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THE RELATIONSHIP OF INTERDIALYTIC WEIGHT GAIN IS ASSOCIATED WITH INTRADIALYSIS HYPERTENSION IN HEMODIALYSIS PATIENTS

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ABSTRACT
One of the complications in the hemodialysis process is intradialysis hypertension. Hemodialysis patients also often experience increased interdialytic weight gain (IDWG). IDWG and intradialysis hypertension are each associated with patient mortality and morbidity. This study was conducted to determine the relationship between interdialytic weight gain and intradialysis hypertension in hemodialysis patients at one of the hospitals in Depok. This research method is quantitative with cross sectional design. A total of 92 hemodialysis patients who met the inclusion criteria were selected using purposive sampling technique. Data were collected using a respondent characteristics questionnaire, IDWG scoring sheet, and intradialysis systolic blood pressure observation sheet. This research uses a respondent characteristics questionnaire, sheet IDWG assessment, and intradialysis systolic blood pressure observation sheet. This study also used a blood pressure monitor (sphygmomanometer digital) and digital weight scales that have been calibrated every three months by the Hospital. Data analysis in this study used univariate analysis in the form of frequency distribution, and bivariate analysis in the form of the Spearman Correlation Test to analyze the relationship between interdialytic weight gain and intradialysis hypertension. The results showed that 37% of respondents were 55-64 years old; 53.3% were female; 48.9% had a high school education; 76.1% of respondents did not work; 75% of respondents had an economic status of <Rp4,878,612.00 (below Depok's minimum wage); 80.4% had a history of hypertension; 52.2% had undergone hemodialysis for 6-12 months; 54.3% had ≥2 comorbidities; 59.8% took ≥2 anti-hypertensive drugs; and 81.5% had a fluid intake of ≥500 ml per day. Based on Spearman correlation test, there was a relationship between interdialytic weight gain and intradialysis hypertension in hemodialysis patients at one of the hospitals in Depok ($p = 0.014$; $r = 0.255$). Monitoring IDWG and the incidence of intradialysis hypertension is important to pay attention to so that its impact can be prevented, so that the mortality and morbidity rates of patients do not increase in the future.

Keywords: hemodialysis; IDWG; interdialytic weight gain; intradialysis hypertension

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INTRODUCTION

Chronic renal failure is an ongoing and increasing health problem that affects more than 10% of the world's population (Centers for Disease Control and Prevention, 2022). Based on data from the World Health Organization (WHO) (2020), chronic kidney failure is one of the ten diseases that are the leading cause of death in the world. The Asian region alone contains more than 4.5 billion people, equivalent to 60% of the total global population to date. Among this population, it is estimated that 434.3 million adults suffer from chronic renal failure, including 65.6 million who have advanced chronic renal failure (Liyanage et al., 2022), while in Indonesia, the incidence of chronic renal failure has been recorded at 713,783, with the highest cases in West Java province at 131,846 (Balitbangkes RI, 2018). In 2018, in Depok City there was an increase of 5.05% or 696 new cases of chronic kidney failure (Dinas Kesehatan Kota Depok, 2018).

Hemodialysis is one of the kidney function replacement therapies that is generally performed when chronic kidney failure patients have experienced a decrease in glomerular filtration rate (GFR) of around 15% (National Kidney Foundation, 2022). In Indonesia, the number of active hemodialysis patients in 2020 amounted to 130,931 patients (IRR, 2020). The hemodialysis process can also cause complications. Studies have shown that intradialysis complications that can occur include infection, thrombosis, amyloidosis, muscle pain, vascular access complications, disequilibrium syndrome, and cardiovascular disorders (Habas et al., 2021). Based on research by Ali et al. (2021), the most common intradialysis complications are intradialysis hypotension, intradialysis hypertension, and nausea and vomiting.

Intradialysis hypertension may increase the risk of cardiovascular complications, such as heart failure, stroke, or myocardial infarction (Iatridi et al., 2023). Therefore, the incidence of intradialysis hypertension will impact patient morbidity and mortality (Assimon, Wang & Flythe, 2018; Iatridi et al., 2022). According to Ayunarwanti & Maliya (2020), several things affect the incidence of intradialysis hypertension including age, gender, Interdialytic Weight Gain (IDWG) more than normal, length of hemodialysis, and the amount of antihypertensive drugs consumed. Other studies also state that one of the risk factors that can cause intradialysis hypertension is excess fluid volume (Nongnuch et al., 2015). This is evidenced by the results of research by Ramadhan et al. (2023) which shows that of several intradialysis complications, one of which is intradialysis hypertension, the majority is found in patients with IDWG levels that are not high.From the results of the preliminary study conducted, hemodialysis patients in one of the West Java Hospitals experienced an increase in intradialysis hypertension, the incidence of intradialysis hypertension in patients tends to occur more often. The high number of cases of chronic kidney failure in West Java, as well as the lack of research related to the relationship between IDWG and intradialysis hypertension in the Hospital, makes it necessary to conduct research.

METHOD

This study used a correlational design with a cross sectional approach. A total of 92 patients were selected using purposive sampling technique based on inclusion criteria, including chronic renal failure patients who undergo routine hemodialysis 2-3x a week at one of the hospitals in Depok, aged >18 years, and can communicate well. Interdialytic Weight Gain data was measured using the IDWG assessment sheet with the formula [current pre HD weight - previous post HD weight], while intradialysis hypertension was measured by observing intradialysis systolic BP at the 2nd hour and 3rd hour through the patient's hemodynamic monitor screen and recorded on the intradialysis systolic blood pressure observation sheet. In addition, there was also data collected through a respondent characteristics questionnaire, such as age, gender, education level, employment status, economic status, ethnicity, history of hypertension, length of hemodialysis, comorbidities, number of antihypertensive drugs, and fluid intake. This research uses a respondent characteristics questionnaire, sheet IDWG assessment, and intradialysis systolic blood pressure observation sheet. This study also uses a blood pressure monitor (sphygmomanometer digital) and digital weight scales that have been calibrated every three months by the Hospital. Data analysis in this study used univariate analysis in the form of frequency distribution, and bivariate analysis in the form of the Spearman Correlation Test to analyze the relationship between interdialytic weight gain and intradialysis hypertension. The researcher conducted a research ethics test. The research design has been reviewed and approved by the research ethics committee of UPN Veteran Jakarta, with a certificate of passing ethics number 210/V/2024/KEP.

RESULTS

Respondent Characteristics

Tabel 1, the results of the 92 respondents who were researched, IDWG scoring sheet, and intradialysis systolic blood pressure observation sheet. The results showed that 37% of respondents were 55-64 years old; 53.3% were female; 48.9% had a high school education; 76.1% of respondents did not work; 75% of respondents had an economic status of <Rp4,878,612.00 (below Depok's minimum wage); 44.6% were of Betawi ethnicity; 80.4% had a history of hypertension; 52.2% had undergone hemodialysis for 6-12 months; 54.3% had ≥2 comorbidities; 59.8% took ≥2 anti-hypertensive drugs; and 81.5% had a fluid intake of ≥500 ml per day.

Table 1.

Frequency Distribution of Respondent characteristics (n=92)

Responden characteristics	f	%
Age Variable Categories		
18-24 Years	0	0
25-34 Years	7	7.6
35-44 Years	15	16.3
45-54 Years	28	30.4
55-64 Years	34	37
65-74 Years	6	6.5
≥75 Years	2	2.2
Gender		
Man	43	46.7
Female	49	53.3
Education		
Elementary	10	10.9
Junior High School	18	19.6
Senior High School	45	48.9
College	19	20.7
Employment Status		
Unemployment	70	23.9
Work	22	76.1
History of Hypertension		
No History of Hypertension	18	19.6
History of Hypertension	74	80.4
Economic Status		
< Rp4.878.612,00	69	75
>= Rp4.878.612,00	23	25
Duration of Hemodialysis		
< 6 Months	25	27.2
6 - 12 Months	48	52.2
≥ 12 Months	19	20.7
Comorbidities		
< 2 Diseases	42	45.7
≥ 2 Diseases	50	54.3
Anti Hypertensive Drugs		
< 2 Drugs	55	59.8
≥ 2 Drugs	37	40.2
Fluid Intake		
< 500 ml	17	18.5
≥ 500 ml	75	81.5

Table 2.
Frequency Distribution of Variable Interdialytic Weight Gain (n=92)

Variable	Category	f	%
IDWG	< 1 Kg	11	12
	>= 1 Kg	81	88

Table 3.
Frequency Distribution of Variable Hipertensi Intradialisis (n=92)

Variable	Category	f	%
Hipertensi Intradialisis	No intradialysis hypertension (≤ 130 mmHg)	12	13
	Intradialysis hypertension (> 130 mmHg)	80	87

Analysis of the Relationship between Interdialytic Weight Gain and Intradialysis Hypertension in Hemodialysis Patients

Table 4.
Analysis of the Relationship between Interdialytic Weight Gain and Intradialysis Hypertension in Hemodialysis Patients (n=92)

Variable	*Spearman's rho*	*p value*
Interdialytic Weight Gain (≤ 130 mmHg)	0.255	0.014
Intradialysis hypertension (>130 mmHg)		

DISCUSSION

According to Dybiec et al. (2022), as a person ages, the kidney structure will also experience aging characterized by a reduction in renal mass, a decrease in renal parenchyma volume, fibromuscular dysplasia of the renal arteries, atherosclerotic narrowing, focal cortical thinning, thickening of the glomerular basement membrane, nephrosclerosis, extracellular matrix accumulation, and mesangial dilation. The occurrence of aging in the kidney structure can cause a decrease in the Glomerular Filtration Rate (GFR). According to research by Salsabila, Herman & Shafira (2023) the glomerular filtration rate decreases by about 8 ml/min/1.73m2 every ten years.In table 1, the results showed that 80.4% had a history of hypertension. This is in line with the results of research by Hayati, Widiany & Nofiartika (2021) at Panembahan Senopati Bantul Hospital that more than 40% of respondents experienced hypertension. Research by Adhiatma, Wahab & Widyantara (2017) at RSUD Tugurejo Semarang showed that there was a significant correlation between hypertension and chronic renal failure disease, as evidenced by the p value = 0.023 and OR value = 5.652. The results of Pranandari & Supadmi (2015) research at RSUD Wates Kulonprogo also proved a significant relationship between hypertension and the incidence of chronic kidney failure (p = 0.000; OR = 4.044). The association of hypertension with chronic renal failure is very strong. A person who has hypertension will eventually experience a decrease in perfusion in the kidneys resulting in decreased function in the glomerulus, while damaged kidneys can also lead to hypertension through several mechanisms, such as decreased nephron mass, sodium retention, extracellular volume expansion, sympathetic nervous system overactivity, activation of the renin-angiotensin-aldosterone system, and endothelial dysfunction (Ku et al., 2019; Nugraha, Sutarto & Utama, 2023).

The results of the study in table 1 show that as many as 52.2% of respondents have undergone hemodialysis for 6-12 months. In line with research by Saputra & Wiryansyah (2023) in the Hemodialysis Unit of Siti Fatimah Hospital, South Sumatra Province, that as many as 65.8% of respondents underwent hemodialysis for ≤ 12 months. Supported by research by Natalia et

al. (2023) which showed that 86.7% of respondents had undergone hemodialysis for > 6 months. In line with the results of research by Satti, Mistika & Imelda (2021) at Stella Maris Makassar Hospital, 84.8% of respondents have undergone hemodialysis for ≤ 5 years. The results showed that the longer the time a person underwent hemodialysis, the higher the IDWG value. From the results of this study, the researcher assumes that in patients who have been undergoing hemodialysis for a long time does not guarantee that patients are more compliant in limiting fluid and sodium intake.Based on the results of the study in table 1, as many as 54.3%. respondents had a number of comorbidities or comorbidities ≥2 diseases. Research by Aditama, Kusumajaya (2024) at Depati Bahrin Sungailiat Hospital in 2023 also stated that as many as 59.8% of patients with chronic renal failure had comorbidities. Research by MacRae et al. (2021) in Scotland showed that as many as 98.2% of patients with chronic renal failure had comorbidities. Research by Iatridi et al. (2023) in Northern Greece also showed that hemodialysis patients who experienced intradialysis hypertension all had comorbidities, with the most common type of comorbidity being hypertension (97.8%) followed by heart failure (40%) and diabetes mellitus (35.6%).

From the results of the study in table 1, it can be seen that more than half of the respondents (59.8%) took less than 2 anti-hypertensive drugs. In line with Aji (2018) at RSAU dr. Esnawan Antariksa which showed that as many as 71.2% of respondents took less than 2 anti-hypertensive drugs. The results of this study are not in line with the research of Tajili, Ridwan & Garina (2020) which states that most hemodialysis patients at Al-Ihsan Bandung Hospital take 2 anti-hypertensive drugs. Research by Suari, Asmara & Widiastuti (2022) at NTB Provincial Hospital in 2021 also showed that as many as 61.9% took more than 2 anti-hypertensive drugs. According to research by Diakité et al. (2020), patients who use two or more antihypertensive drugs have a higher chance of developing intradialysis hypertension compared to patients who use one or no antihypertensive drugs at all. This can occur because of the blood pressure of patients who take multiple drugs.Table 1 shows that 81.5% of respondents had a total fluid intake of ≥500 ml in one day. In line with the research of Suparmo & Hasibuan (2021) at Aminah Hospital, Tangerang City, that as many as 47.1% of respondents were not compliant with fluid restrictions. Based on research by Wahyuni et al. (2019), there is a significant relationship between fluid intake and IDWG ($p = 0.006$). This is also supported by research by Siagian & Trialvi (2020) that there is a significant relationship between fluid intake and IDWG ($p = 0.000$; $r = -907$) and there is an opposite relationship between fluid intake and IDWG, which means that the better the respondent's fluid intake, the lower the IDWG value.

From table 2, this study showed that 88% of respondents had IDWG ≥ 1 kg. In line with the research of Moustapha et al. (2018) that the average IDWG value of respondents was 2.04 kg with a standard deviation of 1.06 kg. Siagian & Trialvi's research (2020) on hemodialysis patients showed an average patient IDWG of 1.6 kg, with the lowest IDWG value being 0.65 kg and the highest IDWG value being 2.45 kg. Research by Diakité et al. (2020) showed that the increase in patients' blood pressure was more common in the second and third hours of hemodialysis sessions. Research by Kale et al. (2020) also observed patients' blood pressure in the second hour of the hemodialysis session, which is when significant ultrafiltration has occurred. Intradialysis hypertension can be caused by several risk factors, such as excess fluid volume, impaired endothelial function, sodium and potassium concentrations in dialysate, duration and frequency of hemodialysis, sympathetic nervous system activity, RAAS activation, age, serum albumin, and the use of antihypertensive drugs (Georgianos, Sarafidis & Zoccali, 2015; Ayunarwanti & Maliya, 2020; Diakité et al., 2020; Uduagbamen & Kadiri, 2021; Theofilis, Vordoni & Kalaitzidis, 2023).

Based on the Spearman test results in table 4, the p value = 0.014 was obtained, which means that the null hypothesis (H0) is rejected. So, it can be concluded that there is a relationship between interdialytic weight gain and intradialysis hypertension in hemodialysis patients at one of the hospitals in one of the hospitals in Depok. This study is in line with the research of Febrianti, Novitasari & Susanti (2023) at Siti Aisyah Hospital, Lubuklinggau City, that there is a significant relationship between IDWG and intradialysis hypertension as evidenced by the p value = 0.030 (p = <0.05). Research by Wibowo & Siregar (2020) at the University Hospital of North Sumatra also showed a significant relationship between moderate to severe IDWG and hemodialysis complications (p = 0.000), with the incidence of intradialysis hypertension in the study being 33.5%. In line with the results of Lestari & Saraswati's research (2020) that there is a correlation between IDWG and changes in intradialysis blood pressure (p = 0.001), with the prevalence of intradialysis hypertension in this study being 5%.The Spearman test results in this study also showed a value of r = 0.255, which means that there is a unidirectional relationship between IDWG values and intradialysis hypertension. This is supported by the research of Sobhi et al. (2021) in the Mohammed V Military Training Hospital hemodialysis unit, that higher IDWG values are associated with an increase in systolic (r = 0.18; p = 0.01) and diastolic (r = 0.2; p = 0.006) blood pressure levels. In the study, it was shown that every 1 kg increase in IDWG was associated with an increase of 3.3 mmHg in systolic blood pressure and 2.7 mmHg in diastolic and systolic blood pressure.

Ayunarwanti & Maliya's research (2020) also states that one of the things that affects the incidence of intradialysis hypertension is the value of Interdialytic Weight Gain (IDWG) which exceeds normal limits. This is also supported by the results of research by Ramadhan et al. (2023), that the majority of intradialysis hypertension is found in patients with severe IDWG levels. According to Georgianos, Sarafidis & Zoccali (2015) patients who experience fluid retention between hemodialysis sessions tend to experience intradialysis hypertension caused by increased heart load and vascular resistance due to excess fluid volume. The results of the Spearman test analysis in this study also showed a correlation coefficient value (r) = 0.255, which means that the relationship between IDWG and intradialysis hypertension is weak. Research by Wahyuni et al. (2019) has shown that there are several factors associated with increased IDWG, including fluid intake, thirst, and patient self-efficacy. According to Armiyati et al. (2021), hemodialysis patients with excessive ultrafiltration rates have a 29.52 times higher risk of intradialysis hypertension. In addition, according to recommendations from the Indonesian Renal Registry (IRR) (2020) the ideal QOB value is < 200ml/min, because if the QOB value is too high and the heart cannot provide balanced strength, it can cause intradialysis hypertension.The weak relationship between IDWG and intradialysis hypertension is different from the results of Dewi, Pujiastuti & Maria (2022) at RSPAU Dr. S. Hardjolukito Yogyakarta which showed no significant relationship between IDWG and intradialysis hypertension (p = 0.484). In this case, according to the researchers, the weak relationship between IDWG and intradialysis hypertension may occur because there are other factors that were not identified in this study, such as the level of fluid intake compliance, patient self-efficacy, ultrafiltration rate, quick of blood, and dialysate sodium concentration..

CONCLUSION

Interdialytic Weight Gain with Intradialysis Hypertension in Hemodialysis Patients at one of the hospitals in Depok has a significant relationship so that monitoring Interdialytic Weight Gain and the incidence of intradialysis hypertension and contributing risk factors are very important to pay attention to so that the impact can be prevented and the patient's mortality and morbidity rate does not increase in the future. It is hoped that this study can be a source of information for nurses regarding the importance of monitoring interdialytic weight gain

(IDWG) values and intradialysis hypertension in patients.

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