

Interdialytic Weight Gain (IDWG) and Complications of Intradialysis among Hemodialized Patients

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ABSTRACT

Background: Hemodialysis is beneficial for patients with chronic renal failure but has side effects. Hemodialysis patients should be able to maintain an interdialytic bodyweight < 1.5 kg to minimize intradialytic complications. This study was to determine the relationship between gender, age, duration of hemodialysis with interdialytic weight gain (IDWG) and complications of intradialytic at Panembahan Senopati Hospital, Bantul, Yogyakarta, Indonesia.

Method: This research was an analytic observational quantitative study with a cross-sectional design. The sample in this study were 132 patients at Panembahan Senopati Hospital, Bantul. The sampling technique used consecutive sampling. The instruments were weight scales, IDWG observation sheets and intradialytic complications observation sheets. Bivariate analysis using the Somers test.

Result: Most of the respondents were male (54.5%), taking blood pressure drugs (78.0%), the late elderly (31.1%), and undergoing hemodialysis > 24 months (76.5%). The majority of respondents experienced increased IDWG and mild complications. Bivariate analysis between sex, age, and duration of HD with IDWG were p0.963, p0.568, and p0.608. The bivariate test results between sex, age, HD duration, and IDWG with intradialytic complications were obtained p0.551, p0.980, p0.417, and p0.001.

Conclusions: There was no association between sex, age, and duration of HD with IDWG and intradialytic complications, whereas changes in IDWG were associated with intradialytic complications.

KEY WORDS

chronic kidney disease, hemodialysis, weight gain

INTRODUCTION

The incidence of Chronic Kidney Disease (CKD) is 13.4% in the world. The incidence of CKD stage 3-5 in Europe is 11.86%. The incidence of CKD in Japan, South Korea and Oceania was 11.73%. The incidence of CKD in Iran is 11.68%, while in China, Taiwan and Mongolia, the prevalence is 10.06%. India and Bangladesh were the countries with the lowest majority, namely 6.76%¹⁾. The bulk of CKD in Indonesia, according to Basic Health Research in 2018, was 3.8%. This incidence rate has increased from 2013, which amounted to 0.2%.

One of the medical therapies in CKD patients is hemodialysis. The number of active hemodialysis patients in Indonesia in 2016 was 52,835, and new patients were 25,446 patients²⁾. Hemodialysis has many benefits, but some unexpected side effects can occur. Side effects or complications of intradialytic that can occur are hypertension, muscle cramps, dizziness, nausea, chills, hypotension, headaches, chest pain, arrhythmias, and vomiting³⁻⁴⁾. The incidence of intradialytic hypotension is related to a history of heart disease, hemodialysis time, albumin levels and weight gain between hemodialysis times⁵⁾.

Interdialytic Weight Gain (IDWG) is calculated by measuring body

weight after the first hemodialysis. Before the second hemodialysis, it is weighed again, and the difference is calculated⁶⁾. Normal IDWG value should be less than 1.5 kg or < 20 ml/kg⁷⁾. The increase in IDWG was caused by internal and external factors. Internal factors such as age, gender, level of education, thirst, stress, self-efficacy. External factors are family support and fluid intake^{8,9)}. A high amount of fluid intake that exceeds predetermined regulations will cause a high IDWG value¹⁰⁾.

An increase in IDWG that is too high results in increased blood pressure. Intradialytic hypertension is experienced by most patients who experience an increase in body weight of 1-5 kg¹¹⁾. A study on 69,819 patients found that 34,107 hemodialysis patients with IDWG > 1.5 kg had a 2-year higher risk of death. Whereas HD patients with IDWG < 1.0 kg survived with a lower risk of cardiovascular death. Cardiovascular problems are the leading cause of death for hemodialysis patients in Indonesia, 41%²⁾. This study aims to determine the relationship between gender, age, duration of hemodialysis with interdialytic weight gain (IDWG) and intradialytic complications at Panembahan Senopati Hospital, Bantul, Yogyakarta, Indonesia.

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Table 1: Distribution Characteristics of Respondent

Characteristics of Respondent	Frequency(f)	Percentage (%)
Gender		
Male	72	54.5
Female	60	45.5
Blood Pressure Medication		
Yes	29	22.0
No	103	78.0
Age		
Early adulthood	12	9.1
Late adulthood	20	15.2
Early elderly	39	29.5
Late old age	41	31.1
Old age	20	15.2
Length of Hemodialysis		
New	3	2.3
Moderate	28	21.2
Old	101	76.5
IDWG Changes		
Decreased	5	3.8
Same	12	9.1
Increased	115	87.1
Intradialytic Complication		
No Complication	9	6.8
Mild Complication	106	80.3
Moderate Complication	17	12.9

METHODS

Study Design

This study used a quantitative observational analytic study with a cross-sectional design. Research and data collection was carried out at the Senopati Bantul Hospital, Yogyakarta, Indonesia, conducted on April 8-20, 2019. The independent variables in the study were gender, age, length of hemodialysis, and IDWG. The dependent variables in this study were IDWG and intradialytic complications.

Samples

The population in this study was 198 patients with chronic renal failure undergoing hemodialysis at Panembahan Senopati Hospital, Bantul. Samples were taken based on inclusion and exclusion criteria. The inclusion criteria were routine hemodialysis patients undergoing hemodialysis ≥ 3 months, hemodialysis patients twice a week, the level of awareness of compliments patients with GCS value 15, and willingness to become respondents. Exclusion criteria were hemodialysis inpatients, travelling hemodialysis patients, and patients with a history of DM. The sample is calculated using the Slovin formula with the desired error rate. The model in this study was taken by a consecutive sampling method totalling 132 respondents.

Instruments

The research instruments used were digital weight scales, questionnaires, standard operating procedures, and observation sheets. The questionnaire was used to examine gender, age, and duration of hemodialysis. Weight scales are used to measure IDWG. Standard operating procedures are used to guide weight weighing. Observation sheets were used to measure intradialytic complications and IDWG documentation.

Data Collection

Interdialytic weight gain (IDWG) is the difference in body weight in the second pre-hemodialysis schedule and the respondent's first

post-hemodialysis schedule in one week. IDWG results are categorized as "Decreased" if the second pre HD weight is $<$ the first post HD weight, "Same" if the second pre HD body weight is the same as the first pre HD weight, and "Increased" if the second pre HD weight $>$ the first post HD weight. An intradialytic complication is a characteristic number of difficulties felt by the respondent during the intradialytic process. The measurement method is done by asking questions and observing respondents directly related to intradialytic complications of muscle cramps, headaches, chest pain, nausea, vomiting, feeling weak, fever, hypotension/hypertension and chills. Complications were categorized into no complications, mild difficulties if 1-3 complications occurred, moderate if 4-6 complications occurred, and severe when 7-9 complications occurred.

Respondents' ages were categorized into early adulthood (26-35), late adulthood (36-45), early elderly (46-55), late old age (56-65) and old age (65-up). Length of HD was categorized as new (< 12 months), moderate (12-24 months), and old (> 24 months). Each respondent was met 2 times. The first meeting aimed to measure post HD bodyweight. The second meeting was held in the HD schedule and then sought to measure pre HD bodyweight and observe complications during hemodialysis. The first and second meetings were held in the same week. Intradialytic complications were measured by monitoring the patient's condition during the HD procedure.

Data Analysis and Ethical Consideration

The type of statistical test used in this study is the Somers test with an alpha of 0.05. The ethical approval was obtained from the Health Ethics Committee of Faculty Health Sciences of Respati Yogyakarta University with an approval number of 014.3/FIKES/PL/II/2019. The study permission was also obtained from the Director of Regional Public Hospital Senopati Bantul Yogyakarta, Indonesia, with an approval number 070/1789. The study permission was also obtained from the Regional Development Planning Agency of Yogyakarta, Indonesia, with an approval number 070/Reg/0698/S1/2019. This research is ethically following the Declaration of Helsinki, all respondents involved have signed informed consent, and all data on respondents are anonymous.

RESULTS

Sample Characteristic

Table 1. known that the majority of patients undergoing hemodialysis at Panembahan Senopati Bantul Hospital are male, using blood pressure medications, late elderly aged 56-65 years, have undergone hemodialysis > 24 months. The majority of patients had an increase in IDWG and had mild complications.

Factors Associated with Changes in IDWG in Hemodialysis Patients

Table 2 shows that male and female patients experience the most increase in IDWG. Patients with the most elderly age range experienced a rise in IDWG. All categories of hemodialysis duration were found to have an increase in IDWG. Based on the Somers test between sex, age, and time of hemodialysis with changes in IDWG, it was obtained $p = 0.963$, $p = 0.568$, and $p = 0.608$. This means that there is no relationship between gender, age, and duration of hemodialysis with changes in IDWG at Panembahan Senopati Hospital, Bantul.

Factors Associated with Intradialysis Complications

Table 3 shows that the majority of male and female respondents experienced mild intradialytic complications. All age categories found that the majority experienced soft type intradialytic difficulties. The longer the HD a patient has, the greater the number who experience mild and moderate complications. Patients who experience an increase in IDWG experience more moderate intradialytic difficulties. Based on the Somers test between sex, age, length of hemodialysis, and changes in IDWG with intradialytic complications, it was found that $p = 0.551$, $p = 0.980$, $p = 0.417$, and $p = 0.001$. This means that there is no relationship between sex, age, duration of hemodialysis with intradialytic complications. Simultaneously, changes in IDWG have a relationship with the incidence of intradialytic complications at Panembahan Senopati

Table 2: Factors Associated with Changes in IDWG in Hemodialysis Patients

Variables	IDWG (Kg)								P-Value
	Decrease		Same		Increase		Total		
	f	%	f	%	f	%	F	%	
Gender									
Male	3	2.3	6	4.5	63	47.7	72	5.5	0.963
Female	2	1.5	6	4.5	52	39.4	60	45.5	
Total	5	3.8	12	9.1	115	87.1	132	100.0	
Age									
Early adulthood	0	0.0	2	1.5	10	7.6	12	9.1	0.568
Late adulthood	0	0.0	2	1.5	18	13.6	20	15.2	
Early elderly	3	2.3	1	0.8	35	26.5	39	29.5	
Late old age	2	1.5	3	2.3	36	27.3	41	31.1	
Old age	0	0.0	4	3.0	16	12.1	20	15.2	
Total	5	3.8	12	9.1	115	87.1	132	100.0	
Duration of Hemodialysis									
New	0	0.0	0	0.0	3	2.3	3	2.3	0.608
Moderate	2	1.5	3	2.3	23	17.4	28	21.1	
Old	3	2.3	9	6.8	89	67.4	101	76.5	
Total	5	3.8	12	9.1	115	87.1	132	100.0	

Table 3: Factors Associated with Intradialysis Complications

Variables	Intradialytic Complication								P-Value
	No		Mild		Moderate		Total		
	f	%	f	%	f	%	F	%	
Gender									
Male	2	1.5	62	47.0	8	6.1	72	54.5	0.551
Female	7	5.3	44	33.3	9	6.8	60	45.5	
Total	9	6.8	106	80.3	17	12.9	132	100.0	
Age									
Early adulthood	2	1.5	9	6.8	1	0.8	12	9.1	0.980
Late adulthood	1	0.8	14	10.6	5	3.8	20	15.2	
Early elderly	3	2.3	32	24.2	4	3.0	39	29.5	
Late old age	2	1.5	34	25.8	5	3.8	41	31.1	
Old age	1	0.8	17	12.9	2	1.5	20	15.2	
Total	9	6.8	106	80.3	17	12.9	132	100.0	
Length of Hemodialysis									
New	0	0.0	3	2.3	0	0.0	3	2.3	0.417
Moderate	2	1.5	24	18.2	2	1.5	28	21.1	
Old	7	5.3	79	59.8	15	11.4	101	76.5	
Total	9	6.8	106	80.3	17	12.9	132	100.0	
IDWG Changes									
Decreased	1	0.8	3	2.3	1	0.8	5	3.8	0.001
Same	5	3.8	7	5.3	0	0.0	12	9.1	
Increased	3	2.3	95	72.7	17	12.1	115	87.1	
Total	9	6.8	106	80.3	17	12.9	132	100	

Hospital, Bantul.

DISCUSSION

The results showed that the majority of patients experienced an increase in IDWG. The results of the study support previous research that most respondents experienced excess weight gain above 2.5 kg dry body weight where dry body weight is the ideal body weight of the respondent¹². Dry weight is the bodyweight without excess fluid that has accumulated between the two hemodialysis treatments. This dry

weight can be equated with the weight of people with healthy kidneys after urinating¹³. Interdialytic Weight Gain (IDWG) is the patient's weight gain between two dialysis times¹⁴. The IDWG changes experienced by respondents have experienced a decline or increase. This shows that the changes in the IDWG for each patient who underwent HD did not always rise, there were patients whose IDWG values were fixed, and some even decreased⁹.

The ability to carry out independent care during hemodialysis, especially the management of IDWG, is influenced by the results of the interaction between knowledge, attitudes and actions of patients in carrying out a diet obtained through their own experiences or other people, or other sources of information such as media¹⁵. Management of thirst

or burning sensation due to fluid restriction is carried out by patients by lowering body temperature by bathing or gargling. Several other patients have been able to minimize thirst by reducing foods that stimulate appetite, such as salt, chillies, monosodium glutamate (MSG) and limiting daily activities¹⁶.

IDGW did not have a significant relationship with gender, age, and duration of hemodialysis. The internal factors such as age, gender, education level and length of hemodialysis did not affect the IDWG score¹⁵. The weight gain between the two hemodialysis times is determined by the patient's ability to manage interdialytic fluid intake¹⁷. Optimal fluid diet counselling, the respondent's level of understanding with the given material, family, and the patient are factors that influence the decline in IDWG scores¹⁸. The benefits of pre-dialysis counselling include increasing patient adherence to health professionals' recommendations and treatment options¹⁹. Counselling is needed by patients in complicated situations and as a precaution for better monitoring of care²⁰.

An intradialytic complication is a characteristic number of difficulties felt by the respondent during the intradialytic process. The results showed that the majority of HD patients at Panembahan Senopati Bantul Hospital had mild intradialytic complications. Patients are said to have mild difficulties if they have one to three characteristics of intradialytic complications. These results support the previous research, where most respondents had few complications, namely less than 2 intra hemodialysis complications¹¹.

Based on gender, respondents who experienced the most intradialytic complications were men compared to women. The most men before being diagnosed with chronic kidney failure had a history of smoking frequently and often drinking energy drinks as dopping due to their daily work as labourers and traders, so that respondents felt the need for dopping so that the body could be more substantial. Carry out daily activities²¹. The increase in the incidence of chronic renal failure in men is associated with poor lifestyle in patients, such as smoking, alcohol, staying up late, not drinking water, lack of exercise and drinking lots of supplement drinks and eating fast food²². Tobacco consumption is associated with CKD development and is a significant cause of morbidity and mortality in patients with CKD²³.

Intradialytic complications can occur at all age levels, but the older a person is, physiologically the function of the organs of the body will also decrease. The changes in kidney function with normal ageing increase the susceptibility of elderly patients to renal dysfunction and kidney failure²⁴. The decrease in mean normal LFG per year with increasing age from the peak GFR (about 120 mL/min per 1.73 m²) achieved in the third decade of life is about 1 mL/min per year per 1.73 m², reaching a mean value of about 70 mL/min per 1.73 m², at the age of 70²⁵.

The longer people undergo HD, the opportunity for patients to be more adaptive to the therapy program. On the other hand, the longer you experience HD, the higher the potential for complications that can actually hinder adherence to therapy programs. The most common type of complication experienced by patients is hypertension which occurred during the last 3-4 hours of HD. The most common complications are hypotension, angioaccess infection, headaches and hypertensive crises²⁶. The causes of hypertension in patients undergoing hemodialysis are activation of the sympathetic nervous system, fluid overload, increased blood viscosity, activation of the renin-angiotensin system and shifting of electrolytes²⁷.

The most common complications during hemodialysis are frequency, hypotension, cramps, nausea and vomiting, headache, chest pain, back pain, and itching²⁸. Pain experienced in dialysis patients is caused by multifactorial causes²⁹. These symptoms are consistent in various studies and are associated with a more inferior quality of life³⁰. The observation result showed that none of the patients experienced vomiting complications during the intradialytic. These results support previous researchs, wherein almost all clients did not experience nausea and vomiting in their study. Intradialytic nausea and vomiting can be affected due to hemostatic problems in the blood, lack of O₂ will cause emetogenic reactions in the digestive system, and there will be a very uncomfortable feeling in the throat, excessive salivation, complaints of headaches. And the urge from the stomach to expel the contents of the gastrointestinal tract, if the patient is unable to adapt to this situation, will cause a vomiting reaction^{31,32}.

IDWG changes have a significant relationship with intradialytic complications. Respondents who experienced the most difficulties were respondents whose IDWG scores had increased-however, some patients with a fixed IDWG value or experience a decline experience complications. The increase in IDWG experienced by most patients was 2 kg, more than the standard rate, which should be < 1.5 kg. These results support previous study, which states that there is an effect of excess

weight gain on the incidence of complications of heart failure in chronic kidney failure patients undergoing hemodialysis therapy¹². An imbalanced amount of fluid can cause pulmonary oedema or hypertension in 2-3 hemodialysis patients¹³. The addition of excessive IDWG values can cause adverse effects on the body, namely hypotension, muscle cramps, shortness of breath, nausea and vomiting³³. Patients who experienced an increase in IDWG did not experience complications because the growth in IDWG experienced by patients was within the normal range. Usually, the IDWG value should be less than 1.5 kg or < 20 ml/kg⁷.

In the patients with chronic renal failure, the weight between the two hemodialysis periods should be maintained as increase in IDWG will affect the patient's life. Hemodialysis patients are repeated patients. They are regularly scheduled for dialysis at the hospital, so nurses play an important role in the success of patient management. Nurses make efforts to keep their IDWG normal. Patients who experience an increase in IGDW will face quality of life problems in various domains. The increase in IGDW causes the quality of life in the physical health domain to be poor³⁴. High IDGW causing a decrease in blood pressure (hypotension), shortness of breath, muscle cramps, nausea and vomiting³⁵. Another source states that every 1% increase in IDGW causes predialic systolic blood pressure to increase by 1.00 mmHg and postdialic blood pressure to decrease³⁶. The psychological domain of the quality of life of patients with increase of IDGW may also deteriorate. The increase in IDGW is in line with poor physical condition and getting worse, this causes worsening of the patient's psychological condition. Patients often experience fear, frustration, and feelings of anger arise in him. HD patients who experience physical and psychological problems will also affect the quality of life in the social relationship domain and the environmental domain. Hemodialysis patients perceive their quality of life at a low level and in social and environmental relationships the patient will withdraws from social activity³⁴.

Increased IDGW and high IDGW have a negative effect on hemodialysis patients which is fatal to death. Knowledge, behavior, and patient non-compliance in fluid restriction are the main causes of the increase in IDGW. Lack of knowledge about Chronic Kidney Failure, especially about IDWG and fluid restriction due to the lack of information from health workers because low education and socioeconomic levels it is not possible to get information from other sources such as the internet or seminars³⁷. Nurses are health workers who have the most contact with hemodialysis patients. Patients regularly meet with nurses during the hemodialysis implementation schedule. So nurses play an important role in increasing patient knowledge about Chronic Kidney Failure and IDGW. Health promotion is the right way to carry out this role. Nurses can carry out health promotion with several methods such as individual health education, groups, peer education, counseling, and etc. With enough knowledge and good patient compliance, expected to be able to keep the patient's IDGW at normal levels, so that poor patient conditions can be avoided and life expectancy can be longer.

CONCLUSION

The results showed no relationship between sex, age, and HD duration with IDWG and intradialytic complications. At the same time, IDWG changes had a relationship with intradialytic complications in patients undergoing hemodialysis at a hospital in Yogyakarta, Indonesia. Changes in IDGW are proven to be associated with difficulties in patients during hemodialysis, so patients need to keep IDGW regular. Fluid and dietary restrictions in patients undergoing hemodialysis are the keys to keeping IDGW stable.

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CONFLICT OF INTEREST

There was no conflict of interest in this study.

ETHICAL CONSIDERATION

Data collection held after receiving the Ethical clearance No: 014.3/FIKES/PL/II/2019 from Ethic Commission of Respati Yogyakarta University.

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