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The Relationship Between Inter-Dialytic Weight Gain (IDWG) and Post-Dialysis Blood Pressure Changes in Hemodialysis Patients at Prof. Dr. Margono Sookarjo Hospital

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Abstract

Chronic Kidney Disease (CKD) is a progressive chronic disease that may damage the function of kidneys and affect the stability of fluids and electrolytes in our body that will impact on our body's system. A usual alternative therapy that has been done to CKD's patients is Hemodialysis (HD). Inter-Dialytic Weight Gain (IDWG) is an increase in volume which is manifested by an increase in body weight as a basis for discovering the amount of incoming fluids within interdialytic process. IDWG and changes in post dialysis blood pressure are closely related to each other because in hemodialysis process, there is a diffusion exchange of dialysis fluids and dirty fluids in patient's body so that it may provide clinical manifestations of blood pressures' changes after hemodialysis process. To discover the relationship between Inter-Dialytic Weight Gain (IDWG) and the changes in post dialysis blood pressure among hemodialysis patients at Prof. Dr. Margono Soekarjo Regional Public Hospital. This research is an analytic observational research and using cross sectional approach. Sampling method with purposive sampling by the amount of 41 patients, and then the results were analyzed for its significance by using Somers'D test. The result of Somers'D test to discover the significance between variables were resulting in p value = 0,000(p<0,05) dan r = 0,746 for the relationship between IDWG and Changes in Post Dialysis Blood Pressure. There is a relationship between Inter-Dialytic Weight Gain and changes in post dialysis blood pressure among hemodialysis patients at Prof. Dr. Margono Soekarjo Regional Public Hospital, Purwokerto.

Keywords: Chronic Kidney Disease, Hemodialysis, Inter-Dialytic Weight Gain, Blood Pressure.

INTRODUCTION

The kidneys are vital organs that function to filter the blood by removing excess fluids, salts, and waste products, thereby maintaining the body's chemical balance. Chronic Kidney Disease (CKD) is a progressive chronic condition that can impair kidney function, affecting fluid and electrolyte balance and consequently impacting various body systems. CKD has become a major global health concern, including in Indonesia. The prevalence of this disease is high and continues to increase almost every year. The World Health Organization (WHO) (2013) reported that the global prevalence of CKD increased by 50% compared to the previous year. In the United States, the incidence of CKD also increased by 50% in 2014, and approximately 200,000 individuals undergo hemodialysis annually.

One of the treatment options for patients with CKD is hemodialysis (HD). Hemodialysis is performed to remove metabolic waste products or specific toxins from the bloodstream, such as excess urea, creatinine, uric acid, and other substances, through a semipermeable membrane. Hemodialysis is a process in which dissolved particles diffuse from the blood compartment across a semipermeable membrane. The procedure is based on two main principles: fluid restriction and the removal of metabolic waste products from the blood using a dialysis machine. Patients with CKD typically undergo hemodialysis two to three times per week, with each session lasting approximately four to five hours.

Weight gain that indicates fluid overload is known as Interdialytic Weight Gain (IDWG). IDWG refers to an increase in fluid volume manifested by weight gain and serves as an indicator of fluid intake during the interdialytic period. According to Neuman (2013), an IDWG that can be tolerated by the body should not exceed 3% of dry body weight. Dry body weight is defined as the body weight at which there are no clinical signs of fluid retention. The higher the IDWG, the greater the excess fluid accumulation in the patient's body and the higher the risk of complications.

The prevalence of hypertension among hemodialysis patients is reported to be 91% during the predialysis period. Elevated blood pressure during this period has a greater likelihood of occurring because intravascular fluid volume increases before being removed through the hemodialysis process. Although hypertension has various causes, the influence of body fluid volume on blood pressure in hemodialysis patients has long been recognized as a significant contributing factor. The relationship between body fluid volume, as reflected by IDWG, and elevated blood pressure in hemodialysis patients was further supported by a study conducted by Inrig et al. (2007), which found that every 1% increase in IDWG percentage was associated with a 1 mmHg increase in predialysis systolic blood pressure and a 0.65 mmHg decrease in postdialysis systolic blood pressure among hemodialysis patients. Several studies have also demonstrated that an IDWG exceeding 4.8% of dry body weight is associated with an increased risk of mortality in hemodialysis patients.

Fluid intake restriction is essential for maintaining health and preventing excessive increases in IDWG, thereby reducing the incidence of hypertension among hemodialysis patients. Furthermore, monitoring body fluid volume through routine body weight measurements and determination of IDWG should be performed carefully by nurses as a means of predicting and preventing the risks of morbidity and mortality, including hypertension.

Prof. Dr. Margono Soekarjo Regional General Hospital (RSUD Margono) is the largest hospital in Purwokerto and has a dedicated hemodialysis unit. Purwokerto is a city located in Banyumas Regency and is considered a rapidly developing urban area with a large population. Based on the background described above, the researchers aimed to investigate the relationship between Interdialytic Weight Gain (IDWG) and post-dialysis blood pressure among hemodialysis patients at Prof. Dr. Margono Soekarjo Regional General Hospital.

RESEARCH METHODS

This study used an observational cross-sectional analytical research design to link Interdialytic Weight Gain with changes in post-dialysis blood pressure at Prof. Dr. Margono Soekarjo Purwokerto Regional General Hospital in December 2019.

The data collected were primary data, collected directly from CKD patients, including weight and blood pressure measurements before and after the second dialysis session, and then compared the results between the two measurements. The sampling technique used in this study was purposive sampling, with a total of 41 patients who agreed to participate.

The data obtained were then analyzed using SPSS and presented in tabular and narrative formats. Univariate analysis was performed to examine frequency distribution using descriptive analysis, and bivariate analysis used the Somers' D test, a statistical test used to analyze the relationship between nominal and ordinal scales in research.

RESULTS AND DISCUSSION

The following are the research results data discussed univariately and bivariately:

Table 1. Demographic data of PGK patients.

Demographic Characteristics	Frequency (n)	Percentage (%)
Gender		
Male	24	58.54
Female	17	41.46
Age		
< 25 years	5	12.20
25–50 years	9	21.95
> 50 years	27	65.85
Education Level		
Low education level (Elementary School, Junior High School, Senior High School)	29	70.73
High education level (Diploma, Bachelor's Degree)	12	29.27
Employment Status		
Employed	34	82.92
Unemployed	7	17.08

The table shows that the frequency distribution of age for CKD patients undergoing routine hemodialysis is higher among those aged >50 years, namely 27 people (65.85%). The gender of CKD patients undergoing routine hemodialysis is higher in men than women, namely 24 people (58.54%). The last educational status of CKD patients undergoing routine hemodialysis is lower, namely elementary school-high school equivalent, namely 29 people (70.73%), and employment status shows that the majority of CKD patients undergoing routine hemodialysis have daily jobs, namely 34 people (82.92%).

Table 2. Distribution of IDWG status of CKD patients

IDWG Status	Frequency (n)	Percentage (%)
Heavy (>3,9%)	9	21,95
Moderate (3-3,9%)	7	17,07
Light (<3%)	25	60,97
Total	**41**	**100**

IDWG status is categorized as mild (<3%), moderate (3-3.9%), and severe (>3.9%). Based on the results obtained, the number of patients with mild IDWG was higher at 25 (60.97%), followed by severe at 9 (21.95%), and moderate at 7 (17.07%). This may occur because weight gain between dialysis sessions (IDWG) is closely related to the patient's fluid intake. In patients with high IDWG, this occurs because they do not follow instructions to limit their fluid intake. Fluid restriction is one of the therapies given to patients with end-stage renal disease, the goal being to prevent fluid overload.

Table 3. Distribution of blood pressure changes in CKD patients

TD Changes	Frequency (n)	Percentage (%)
Up	9	21,96
Down	32	78,04
Total	**41**	**100**

The results showed that the number of patients with decreased blood pressure was higher, at 78.04%. This may be influenced by the patient's fluid intake before undergoing HD. Excessive fluid intake before and during HD will manifest as increased post-dialysis blood pressure.

Table 4. Analysis of the relationship between IDWG and blood pressure changes.

Interdialytic Weight Gain (IDWG) Status	Blood Pressure Changes after HD		Total	R	P
	Up	Down			
Heavy (>3,9%)	9	0	9		
Moderate (3-3,9%)	0	7	7	0,746	0,000
Light (<3%)	0	25	25		
Total	9	32	41		

Based on the results of the Somers' d correlation test, a significant relationship was found between Interdialytic Weight Gain (IDWG) and post-dialysis blood pressure changes among patients with Chronic Kidney Disease (CKD) undergoing hemodialysis at Prof. Dr. Margono Soekarjo Regional General Hospital, Purwokerto. The relationship was statistically significant with a p-value of 0.000, indicating that there is a significant association between IDWG and post-dialysis blood pressure changes in hemodialysis patients at the hospital. These findings suggest that the higher the IDWG in hemodialysis patients, the greater the blood pressure changes experienced during hemodialysis.

The findings of this study are consistent with those reported by Abdiansyah (2017), who investigated the relationship between IDWG and predialysis blood pressure changes in hemodialysis patients. Abdiansyah (2017) found a significant relationship between IDWG and blood pressure changes ($p = 0.049$). Increases in blood pressure during hemodialysis may lead to congestive heart failure and pulmonary edema, whereas decreases in blood pressure during hemodialysis may increase the risk of impaired consciousness, cephalgia, nausea, vomiting, and discomfort.

The results of this study showed that the number of patients who experienced an increase in blood pressure was lower than those who experienced a decrease in blood pressure, accounting for 9 patients (21.96%) and 32 patients (78.04%), respectively. This may be attributed to the absence of excess fluid resulting from sodium consumption during the fluid removal process that occurs during dialysis. Hypotension occurring during or at the end of hemodialysis is generally caused by an increased ultrafiltration rate aimed at achieving the target dry body weight. However, some patients may experience an increase in blood pressure after dialysis, which may result from fluid overload due to excessive sodium intake before the dialysis session. Therefore, fluid intake restriction is necessary for all patients to prevent extracellular fluid overload.

In this study, 21.96% of respondents experienced an increase in blood pressure after undergoing hemodialysis. Intradialytic hypertension is defined as an increase in blood pressure resulting from resistance to ultrafiltration or an increase in systolic blood pressure of ≥10 mmHg from before to after hemodialysis. Based on the calculation of systolic blood pressure changes following hemodialysis compared with predialysis values, 9 patients (21.96%) experienced intradialytic hypertension.

Intradialytic hypertension may be caused by excessive fluid intake due to thirst, leading to increased extracellular fluid volume during hemodialysis; anxiety or stress, which increases sympathetic activity (increased stroke volume and/or vasoconstriction); the ultrafiltration process or fluid removal during hemodialysis, which reduces vascular volume and may excessively stimulate the Renin–Angiotensin–Aldosterone System (RAAS); and vascular damage caused by underlying diseases such as diabetes mellitus and hypertension, resulting in an imbalance between endothelial hormones (Endothelin-1) and nitric oxide (NO), both of which are vasoactive substances that contribute to endothelial dysfunction.

Another blood pressure alteration that may occur during hemodialysis is intradialytic hypotension, defined as a reduction in systolic blood pressure of ≥20 mmHg after hemodialysis compared with pre-hemodialysis values, accompanied by symptoms such as abdominal discomfort, drowsiness, nausea, vomiting, muscle cramps, restlessness, dizziness, and anxiety. The study results

indicated that 32 patients (78.04%) experienced intradialytic hypotension. Factors contributing to intradialytic hypotension include inadequate food intake due to nausea and vomiting, as well as the inability of the cardiovascular and neurohormonal systems to respond adequately to acute plasma volume removal during hemodialysis. IDWG and interdialytic blood pressure have a directly proportional relationship, where each 1% increase in IDWG percentage is associated with a 1.00 mmHg increase in predialysis systolic blood pressure and a decrease in post-dialysis blood pressure. This condition supports the occurrence of intradialytic hypotension.

Changes in body weight indicate fluid overload. The amount of fluid overload that can still be tolerated is approximately 0.5 kg per 24 hours between dialysis sessions relative to dry body weight. According to the researchers, Interdialytic Weight Gain (IDWG) is an important factor contributing to increased predialysis blood pressure in hemodialysis patients. Patients with high IDWG generally have a higher volume of body fluid, thereby increasing their risk of elevated blood pressure. According to the National Kidney Foundation Kidney Disease Outcomes Quality Initiative (NKF-KDOQI), the target blood pressure for hemodialysis patients is <140/90 mmHg during the predialysis period and <130/80 mmHg during the post-dialysis period. Achieving these targets requires several key strategies, including restricting high-sodium diets, adjusting dialysate sodium concentrations according to individual patient needs, managing dry body weight, and ensuring adequate hemodialysis duration.

Dry body weight is defined as the lowest body weight that can be tolerated without symptoms of hypotension. Although it can be accurately determined using specific methods, such techniques are often unavailable in routine hospital clinical settings (e.g., multifrequency bioimpedance spectroscopy). Consequently, dry body weight is usually determined clinically by evaluating blood pressure levels as evidence of fluid overload. It should be noted that patients may experience excess body fluid in the absence of obvious clinical signs, a phenomenon referred to as “Silent Overhydration”.

CONCLUSIONS

There is a relationship between Inter-dialytic Weight Gain (IDWG) and changes in post-dialysis blood pressure in hemodialysis patients at Prof. Dr. Margono Soekarjo Regional General Hospital.

REFERENCES

Agarwal, A., & Mallick, P. 2014. A study of relationship between internet addiction and self-concept of adolescents. *Indian Journal of Health and Wellbeing*, Vol5(2), 219-221.

Armiyanti, Y. 2010. Hipotensi dan Hipertensi Intradialisis Pada Pasien Hemodialisa di Yogyakarta. *Medical Surgical and Emergency Nursing*. Univeristas Muhammadiyah Semarang.

Gorsane, Imen dkk. 2015. Prevalence and Risk Factors of Hypertension in Hemodialysis. *Open Journal of Nephrology*. Vol5(2):54-60

Hecking, Manfred dkk. 2012. Dialysate Sodium Concentration and the Association with Interdialytic Weight Gain, Hospitalization, and Mortality. *Clin J Am Soc Nephrol*, Vol7(1): 92–100.

Inrig, J.K. 2010. Intradialytic Hypertension: A Less-Recognized Cardiovascular Complication of Hemodialysis. *Journal of the American Society of Nephrology*. 2010:724–734.

Istanti, Y.P. 2014. Hubungan antara masukan cairan dengan interdialytic weight gains (IDWG) pada pasien chronic kidney diseases di Unit Hemodialisis RS PKU Muhammadiyah Yogyakarta. *Profesi*, *10*, 14–20.

Kandarini Y. 2012. Hubungan antara UF yang berlebih saat HD dengan terjadinya episode HID melalui keterlibatan disfungsi endotel. Bali : *Universitas Udayana.*

Linberg, M. 2010. *Excessive fluid overload among hemodialysis patients: Prevalence individual characteristic and self regulation of fluid intake*(tesis).Sweden: Faculty of Medicine Uppsala

Universitet.

National Kidney Foundation (NKF). 2010. About Chronic Kidney Disease: A Guide for Patients and Their Families. In New York: *National Kidney Foundation*, Inc., p.8 11Abdiasyah, B. 2017. Hubungan IDWG dengan perubahan tekanan darah predialisis di RSUD Dr. Harjono Ponorogo

Neuman, C. 2013. Body weight telemetri is useful to reduce interdialytic weight gain in patients with end-stage renal failure on hemodialysis. *Journal of the American telemedicine.*

Noel P, Buren V, Inrig JK. 2016. Mechanisms and Treatment of Intradialytic Hypertension.*American Journal of Kidney Diseases*. 2011;58:794–803.

Rahman, M.T.S.A., Kaunang, T.M.D., Elim, C. 2016. Hubungan antara lama menjalani hemodialisis dengan kualitas hidup pasien yang menjalani hemodialisis di Unit Hemodialisis. *Jurnal e-Clinic (eCl*). 4(1):36-40.

Sukandar, E.Y., Adnyana, I.K., Andrajati, R., dkk. 2008. *ISO Farmakoterapi*. PT. ISFI. Jakarta.

Widyastuti, R. 2014. Korelasi Lama Menjalani Hemodialisis dengan Indeks Massa Tubuh Pasien Gagal Ginjal Kronik di RSUD Arifin Achamad provinsi Riau. Vol1(2)

World Health Organization. 2013. CKD Disease. *USRDS Anual Data Report*. US.2013