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Factors Affecting Interdialytic Weight Gain (IDWG) in Hemodialysis Patients with Precede-Proceed Theory Approach

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Abstract. Patients with End Stage Renal Disease (ESRD) who receive hemodialysis often failed to undergo treatment of diet and fluids are recommended. This condition can cause Interdialytic Weight Gain (IDWG) increases. Increased IDWG is also found in hemodialysis patients in Hemodialysis Unit RSU Haji Surabaya. Higher IDWG is strongly associated with mortality and can reduce the effectiveness of the treatment and cause unpredictable disease progression and a high likelihood of complications, but factors related to IDWG in hemodialysis patients in RSU Haji Surabaya still inexplicable. It is important to know the factor related to IDWG in order to make an appropriate intervention to the patients. This study aimed to analyze factors affecting interdialytic weight gain in hemodialysis patients RSU Haji Surabaya. Cross sectional study design involved 79 total sampling respondents. Independent variables were fluid intake, thirst, self efficacy, and stress. Dependent variable was interdialytic weight gain. Data were obtained using questionnaire then analyzed with Spearman rho with degree of significant $p \leq 0.05$. IDWG increase in hemodialysis patients was significantly associated with fluid intake ($p = 0.006$; $r = 0.304$), thirst ($p = 0.001$; $r = 0.382$), and self efficacy ($p = 0.035$; $r = -0.237$). The increasing of IDWG can be avoid by controlling fluid intake, thirst management, and improving patient self efficacy. Nurse hemodialysis is expected to make an appropriate strategy management so that IDWG increase can be controlled. Further research suggested to examine the intervention or nursing model that may suppress IDWG increase in hemodialysis patients.

1. Introduction

The prevalence of chronic kidney disease increases with the increasing number of elderly people, diabetes mellitus and hypertension. The results of a systematic review and meta-analysis conducted by [1], found a global prevalence of CKD of 13.4%. Data from the Indonesian Nephrology Association (Pernefri) in 2016 obtained from 169 dialysis unit in Indonesia recorded 30.554 active patients undergoing dialysis in 2015.

The main problem that occurs in patients undergoing hemodialysis is weight gain between two hemodialysis times or called Interdialytic Weight Gain (IDWG) [2]. Interdialytic Weight Gain (IDWG) is an increase in the volume of fluid that is manifested by weight gain as an indicator to determine the amount of fluid entering during the interdialytic period and the client's compliance with fluid management in clients who receive hemodialysis therapy [3]. Data in July 2017 in the hemodialysis unit at RSU Haji Surabaya, daily patient visits averaged 30 patients, while monthly visits



averaged 800 patients. An increase in IDWG was also found in hemodialysis patients at the Hemodialysis Unit of RSU Haji Surabaya. The total clients who underwent regular hemodialysis 2 times or weeks were 100 patients and CKD sufferers with IDWG still above 3 kg there were 68 patients or 32%. Whereas a total of 68% of patients have an IDWG below 3 kg or still within normal limits [4]. Observations at the end of August 2017 in patients randomly selected were seven patients, five of whom experienced an increase in IDWG. Patients with an increase in IDWG when assessed said that it was difficult to withstand thirst, difficulty limiting fluid intake, especially during hot weather conditions, and stressful mind conditions. Factors related to the increase in IDWG of RSU Haji Surabaya hemodialysis patients are still unexplained.

Limiting fluid intake in CKD clients is very important, because excessive intake of fluid can lead to rapid weight gain (over 5%), edema, ronkhi in the lungs, swollen eyelids and shortness of breath caused by excessive fluid volume and uremic symptoms [3]. The increase in IDWG can be caused by various factors, both internal factors including age, gender, education level, thirst, stress, self efficacy, and external factors, namely family and social support and the amount of fluid intake [5]. PRECEDE PROCEED theory examines the problem of human behavior and the factors that influence it [6]. The assessment process at the PRECEDE stage and the follow-up process is in the PROCEED stage [7]. Health behavior is influenced by several factors, namely predisposing factors in the form of demography, thirst, fluid intake, self-efficacy, and stress, enabling factors including hemodialysis and health infrastructure, as well as driving factors. in the form of family social support. Risk factors for increasing IDWG based on Green Law theory predisposing factors include thirst, fluid intake, self-efficacy, and stress. It is important to know the factor related to IDWG in order to make an appropriate intervention to the patients. This study aimed to analyze factors affecting interdialytic weight gain in hemodialysis patients RSU Haji Surabaya.

2. Research Method

This study used correlation with the cross sectional approach. Population in this study were all clients who underwent regular hemodialysis therapy in Hemodialysis Unit RSU Haji Surabaya with a total of 79 patients. The sampling technique used is total sampling so that the study sample were 79 patients. The independent variables in this study were fluid intake, thirst and self efficacy. The dependent variable in this study was Interdialytic Weight Gains (IDWG).

The instrument used was a questionnaire containing several questions related to the factors that contributed to the IDWG. Liquid intakes are measured using a observation sheet recording the intake output fluid from the Fluid Balance Record. Thirst is measured using the Visual Analogue Scale (VAS). Self efficacy was measured using the Bandura theory development questionnaire [8]. All questionnaires have been tested for validity and reliability so that they can be declared valid and reliable. IDWG is measured by weighing the patient's weight after hemodialysis on the first day of data collection and before hemodialysis in the second data collection and calculating the difference. IDWG instrument used is in accordance with the standard of an ISO certified medical instrument and a calibration test is carried out once a year. Data were analyzed using the Spearman Rho test with significance level of $p \leq 0.05$. This research has fulfilled the ethical feasibility requirements by the Faculty of Nursing Health Ethics Research Commission of Universitas Airlangga by letter number 591-KEPK ethical assessment certificate dated December 5, 2017.

3. Results

Table 1 showed that majority of respondents (77.2%) had an age range of 46-59 years, more than half of respondents (53.2%) were female, and almost half of respondents (46.8%) had the last educational background were high school.

Table 1. Characteristics of Respondents (n=79)

Variable	n	%
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Age		
21-35 years old	4	5.1
36-45 years old	14	17.7
46-59 years old	61	77.2
Sex		
Man	37	46.8
Woman	42	53.2
Education		
Ungraduate elementary school	4	5.1
Elementary school	8	10.1
Junior high school	13	16.5
Senior high school	37	46.8
University	17	21.5

Table 2 shows that most of the respondents' fluid intake in the category excess were 71 respondents (89.9%), the frequency of thirst with a percentage of heavy thirst were 29 respondents (36.7%), self efficacy is in the high category that were 40 respondents (50.6%), stress in the normal category or not experiencing stress that is equal to 41 respondents (51.9%), and half of the respondents had an increase in IDWG in the mild category were 42 respondents (53.2%).

Table 2. Factors influence IDWG (n=79)

Variable	n	%
Fluid intake		
Less	5	6.3
Moderate	3	3.8
Excess	71	89.9
Thirst		
Mild	22	27.8
Moderate	28	35.4
Severe	29	36.7
Self Efficacy		
Mild	17	21.5
Moderate	22	27.8
Severe	40	50.6
Stress		
Normal	41	51.9
Mild	8	10.1
Moderate	9	11.4
Severe	16	20.3
Very heavy	5	6.3

IDWG

Normal	12	15.2
Mild	42	53.2
Moderate	23	29.1
Severe	2	2.5

Table 3. The relationship between fluid intake and *interdialytic weight gain* (IDWG)

Variable	IDWG								Total		
	Normal		Mild		Moderate		Severe		f	%	
	f	%	f	%	f	%	f	%			
Fluid intake	Less	2	2.5	2	2.5	1	1.3	0	0.0	5	6.3
	Moderate	3	3.8	0	0.0	0	0.0	0	0.0	3	3.8
	Excess	7	8.9	40	50.6	22	27.8	2	2.5	71	89.9
Total	12	15.2	42	53.2	23	29.1	2	2.5	79	100.0	
<i>Spearman rho test</i>				p = 0.006				r = 0.304			

Table 3 showed that spearman rho statistical test results showed that $p = 0.006$ or $p \leq 0.05$ which means that there was a significant relationship between fluid intake and interdialytic weight gain (IDWG), the results of the calculation of correlation coefficients obtained $r = 0.304$ which means that the variables have a weak relationship.

Table 4. The relationship between thirst and *interdialytic weight gain* (IDWG)

Variable	IDWG								Total		
	Normal		Mild		Moderate		Severe		f	%	
	f	%	f	%	f	%	f	%			
Thirst	Mild	6	7.6	14	17.7	4	5.1	0	0.0	24	30.4
	Moderate	5	6.3	17	21.5	6	7.6	0	0.0	28	35.4
	Severe	1	1.3	11	13.9	13	16.5	2	2.5	27	34.2
Total	12	15.2	42	53.2	23	29.1	2	2.5	79	100.0	
<i>Spearman rho test</i>				p = 0.001				r = 0.382			

Table 4 showed spearman rho test results obtained results $p = 0.001$ or $p \leq 0.05$, which means that there was a significant relationship between thirst and interdialytic weight gain (IDWG), the results of the calculation of the correlation coefficient is $r = 0.382$, which means that the thirst variable with IDWG has the strength of a weak relationship.

Table 5. The relationship between self efficacy and *interdialytic weight gain* (IDWG)

Variable	IDWG								Total		
	Normal		Mild		Moderate		Severe		f	%	
	F	%	f	%	f	%	f	%			
<i>Self Efficacy</i>	Mild	2	2.5	9	11.4	4	5.1	2	2.5	17	21.5
	Moderate	2	2.5	9	11.4	11	13.9	0	0.0	22	27.8
	Severe	8	10.1	24	30.4	8	10.1	0	0.0	40	50.6
Total	12	15.2	42	53.2	23	29.1	2	2.5	79	100.0	
<i>Spearman rho test</i>				p = 0.035				r = -0.237			

Table 5 tell us that statistical result using spearman rho test showed the results of $p = 0.035$ or $p \leq 0.05$ which means that there was a significant relationship between self efficacy and interdialytic weight gain (IDWG), the results of the calculation of correlation coefficients obtained $r = -0.237$ which means between self efficacy and IDWG has an inverse relationship with weak relationship.

4. Discussion

4.1. Relationship between fluid intake and interdialytic weigh gain (IDWG)

Respondents with excessive fluid intake had a tendency to experience an increase in IDWG in the light category, moderate category or even heavy category, although found a number of respondents did not experience an increase in IDWG even though with excessive fluid intake. Respondents with fluid intake in the sufficient category had a tendency to not increase IDWG, and none of the respondents experienced an increase in IDWG in the mild, moderate or severe categories. Whereas respondents with fluid intake in the less category experienced a mild and moderate increase in IDWG. Spearman rho statistical test results show a significant relationship between fluid intake and interdialytic weight gain (IDWG), the results of the calculation of the correlation coefficient is known that the relationship between variables has strength in the weak category.

El-Sharkawy reveals that in a healthy condition, the body can respond to disturbances in fluid and electrolyte balance to prevent or repair damage [9]. The average adult fluid intake is approximately 2200 to 2700 ml per day, which consists of oral intake of about 1100 to 1400 ml, food at approximately 800 to 1000 ml, and 300 ml of oxidative metabolism per day. But in the case of patients with chronic renal failure undergoing hemodialysis limiting fluid intake. This is based on the opinion of ferraz that as many as 60% -80% of patients undergoing hemodialysis die due to excess fluid and food input in the interdialitic period [10]. Kalantar-Zadeh states that weight gain due to fluid (overfluid) becomes one of the prognoses of kidney failure that affects survival time. That is, the greater the weight gain, the lower the level of safety [11].

Researchers argue that fluid intake is related to the patient's body because fluid intake directly increases the patient's body mass. Fluid intakes in patients with chronic renal failure are very difficult to eliminate in the body because kidney regulation in eliminating fluids is very limited or fails. IDWG is in line with the amount of body fluid input that cannot be eliminated by the kidneys, resulting in a weight gain gradient between dialysis periods. However, the results of the relationship between variables are weak, as from the results of the study, it was found that the respondents even though the excess fluid intake did not experience an increase in IDWG. Excess fluid intake is a final form of individual behavior in response to responses. This opinion is in accordance with the PRECEDE PROCEED theory that individuals have a process of forming behavior and the factors that influence it. Excess fluid intake will affect IDWG and lead to a decrease in the quality of life of respondents. Decreasing quality of life will make respondents in the phase of outcome / evaluation. The evaluation phase is the last faser that provides feed back to improve the behavior of the source of the outcome. Therefore, respondents with a long period of undergoing hemodialysis will be very compliant with fluid intake restrictions.

Some respondents with less fluid intake were also found to experience an increase in IDWG. The researcher believes that the increase is possible because of the factor of fluid intake from food consumed by respondents. Food is not taken into account by the respondent as a component of fluid that enters the body. In addition, the respondent during the interdialysis time at home was not monitored directly by the researcher in filling in fluid intake.

Evaluation of respondents based on PRECEDE PROCEED theory is also supported by research by Kahraman et.al that involving three respondents with a qualitative approach. The results showed that there was a significant effect of early detection of IDWG with quality of life and physical well-being of patients [3]. Patients with a good understanding of the importance of quality of life will have optimal IDWG control, patients have a tendency to adhere to a therapy program when compressing the good and bad effects of a behavior that has been done.

4.2. Relationship between thirst and interdialytic weigh gain (IDWG)

Respondents who had thirst in the heavy category tended to experience a variety of IDWG increases, a number of respondents experienced an increase in the IDWG in the light category, moderate category, and even a small percentage in the heavy IDWG category. However, respondents with mild thirst also experienced an increase in IDWG, namely in the category of mild IDWG, as well as the medium category. Spearman rho statistical test results revealed that there was a significant relationship between thirst and interdialytic weight gain (IDWG), the results of the calculation of the correlation coefficient showed that the variables had a weak relationship strength.

Salt plays an indirect role in increasing patient IDWG. High salt concentration in the body will increase body fluid retention, regulation of the retention process promoted by the hormone Aldosterone in the kidneys. The high concentration of salt in the body gives rise to a thirsty response thus increasing fluid intake during the interdialysis period. Usually sodium food intake is a factor that stimulates the most thirst [12]. CKD clients, even with hypervolaemia, often experience excessive thirst which is one of the stimuli for thirsty sensations [2]. Responding to normal thirst is by drinking, but PGK clients are not allowed to respond in a normal way to the thirst they feel. Thirst is a common sensation based on a combination of the actions of several types of sensors, some inside the periphery and others on the central nervous system sensors. The thirst control center is located inside the hypothalamus. Diencephalons, especially the hypothalamus, play a dominant role in integrating these afferent inputs [13].

Researchers argue that thirst arises in hemodialysis patients in addition to the Surabaya environment which tends to heat as well as unregulated salt intake well in the patient's body. This thirst encourages the patient to drink, the increase in intake of drinking the liquid makes the respondent also increases IDWG. This is in line with Istanti [14] research that thirst or desire to drink is caused by various factors including sodium intake, high sodium levels, decreased potassium levels, angiotensin II, increased ureaplasma, increased plasma urea, post-dialysis hypovolemia and factors psychological. Some respondents were found to have thirst in the medium and severe categories but did not experience an increase in IDWG. Researchers argue that thirst is an individual's subjective response. As per the PRECEDE PROCEED theory the thirst response is in the third phase where individuals are able to assess the condition of the body that has experienced a lack of fluid intake. Healthy individuals usually respond by increasing fluid intake. Hemodialysis patients who already have a good understanding of fluid restriction will enter the keemat phase, individuals will consider the danger of increasing IDWG due to following thirst desires to increase fluid intake. This underlies the respondents despite having moderate or severe thirst, but not accompanied by an increase in fluid intake.

4.3 Relationship between self efficacy and interdialytic weigh gain (IDWG)

Respondents with self efficacy in the high category still experienced an increase in IDWG even though it was only in the light category and medium category. Whereas respondents with low self efficacy have a tendency to increase IDWG which is more diverse ranging from mild to severe. Some respondents with high self efficacy were found to have experienced an increase in IDWG in the mild and moderate categories.

Self efficacy can affect the client's confidence in undergoing therapy (hemodialysis). High self efficacy is needed to generate motivation from within to be able to adhere to therapy and control fluid well so as to prevent an increase in IDWG [14]. Xhulia et.al involving 19 respondents with renal failure patients undergoing hemodialysis. The results showed social support and motivation related to adherence to limiting fluid intake in patients with kidney failure [15]. This indicates that the respondent's social support factor is one of the determinants in shaping the compliance of fluid intake so that it has implications for the increase of IDWG in the light and medium categories.

Researchers argue that self efficacy can influence patient confidence in managing fluid intake and output during interdialysis periods. High self efficacy can shape the patient's psychological feelings to behave in accordance with the recommendations set for patients undergoing hemodialysis to avoid an

increase in IDWG. Based on the PRECEDE PROCEED theory, self efficacy is one component of predisposing factors. Self efficacy directly influences the behavior and lifestyle of a person. There are many factors that influence self efficacy so as to stop the occurrence of belief into a behavior such as environmental and biological factors. Hot environmental factors, social influences, availability of resources, and the biological condition of the body which are decreasing are likely to contribute more directly to the occurrence of IDWG in these respondents.

5. Conclusion

Excessive fluid intake increases the respondent's IDWG significantly because it influences the increase in respondents' dry weight. High thirst increases significantly the respondent's IDWG because thirst triggers a desire to increase fluid intake. Low self efficacy increases the respondent's IDWG significantly because self efficacy forms the patient's confidence aspect to manage the balance of body fluids so that there is no increase in IDWG. Hemodialysis nurses to further improve education and monitoring fluid intake so as not to increase the IDWG at home (home care).

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