing University of Sumatera Utara No. 1271/VIII/SP/2017.

RESULTS

Characteristic of Respondents

The mean of respondents' age in this study was 48.68 ± 14.15 in the intervention group and 52.55 ± 12.27 in the control group. The majority of respondents were aged 35-54 years, which 36.4% in the intervention group and 40.9% in the control group. Majority of gender in this study was male, which 52.3% in the intervention group and 68.2% in the control group. Based on marital status, 68.2% were married in the intervention group and 77.3% in the control group. There were 56.8% of respondents were not working in the intervention group, while in the control group as much as 34.1%. Based on educational background, 31.8% in intervention group was college graduates and the control group 38.6% was graduated from senior high school. Of 48.86% of respondents in the intervention group and 50% in the control suffered from renal impairment caused by hypertension disease. The majority of respondents in the intervention and control group had taken regular hemodialysis with more than 1 year (61.4%).

Table 1 Characteristic of respondents

Characteristic	Intervention (n = 44)		Control (n = 44)		F	P value
	F	%	F	%		
Age					t=1.524	0.113
Average	Mean:	SD:	Mean:	SD:		
	48.68	14.15	52.55	12.27		
18 – 34 years old	9	20.5	5	11.4		
35 – 54 years old	16	36.4	18	40.9		
55 – 64 years old	13	29.5	16	36.4		
> 65 years old	6	13.6	5	11.4		
Gender					x ² =3.682	0.055
Male	23	52.3	30	68.2		
Female	21	47.7	14	31.8		

Educational					0.144	0.706
Elementary	6	13.6	6	13.6		
Junior high school	9	20.5	9	20.5		
Senior high School	14	31.8	17	38.6		
Diploma/Degree	15	34.1	12	27.3		
Occupation					0.622	0.432
Employee	9	20.4	18	40.9		
Entrepreneur	10	23.7	11	34.1		
Unemployee	25	56.8	15	25.0		
Marital Status					0.443	0.507
Single	6	13.6	6	13.6		
Married	30	68.2	34	77.3		
Widow/divorce	8	18.2	4	9.1		
Race					3.514	0.064
Batak	33	75.0	32	72.2		
Jawa	6	13.6	9	20.5		
Minang	0	0	2	4.5		
Malay	1	2.3	0	0		
Another	4	9.1	1	2.3		
During Hemodialysis					0.480	0.490
< 1 year	17	38.6	17	38.6		
> 1 year	27	61.4	27	61.4		
Etiology of Hemodialysis					0.443	0.507
Hypertension	17	38.6	22	50.0		
Diabetes mellitus	16	36.4	14	32.8		
Kidney stones	6	13.6	8	18.2		
Another	5	11.4	0	0		

Distribution of Thirst Distress Scale (TDS), Visual Analog Scale (VAS) and Interdialytic Weight Gain (IDWG)

Of the total respondents, 56.82% of respondents in the intervention group experienced moderate thirst and 43.18% with heavy thirst before low sodium management intervention with TDS measurement. In the control group, 11.36% of respondent experienced with mid thirst and 43.18% of moderate thirst and 45.45% of heavy thirst before intervention done. After intervention of low sodium management, of 2.27% of respondents in the intervention group experienced mild thirst, 90.91% experienced moderate thirst and 6.82% with heavy thirst. In the control group, after intervention, 6.82% of respondents experienced mild thirst, 52.27% of moderate thirst and 40.91% of heavy thirst.

Based on VAS measurement, before intervention 56.82% of respondents from the intervention group experienced moderate thirst and 43.18% experienced heavy thirst. In the control group, 11.36% of respondents experienced mild thirst, 47.72% of moderate

thirst and 40.91% of heavy thirst. While after intervention in the intervention group there were 2.27% respondents experienced mild thirst, 90.91% experienced moderate thirst and 6.82% with heavy thirst. And in the control group there were 6.82% of respondents experienced mild thirst, 59.09% experienced moderate thirst and 34.09% with heavy thirst.

The results also shows that there were 6.8% of respondents experienced mild IDWG, 59.1% of respondents experienced moderate IDWG and 34.1% of respondents experienced heavy IDWG in the intervention group before given low sodium diet management; while in the control group there were 4.5% of respondents experienced mild IDWG, 81.8% of respondents experienced moderate IDWG and 13.6% with heavy IDWG. After low sodium diet management in the intervention group, 22.7% of respondents experienced mild IDWG and 77.3% of respondents experienced moderate IDWG, and in the control group there were 4.5% of respondents experienced mild IDWG, 77.3 of respondents with moderate IDWG and 18.2% with heavy IDWG.

Table 2 Distribution of TDS, VAS and IDWG

	Pretest						Posttest					
	Mild		Moderate		Heavy		Mild		Moderate		Heavy	
	F	%	F	%	F	%	F	%	F	%	F	%
Intervention												
TDS	0	0	25	56.82	19	43.18	1	2.27	40	90.91	3	6.82
VAS	0	0	25	56.82	19	43.18	1	2.27	40	90.91	3	6.82
IDWG	3	6.80	26	59.10	15	34.10	10	22.70	34	77.30	0	0
Control												
TDS	5	11.36	21	43.18	18	45.45	3	6.82	23	52.27	18	40.91
VAS	5	11.36	21	43.18	18	45.45	3	6.82	26	59.09	15	34.09
IDWG	2	4.50	36	81.80	6	13.60	2	4.50	34	77.30	8	18.20

Thirst Before and After Low Sodium Management Treatment

Wilcoxon Signed Rank Test result showed that there was a difference of thirst between before and after low sodium diet management intervention in the intervention group measured by TDS and VAS. But these results differ from the control group. In the control group, the results of data processing showed that there was no difference of thirst between before and after low sodium management treatment measured by TDS and VAS.

There were 37 respondents in the intervention group had a decrease of TDS score and 7 respondents with TDS 'no difference' with significant value 0.000 ($p < 0.05$) after low sodium diet management. For VAS

measurement there were 30 respondents on intervention group had a decrease of VAS score and 14 respondents with VAS 'no difference' with significant value 0.000 ($p < 0.05$) after low sodium management treatment. In the control group, there were 17 respondents had an increase of TDS score, 10 respondents had a decrease of TDS score and 17 respondents with TDS 'no difference' and significant value 0.399 ($p > 0.05$) after low sodium diet management treatment. At the same time, the result of VAS measurement showed that there were 9 respondents had an increase of VAS score, 13 respondents had a decrease of VAS score and 22 persons with 'no difference' and significant value 0.577 ($p > 0.05$) after low sodium diet management.

Table 3 Thirst response after intervention of low sodium diet

	Mean Rank			p value
	Increase	Decrease	No difference	
Intervention				
TDS	0	37	7	0.000
VAS	0	30	14	0.000
Control				
TDS	17	10	17	0.399
VAS	9	13	22	0.577

Influence of Low Sodium Diet Management on Hemodialysis Patients

The Mann Whitney test results that there was a difference of thirst as measured by TDS after low sodium diet management in the intervention and control group with a

significance $p = 0.008$ ($p < 0.05$). The same result is also shown on thirst as measured by VAS, which there was a difference of thirst intensity after low sodium diet management in the intervention and control group with a significance $p = 0.048$ ($p < 0.05$)

Table 4 Low sodium management influence of thirst in chronic renal failure patients

Thirst	Intervention	Control	P value
	Mean Rank	Mean Rank	
TDS			
Pretest	47.45	41.55	0.276
Posttest	37.36	51.64	0.008
VAS			
Pretest	45.27	43.73	0.772
Posttest	39.45	49.55	0.048

DISCUSSION

Low sodium diet management provides significant benefits for thirst reduction in hemodialysis patient due to fluid retention. These results are consistent with previous study that increased sodium salt intake in excess of body requirements will result in an increase in plasma osmotic pressure, resulting in an osmotic thirst response as a mechanism for fluid and electrolyte balance ([Stachenfeld, 2008](#)). It is also acknowledged that in addition to salt can cause dry mouth and the consequence is increased drinking response, low-salt diet conduct also increased blood pressure of hemodialysis patient ([Leshem, 2015](#)).

The number of respondents who had a decrease of thirst respondent was more in the intervention group compared with the control group because the respondents in the intervention group carried out the low sodium diet treatment that researchers had designed in their life for 3 weeks under the supervision of researchers. In addition, within 3 weeks of treatment, researchers also carried out the repeated education continuously and home visits as a form of supervision of the education.

Decreased thirst also occurred in the control group but fewer in number than the intervention group. This occurs because the hemodialysis patients treated in hemodialysis unit of Adam Malik Medan Hospital also obtains the same information about low sodium diet for hemodialysis patient from the researchers and the nurse on hemodialysis unit. While the researchers did not perform

the repetitive and continuous educational actions as well as the home visits in this control group as a form of educational supervision.

Continuous education and supervision can improve the self-management behavior of patient every day that shown by reducing the daily salt intake behavior. Reducing daily salt intake behavior is one form of patient adherence toward hemodialysis regimen management.

Dietary behavior is a very complex and greatly affects the treatment. The cause of non-compliance with the sodium restriction diet is the lack of patient acceptance of the bland taste resulting from the sodium, lack of knowledge and acceptance of the patient on low-salt foods and lack of socialization of health workers on low-salt diet ([McMahon et al., 2012](#)).

Adherence to salt or sodium restriction can be achieved if there is a synergy between patient, family (caregiver) as well as health workers. Low sodium diet management applied in this study is a synergy approach that is meant by doing education, counseling guidance and home visit as a form of observation with expectation of positive behavior for patient in accordance with education.

CONCLUSION

Based on these results, it can be concluded that low sodium food management (consisting of education, counseling and home visits) has an effect in reducing the thirst response in

patients with end-stage renal disease with hemodialysis. This study provides an understanding that education supported by counseling and supervision can improve understanding and compliance of hemodialysis patients against diet and fluid restriction policies.

Declaration of Conflicting Interest

None declared.

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Author Contribution

All authors contributed equally in this study.

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