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Duration, Compliance, and Value of Interdialytic Weight Gain in Chronic Kidney Disease Patients Undergoing Hemodialysis

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ABSTRACT

Background: Chronic Kidney Disease (CKD) is a life-threatening problem. CKD patients who require hemodialysis therapy experience a significant increase; one of the important indicators in hemodialysis therapy is interdialytic weight gain (IDWG). In practice, there are still cases where patients experience high IDWG, which is suspected to be due to non-compliance with the schedule or length of hemodialysis sessions.
Objectives: This study aimed to determine the relationship between frequency and compliance with the value of IDWG in CKD patients undergoing hemodialysis.
Methods: This quantitative study uses a correlative analytical research method with a cross-sectional approach. The population was 47 chronic kidney failure patients undergoing hemodialysis at the Muhammadiyah Mayong Hospital, Jepara. The instruments used were weight scales, patient medical records, and End-Stage Renal Disease Adherence Questionnaire (ESRD-AQ) questionnaires. Bivariate analysis in this study used the Spearman Rho test.
Results: The results of this study are that most respondents have undergone hemodialysis for more than 12 months, as many as 20 respondents (42.6%); respondents who are compliant with hemodialysis are 25 respondents (53.2%); and most respondents experienced a mild weight gain category of 16 respondents (34%). There is a relationship between the length of time (p-value = 0.001, r= 0,762) and hemodialysis compliance (p-value = 0.003, r= 0,578) with the interdialytic weight gain value in chronic kidney disease patients undergoing hemodialysis at the hospital.
Conclusion: Frequency and compliance have a relationship with the value of IDWG in CKD patients undergoing hemodialysis. The correlation between two variables are direct and positive means that the more compliant with HD, the value of IDWG is lower.

KEYWORDS
Compliance, chronic kidney disease, frequency, hemodialysis, IDWG

INTRODUCTION

Chronic Kidney Disease (CKD) remains a major global health problem with continuously increasing morbidity and mortality, particularly in developing countries. Global Burden of Disease (GBD) data show that CKD-related mortality increased by 50% in 2020, making it one of the fastest-growing causes of death worldwide (Kovesdy, 2022). The global prevalence of CKD exceeds 10% of the population, with hundreds of millions affected, and the number of patients requiring hemodialysis continues to rise annually. These epidemiological trends highlight CKD not only as a clinical issue but also as a social and economic burden for patients, families, and health systems (Zhang et al., 2023).

In Indonesia, the burden of CKD is similarly increasing, as reflected in national and regional data. Reports from the Indonesian Renal Registry and Riskesdas indicate a growing number of patients undergoing routine hemodialysis, accompanied by substantial mortality rates. Central Java, including Semarang, is among the provinces with a high number of hemodialysis patients, underscoring the relevance of CKD management at secondary or regional hospitals. Despite advances in renal replacement therapy, hemodialysis remains a lifelong treatment for most patients and does not restore kidney function,

thereby requiring long-term adherence and self-management (Srianti et al., 2021)

One of the most critical clinical indicators in hemodialysis management is Interdialytic Weight Gain (IDWG), which reflects fluid accumulation between dialysis sessions. Excessive IDWG is associated with serious complications, including hypertension, pulmonary edema, heart failure, and increased mortality. Previous studies consistently report that IDWG exceeding 5% of dry body weight significantly elevates the risk of adverse cardiovascular outcomes. Therefore, controlling IDWG is a key target in improving the prognosis and quality of life of CKD patients undergoing hemodialysis transplant (Lubis & Thristy, 2023; Kristanti et al. 2024)

Various factors can cause improvement in IDWG, including internal factors, such as age, gender, education level, thirst, stress, and self-efficacy, as well as external factors, such as family and social support and amount of fluid intake (Safitri et al., 2022). It was further explained that hemodialysis patients must undergo hemodialysis compliance, incredibly limiting fluid intake (Wayunah et al., 2022). If the patient ignores compliance with fluid restrictions, it can cause complications up to death due to hyperkalemia, pulmonary oedema, shortness of breath, and re-hospitalization (Sari et al., 2020).

Ideally, a CKD patient's ability to adapt to their condition aligns with their time on HD therapy. On the other hand, a longer duration of hemodialysis increases the possibility of other problems that can interfere with patients carrying out treatment therapy. Research by Making, Betan, Israfil, and Tuesday (2022) states that there is a relationship between hemodialysis duration and IDWG in hemodialysis patients from Professor W.Z Johannes Hospital, Kupang City.

Based on an initial survey conducted at PKU Muhammadiyah Mayong Hospital on August 25 2024, the number of patients undergoing hemodialysis was 47, with an HD frequency of 2 times per week. Based on a preliminary study of 10 people undergoing hemodialysis, five people (50%) had IDWG above 4% or moderate category, two people above 6% in the dangerous category and three less than 4% in the mild category. This research aims to analyze the relationship between hemodialysis frequency and compliance with the Interdialytic Weight Gain value in Chronic Kidney Disease patients undergoing hemodialysis.

Existing literature has identified multiple factors influencing IDWG, including demographic characteristics, thirst, self-efficacy, stress, family support, fluid intake, duration of hemodialysis, and treatment compliance. Studies have shown that longer duration of hemodialysis may lead to physical and psychological fatigue, which in turn reduces patient adherence to dialysis schedules and fluid restrictions. However, many studies have examined these factors separately, with limited integration between hemodialysis duration and compliance as combined determinants of IDWG, particularly in real-world clinical settings.

Notably, there remains a gap in research that analytically examines how hemodialysis duration and patient compliance interact to influence IDWG, especially in secondary or regional hospital contexts where resource limitations and patient characteristics

may differ from tertiary centers. Therefore, this study aims to explicitly analyze the relationship between hemodialysis duration and compliance with interdialytic weight gain (IDWG) among CKD patients undergoing hemodialysis, with the goal of providing evidence-based insights to improve fluid management and treatment adherence in regional hospital settings.

METHODS

This research uses a correlative analytical design with a cross-sectional approach. The independent variables are frequency and compliance with hemodialysis, while the dependent variable is the value of interdialytic weight gain. This research was conducted at a private Islamic hospital in Jepara Regency in January 2025. The sample for this study was 47 chronic kidney failure patients undergoing hemodialysis, which was determined based on the total sampling technique. Inclusion criteria were patients diagnosed with CKD, undergoing hemodialysis, aged > 18 years, compos mentis awareness, and able to read and write. Exclusion criteria were uncooperative patients who had difficulty communicating and did not participate in the research process. The instrument used to obtain research data is a weight scale with the GEA brand model EB 1622 and series 1622 HD with proper, reasonable, and calibrated conditions valid until October 2025. This questionnaire has been translated into Indonesian and has undergone validity and reliability testing by (Ambakaraeng, 2024) all items in the variable are valid with a calculated r value > r table 0.6319 at a significance level of 0.05. The reliability test results using Cronbach's Alpha value show that all items in the variables of treatment, general information, and hemodialysis have a value above 0.60. Researchers use patient medical records to identify health history, medical conditions, diagnoses, treatment, and medical procedures the patient receives.

RESULT AND DISCUSSION

Table 1 explains that most respondents were men, 27 (57.4%). The average age of the respondents is 55.9 years, with a standard deviation of 8.298. Respondent: Those with a high school education or equivalent were 20 respondents (42.6%). Most respondents in the study were employees, 12 respondents (25.5%).

Table 1. Characteristics of hemodialysis patients (n=47)

Characteristics	f	%	Mean	SD
Age (years)	-	-	55.9	8,298
Gender				
Man	27	57.4	-	-
Woman	20	42.6	-	-
Education				
No school	3	6.4	-	-
Elementary School/Equivalent	5	10.6	-	-
Middle School/Equivalent	17	36.2	-	-
High School/Equivalent	20	42.6	-	-
College	2	4.2	-	-
Work				
Does not work.	10	21.3	-	-
Housewife	4	8.5	-	-
Labourer	9	19.1	-	-
Employee	12	25.5	-	-
Farmer	10	21.3	-	-
Government employees	2	4.3	-	-
Amount	**47**	**100**	**-**	**-**

Table 2 explains that Most of the respondents had undergone hemodialysis for more than 12 months or more than one year, 20 respondents (42.6%). Respondents who adhered to hemodialysis were 25 respondents (53.2%). Respondents who experienced mild weight gain (IDWG) were 16 respondents (34%).

Table 2. Duration of hemodialysis, hemodialysis compliance, and IDWG scores (n=47)

Variable	f	%
Duration		
< 12 months	19	40.4
12-24 months	20	42.6
>24 months	8	17
Hemodialysis compliance		
Comply	25	53.2
Not obeying	22	46.8
IDWG Value		
Normal	3	6.4
Light	16	34.0
Currently	15	31.9
Heavy	13	27.7
Amount	**47**	**100**

Table 3 shows that respondents who had undergone HD between 12 and 24 months experienced the most weight gain in the moderate category, 10 (21.3%), and the heavy category, 7 (14.9%). The results of the Spearman rank test show a significant p-value of 0.001 with α=0.05. So, it can be concluded that there is a relationship between the duration of hemodialysis and the Interdialytic Weight Gain (IDWG) value in CKD patients undergoing hemodialysis at the PKU Muhammadiyah Mayong Jepara Hospital.

The cross-distribution between compliance with hemodialysis and IDWG values explains that respondents who adhered to undergoing HD experienced the most weight gain in the mild category, 14 (29.8%) and moderate, 5 (10.6%). The Spearman rank relationship test results show a significant p-value of 0.003 with α=0.05. So, it can be concluded that there is a relationship between hemodialysis compliance and the Interdialytic Weight Gain (IDWG) value in CKD patients undergoing hemodialysis at the PKU Muhammadiyah Mayong Jepara Hospital.

Table 3. Relationship between duration and adherence to hemodialysis with IDWG values

Duration hemodialysis	IDWG Value (%)				Total	%	p-value
	Normal	Light	Currently	Heavy			
< 12 months	3(6,4)	13(27.6)	3(6,4)	0(0)	19	40.4	0.001
12-24 months	0(0)	3(6,4)	10(21,3)	7(14.9)	20	42.6	
>24 months	0(0)	0(0)	2(4,2)	6(12,8)	8	17.0	
Total	**3(6,4)**	**16(34)**	**15 (31.9)**	**13 (27.7)**	**47**	**100**	
Hemodialysis compliance							
Comply	3(6,4)	14 (29.8)	5(10,6)	3(6,4)	25	53.2	0.003
Not obeying	0(0)	2(4,2)	10(21,3)	10(21,3)	22	46.8	
Total	**3(6,4)**	**16(34)**	**15 (31.9)**	**13 (27.7)**	**47**	**100**	

1. Relationship between duration of hemodialysis and IDWG value

The results of the study showed that there was a statistically significant relationship between the duration of hemodialysis and the IDWG value. These results indicate that the longer the patient undergoes hemodialysis, the more experience their IDWG ascension. An increase in IDWG is an indicator of fluid management in hemodialysis patients and can have an impact on quality of life and the risk of complications.

The results of this study are also supported by previous research from Wicaksono (2022), where 43 or (69.4%) of respondents had a hemodialysis duration of 12-24 months. Test statistics test data isomers obtained p-value = 0.000 (<0.05). This shows that statistically, there is a relationship between length of service hemodialysis and interdialytic weight gain (IDWG) at the Sultan Agung Islamic Hospital Semarang. The r value obtained is -0.599, meaning that one variable is high and the other is low.

Similar research from Sulistini et al. (2019) stated that the correlation and regression analysis tests showed that the p-value for the length of undergoing hemodialysis was 0.018, where the p-value < (0.05), so it could be concluded that there was a statistically significant relationship between the length of undergoing hemodialysis and interdialytic weight gain in hemodialysis patients in the Hemodialysis Room at Dr RSUP. Mohammad Hoesin Palembang. Furthermore, Putri (2023) concluded that the length of undergoing hemodialysis with increasing IDWG has a moderate correlation and a positive pattern, which means that the longer you undergo hemodialysis, the higher the increase in IDWG.

The longer you undergo hemodialysis, the more often you will be exposed to the side effects of hemodialysis, both acute and chronic, and one of the side effects of hemodialysis is an IDWG upgrade. The higher the increase in IDWG, the longer it takes for the patient to undergo hemodialysis to withdraw fluid from the body. An increase in IDWG impacts and influences and reduces the quality of life of hemodialysis patients and can cause changes in the ability to carry out daily family functions (Purnama et al., 2021).

The longer you undergo hemodialysis, the higher the increase in IDWG will be. This aligns with research by Bayhakki & Hasneli (2019) that the longer you undergo hemodialysis, the more often you will be exposed to hemodialysis side effects, both acute and chronic, and one of the side effects of hemodialysis is an increase in IDWG. The higher the increase in IDWG, the longer the patient will undergo hemodialysis to withdraw fluid from the body. Dialysis efficiency may decrease due to factors such as fibrosis of the vascular access or changes in kidney health. If hemodialysis efficiency decreases, fluid cannot be removed optimally from the body, which causes IDWG to increase.

Adding an IDWG value that is too high can cause adverse effects on the body, including hypotension, muscle cramps, and shortness of breath—increased body weight during the interdialytic period results in various complications. This complication is hazardous for patients Because, During the interdialytic period, the patient is at home without supervision from health workers. As many as 60%-80% of patients die due to excess fluid and food intake during the interdialytic period (Istanti, 2020)

Longer duration of hemodialysis may be associated with increased Interdialytic Weight Gain (IDWG) through behavioral, psychological, and physiological mechanisms. From a behavioral perspective, patients undergoing long-term hemodialysis often experience treatment fatigue, which can reduce adherence to fluid restrictions over time. While adherence is typically higher during the early phase of therapy due to fear of complications and strong motivation, prolonged exposure to repetitive treatment routines and lifestyle limitations may lead to complacency and poorer fluid control.

Psychological factors further contribute to this association. Long-term hemodialysis patients are more likely to experience chronic stress, emotional exhaustion, and reduced self-efficacy, all of which negatively affect health behaviors. International studies consistently report higher levels of depression and psychological distress among long-term dialysis patients, which are closely linked to non-adherence to

fluid management and increased IDWG. These findings suggest that elevated IDWG is not merely due to insufficient knowledge, but rather to diminished psychological capacity to sustain adaptive behaviors over time.

Physiologically, prolonged hemodialysis is associated with progressive loss of residual renal function and altered fluid regulation, leading to increased thirst and fluid accumulation between dialysis sessions. International literature supports a positive correlation between longer hemodialysis duration and higher IDWG, although findings vary across settings, likely due to differences in patient education and multidisciplinary support. Theoretically, these results highlight the importance of nursing interventions that go beyond initial education, emphasizing long-term behavioral support, self-efficacy enhancement, and continuous monitoring to maintain adherence and control IDWG in chronic hemodialysis patients.

2. Relationship of hemodialysis compliance with IDWG values

The results of the study showed that there was a statistically significant relationship between hemodialysis compliance and IDWG scores. This shows that patients who comply can maintain the increase in IDWG within normal limits. If the increase in IDWG exceeds the limit or weight category, it can cause complications in the patient.

Testing The hypothesis that has been carried out has been able to answer the problem formulation posed at the beginning of the research, namely that there is a relationship between compliance with hemodialysis and interdialytic weight gain (IDWG) in patients on hemodialysis. This is supported by research by Wijayanti et al. (2024), concluding a relationship between hemodialysis compliance and increased IDWG in hemodialysis patients at Dr. H. Abdul Moeloek Lampung Province with a p-value of 0.013. Patients who do not comply with hemodialysis according to schedule will experience more significant fluid accumulation because the time between dialysis sessions is longer, which causes an increase in IDWG. On the other hand, patients who comply with the dialysis schedule have shorter time intervals between sessions so that body fluids can be better regulated, reducing IDWG.

Other research by Siamben et al. (2021) states that there are differences between compliance restrictions fluid ($p<0.05$) and Intradialytic Weight Gain value ($p<0.05$) before and after the intervention. Well-controlled IDWG, through compliance, can improve the general health condition of CKD patients and their overall quality of life. Apart from that, (Aziza et al., 2019) stated that the majority experienced interdialysis weight gain between 4-6% as many as 32 respondents (42.1%). A relationship exists between fluid diet compliance and CKD patients' interdialysis weight gain (IDWG). Patients who do not adhere to a low-sodium diet are at risk of increased fluid retention and, ultimately, increased IDWG.

Patients who adhere to hemodialysis will maintain better fluid balance in the body. Each hemodialysis session will remove accumulated fluid so that IDWG can be controlled. Conversely, non-compliance or skipping hemodialysis sessions can cause fluid buildup between sessions, which improves IDWG. Then, by adhering to the hemodialysis

schedule, excess fluid load on the kidneys can be reduced, which helps maintain heart condition and prevents an increase in blood volume that can affect IDWG. On the other hand, HD patient non-compliance can increase the patient's IDWG, where the excess fluid exceeds the standard norm (500 ml+ output urine), and free intake of foods high in sodium in patients causes the patient's condition to worsen (W. Wijayanti et al., 2019).

Adherence to hemodialysis is an important behaviour in ineffective management. Compliance is a series of clinical consequences that hemodialysis patients must endure (Ozen et al., 2019). Compliance with hemodialysis Suboptimal treatment, diet, and the presence of hemodialysis will cause clinical harm to the patient. When patients do not undergo this and become non-compliant, it will decrease the patient's quality of life (Fauzi et al., 2021).

Fauzi et al. (2021) stated that fluid intake is too liberal in HD patients, and patients not maintaining HD compliance can cause an increase in fluid, an increase in circulatory load, shortness of breath caused by pulmonary oedema, anasarca oedema, and anxiety. Further increase of IDWG indicates patient compliance with fluid management, as obtained from measuring the patient's dry body weight. The influence of non-compliance with fluids and diet in HD patients can have adverse effects on patients.

An increase in the patient's dry body weight that exceeds 6% can increase the patient's danger level and cause various complications such as hypotension or hypertension. This condition can reduce the effectiveness of HD, QB or engine speed is not achieved, and the patient's blood clearance is not optimal. This condition will affect HD patients indirectly and affect the patient's HD adequacy. (Kurniawati et al., 2019)

Based on the results of this study, researchers argue that adherence to hemodialysis not only influences IDWG scores but also reflects the extent to which patients understand and comply with pharmacological treatment. Therefore, continuous assistance and emotional support from the family are priorities in the management of CKD patients undergoing HD. This is important to improve the patient's quality of life while minimizing the risk of long-term complications.

Research Limitation

This study did not consider other variables affecting IDWG, such as patient nutritional status and physical activity levels, that may be important in hemodialysis outcomes and IDWG. In addition, researchers did not control for the use of other drugs or additional therapies that may affect interdialytic weight. Patient monitoring was only carried out for a limited period. This may not be able to describe better changes in IDWG in CKD patients undergoing regular hemodialysis. The cross-sectional design restricts the ability to infer causal relationships between hemodialysis duration, treatment adherence, and interdialytic weight gain (IDWG).

CONCLUSSION AND RECOMMENDATION

The results showed the longer and more obedient you are in the hemodialysis process, the Interdialytic Weight Gain value in CKD patients will decrease. Longer hemodialysis duration appears to act

as a risk factors likely due to treatment fatigue, reduced motivation, and progressive physiological changes affecting fluid regulation. In contrast, better adherence to hemodialysis schedules and fluid restrictions serves as a protective factor by facilitating adequate fluid removal and preventing excessive interdialytic fluid accumulation.

Hospitals need to improve health education programs in fluid management, low-salt diets, and the importance of adherence to therapy schedules. Hospitals can also develop technology-based reminder systems to help remind patients of hemodialysis schedules. The research results can be integrated as study material in the student learning process at both the academic and clinical stages, especially in medical-surgical nursing courses. Future research can identify other factors related to interdialytic weight gain, such as quality of life, stress levels, comorbid conditions, etc.

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