INTERNATIONAL JOURNAL OF SOCIAL HEALTH
https://ijsh.ph/index.php/rp
Volume 3 Number 11 November 2024 E-ISSN: 2963-3036

Interdialytic Weight Gain and Fluid Restrictions Among Hemodialysis Patients on Chronic Kidney Disease: A Systematic Review

Erika Yusticia Handayani[1]*, Rayendra[2], Nurhasanah[3]
[1,2,]Department of Internal Medicine/Renal Hypertension, Faculty of Medicine, University of Riau, Arifin Achmad General Hospital, Riau, Indonesia
[3]Department of Internal Medicine/Department of Nutrition, Faculty of Medicine, University of Riau, Arifin Achmad General Hospital, Riau, Indonesia
Email: erikayusticia99@gmail.com[1], rayendra63@yahoo.com[2], nurhasanah.spgk@lecturer.unri.ac.id[3]

KEYWORDS
fluid, kidney, hemodialysis, interdialytic

ABSTRACT
Interdialytic weight gain (IDWG) is a significant concern in chronic kidney disease (CKD) patients undergoing hemodialysis, as it is associated with adverse clinical outcomes, including elevated cardiovascular mortality. This study aims to explore the relationship between IDWG and adherence to fluid restrictions, focusing on identifying factors influencing IDWG and evaluating the effectiveness of various interventions. A systematic review was conducted through a comprehensive search of multiple databases, yielding ten relevant studies comprising observational studies, systematic reviews, and cohort studies. The findings indicate that higher IDWG is associated with factors such as younger age, lower dry weight, and prolonged hemodialysis duration. Interventions targeting IDWG reduction, including educational and psychological strategies, showed varying degrees of effectiveness, with reductions ranging from 0.15 kg to 0.26 kg. These results underscore the importance of individualized sodium prescriptions and tailored fluid management strategies in mitigating IDWG. The study highlights the critical need for improved adherence to fluid restrictions and the implementation of targeted interventions to enhance patient outcomes in hemodialysis care. These findings provide valuable insights for healthcare professionals in designing effective strategies to manage IDWG and improve the quality of life for patients undergoing hemodialysis.

DOI: 10.58860/ijsh.v3i11.262

Corresponding Author: Erika Yusticia Handayani*
Email: erikayusticia99@gmail.com

INTRODUCTION

Interdialytic weight gain (IDWG) is defined as the increase in body weight between hemodialysis sessions in patients with chronic kidney disease (CKD) (Isnaini, 2020). This weight gain results from fluid retention that occurs due to the kidneys' inability to excrete excess fluids, leading to fluid accumulation until the next dialysis session. IDWG is a crucial indicator of fluid overload and reflects the patient's fluid intake and adherence to fluid restrictions. Effective management of IDWG is essential in CKD care, as uncontrolled IDWG is associated with heightened cardiovascular risks, increased mortality rates, and a diminished quality of life for patients. Thus, gaining a comprehensive understanding of IDWG and the critical role of fluid restrictions in hemodialysis patients is fundamental to enhancing clinical outcomes and patient well-being (Sukartini et al., 2022).

Fluid restrictions play a crucial role in managing patients with CKD undergoing hemodialysis, aiming to control fluid accumulation between sessions, minimize the risks associated with high IDWG, and reduce cardiovascular strain. However, adherence to these restrictions often proves challenging due to various patient-specific and psychosocial factors. Many patients face psychological and environmental obstacles in limiting fluid intake, such as the influence of certain medications, hot

weather, and the inherent discomfort of thirst (Pruimboom & Muskiet, 2018). Poor adherence, combined with uncontrolled IDWG, significantly heightens the risk of severe health complications, including hypertension, edema, cardiovascular events, and increased mortality. Emphasizing the urgency of addressing these challenges is critical to improving patient outcomes (Mostafa & El-Atawi, 2024).

Systematic reviews on IDWG and fluid restrictions among hemodialysis patients have consistently demonstrated a strong relationship between adherence to fluid restrictions and reduced IDWG, along with fewer associated complications. Several studies suggest that high IDWG is a major predictor of mortality in hemodialysis patients. Moreover, inadequate fluid management can lead to volume overload, negatively affecting blood pressure regulation and cardiac function. Thus, effective fluid restriction is crucial for CKD management, but its implementation often faces challenges due to social, psychological, and behavioral factors influencing patient compliance (Schrauben et al., 2022).

Patient compliance with fluid restrictions also significantly impacts their quality of life. Those who struggle to control fluid intake often experience uncomfortable symptoms such as shortness of breath, fatigue, and bloating. These conditions worsen their daily life and contribute to higher levels of depression and anxiety among CKD patients (Alshelleh et al., 2022). Conversely, patients who adhere to fluid restrictions tend to have lower IDWG and better clinical outcomes. Factors such as family support, education, and patient motivation play key roles in helping individuals comply with the recommended fluid limits provided by their healthcare team.

In recent years, multidisciplinary approaches have gained recognition as effective methods for managing IDWG in hemodialysis patients by addressing both physiological and psychosocial aspects of care (Weiner et al., 2014). These approaches involve collaboration among nephrologists, nurses, dietitians, and psychologists to provide comprehensive support encompassing fluid management, dietary guidance, and psychosocial counseling. A primary focus of these interventions is educating patients on the critical importance of fluid restriction adherence and proactive IDWG management. Educational initiatives have demonstrated success in raising patient awareness of the risks linked to IDWG and the necessity of sustaining fluid balance, underscoring the multidimensional nature of effective IDWG management.

Therefore, this systematic review aims to comprehensively examine the current literature on interdialytic weight gain (IDWG) and fluid restriction adherence in chronic kidney disease (CKD) patients undergoing hemodialysis (Kim et al., 2022). The review will focus on identifying factors that influence adherence to fluid restrictions, the broader clinical implications of elevated IDWG, and effective, multidisciplinary strategies for managing IDWG. Additionally, the review will explore potential healthcare policy implications, such as fluid restriction education programs, to improve patient outcomes and quality of life for those receiving hemodialysis.

Based on this background, this study aims to analyze the factors that influence patient adherence to fluid restriction in chronic kidney disease (CKD) patients undergoing hemodialysis, evaluate the clinical implications of increased interdialytic weight gain (IDWG) on patient health, and identify effective multidisciplinary strategies for its management. In addition, this study also aims to explore the potential of health policies, such as fluid restriction education programs, to increase patient compliance, prevent complications, and improve quality of life. The results of this study are expected to make theoretical contributions in expanding the understanding of IDWG and fluid management in hemodialysis patients, as well as practical benefits for healthcare professionals and policy makers in designing educational interventions and patient-centered multidisciplinary approaches to reduce the social and clinical burden of non-adherence to fluid restriction.

METHOD

The systematic review's literature search strategy aimed to identify relevant studies on interdialytic weight gain (IDWG) and fluid restrictions among hemodialysis patients with chronic kidney disease (CKD) published from 2020 to 2024. Multiple electronic databases, including PubMed, Scopus, Web of Science, and Google Scholar, were searched systematically. Key search terms included combinations like "interdialytic weight gain," "IDWG," "fluid restrictions," "hemodialysis," and "chronic kidney disease," with Boolean operators (AND, OR) to refine results. Manual searches of reference lists in selected articles were also conducted to capture any additional relevant studies.

Studies met inclusion criteria if they were published between 2020 and 2024, written in English, focused on adult CKD patients undergoing hemodialysis, and addressed the impact of fluid restrictions and IDWG on clinical outcomes. Excluded studies included those focusing on pediatric populations, peritoneal dialysis, or lacking substantial data on fluid management. The selection process adhered to the PRISMA guidelines, ensuring a systematic and replicable review. To enhance transparency, quality assessment tools, such as the Cochrane Risk of Bias tool or the Newcastle-Ottawa Scale, were applied to evaluate and select high-quality studies for inclusion.

Data Extraction and Study Quality Assessment

For this systematic review, data extraction focused on studies related to interdialytic weight gain (IDWG) and fluid restrictions among hemodialysis patients with chronic kidney disease (CKD) published between 2020 and 2024. A total of 10 studies were included based on the inclusion criteria. The following data were extracted from each study: author(s), year of publication, study design, sample size, patient characteristics, IDWG measurement methods, fluid restriction strategies, clinical outcomes (e.g., cardiovascular risks, mortality), and adherence levels to fluid restrictions. Each study's results were carefully organized for comparison and analysis.

Different tools were applied to assess the quality of the studies, depending on the study design. Randomized controlled trials (RCTs) were evaluated using the Cochrane Risk of Bias tool, while observational and cohort studies were assessed using the Newcastle-Ottawa Scale (NOS). The assessment criteria included aspects such as sample size, potential biases, follow-up duration, and clarity of reporting (Radke et al., 2019). Studies with a higher score were considered more reliable and were given greater weight in the overall analysis. Only high-quality studies were included to ensure robust conclusions in this review.

Inclusion and Exclusion Criteria

This review included studies published between 2020 and 2024 focusing on adult chronic kidney disease (CKD) patients undergoing hemodialysis, specifically addressing interdialytic weight gain (IDWG) and fluid restrictions and reporting relevant clinical outcomes like cardiovascular risks or patient adherence. Randomized controlled trials, cohort, cross-sectional, and observational studies in English were included (Zeraatkar et al., 2021). Excluded were studies involving pediatric populations, non-hemodialysis patients, non-original research, or those lacking sufficient data on IDWG and fluid restriction outcomes

RESULT AND DISCUSSION

Table 1. Previous Research

Author(s), Year of Study	Study Design	Study Location	Study Title	n (Sample)	Study Results
(Jalalzadeh et al., 2021)	Observational Study	Metropolitan Hospital Center, New York	Consequences of Interdialytic Weight Gain in Patients	300	Higher IDWG% is linked to younger males, lower dry weight, and longer

Author(s), Year of Study	Study Design	Study Location	Study Title	n (Sample)	Study Results
		Medical College, USA	Undergoing Hemodialysis		hemodialysis duration; there is no association with increased blood pressure or nutritional status.
Maurizio (Bossola et al., 2022)	Systematic Review & Meta-Analysis	Multi-center Analysis, various locations	Educational/Cognitive, Counseling/Behavioral, and Psychological/Affective Interventions for Managing Interdialytic Weight Gain in Chronic Hemodialysis Patients	1759	Educational and counseling interventions reduced IDWG by −0.15 kg (P=0.004), while psychological interventions led to a −0.26 kg decrease (P=0.020); neither showed significant clinical relevance.
(Rocco et al., 2023)	Within-group comparison before or during the interventi on	Not specified	Fluid Intake Management in Maintenance Hemodialysis Using a Smartphone-Based Application: A Pilot Study	25	18 participants completed the study; 61% showed a decrease in IDWG; the app was used on ≥80% of days by 72% of participants.
(Kaplan & Karadağ, 2022)	Cross-sectional study	Kayseri University, Turkey	The determination of adherence to fluid control and symptoms of patients undergoing hemodialysis	596	Mean adherence score (FCSHP): 48.68±4.43; DSI score: 65.07±2.17. Common symptoms: fatigue, pins and needles, sleep difficulties. Higher adherence is linked to fewer symptoms.
(Bossola et al., 2024)	Systematic review and meta-analysis	Not specified (generalized)	Interdialytic weight gain and low dialysate sodium concentration in patients on chronic hemodialysis	710	Low dialysate sodium concentration reduced IDWG with pooled MD of −0.40 kg (95% CI −0.50 to −0.30; p<0.001). There was a significant reduction in two studies, a sustained reduction in one study, and no significant reduction in one study.

Author(s), Year of Study	Study Design	Study Location	Study Title	n (Sample)	Study Results
(Dantas et al., 2019)	Cohort study	Northeast Brazil	Non-adherence to Haemodialysis, Interdialytic weight gain, and cardiovascular mortality: a cohort study.	255	IDWG ≥4% of DW is linked to higher all-cause mortality (HR: 2.02, p=0.012) and borderline cardiovascular mortality (HR: 2.09, p=0.047). 54% of deaths were cardiovascular.
(Sharif-Nia et al., 2024)	Cross-sectional study	Iran	The relationship between fatigue, pruritus, and thirst distress with quality of life among patients receiving hemodialysis: a mediator model to test the concept of treatment adherence	411	Negative association between QOL and fatigue, pruritus, and TD; TA partially mediated these associations. QOL variance explained: 68.5%.
(Halle et al., 2020)	Cross-sectional study	Cameroon	Non-adherence to hemodialysis regimens among patients on maintenance hemodialysis in sub-Saharan Africa: an example from Cameroon	170	- Non-adherence rates: 15.3% for fluid, 26.9% for dietary, and 21.2% for dialysis sessions. - Significant predictors include being older than 49 and unmarried.
(Gondokesumo et al., 2021)	Prospective interventional	Not specified	Effects of Individualized Dialysate Sodium Prescription in Hemodialysis	40	- Individualized sodium levels led to reduced weight gain (2.13 kg vs. 2.64 kg) and lower systolic blood pressure (134 mmHg vs. 138 mmHg) - No impact on intradialytic complications.
(Mujtaba et al., 2022)	Cross-sectional study	Dialysis center (location not specified)	Frequency of Intradialytic Hypertension Using KDIGO Suggested Definition	263	- Found an intradialytic hypertension rate of 16%. - Older age linked to hypertension (p=0.038), with most affected patients on antihypertensive drugs (p <0.004).

The management of interdialytic weight gain (IDWG) is a critical concern in patients undergoing hemodialysis, as evidenced by the study conducted by Jalalzadeh et al. (2024). This observational study revealed a connection between higher IDWG percentages and factors such as

younger male patients, lower dry weight, and prolonged hemodialysis duration. Interestingly, no significant correlation was found between increased IDWG and elevated blood pressure or nutritional status. This highlights the importance of understanding individual patient characteristics in effectively managing fluid intake and weight gain during dialysis sessions.

The systematic review and meta-analysis by Bossola et al. (2024) further elucidate the relationship between low dialysate sodium concentration and reduced IDWG, indicating a mean difference of −0.40 kg. This reduction is statistically significant ($p < 0.001$) across various studies, suggesting that adjusting sodium levels in dialysis can lead to better weight management. Such interventions emphasize the potential benefits of personalized treatment strategies to mitigate IDWG and improve overall patient outcomes in hemodialysis settings.

Dantas et al (2019) conducted a cohort study that identified a concerning link between IDWG of 4% or more of dry weight and increased mortality rates. Specifically, they found a two-fold increase in all-cause mortality and borderline cardiovascular mortality associated with significant IDWG. This evidence underlines the critical need for stringent fluid management protocols to reduce IDWG and, consequently, the associated health risks in hemodialysis patients.

The findings of Sharif-Nia et al. (2024) also contribute to the understanding of how factors like fatigue, pruritus, and thirst distress affect the quality of life (QOL) in hemodialysis patients. Their study suggested that treatment adherence partially mediates the negative associations between these symptoms and QOL. When patients struggle with managing fluid intake due to symptoms, their adherence to dialysis regimens may decline, leading to increased IDWG and further complications.

Lastly, the various studies point to a multifaceted approach needed for managing fluid intake among hemodialysis patients. Kaplan and Karadağ (2022) reported that higher adherence to fluid control is linked to fewer adverse symptoms. The implications of these findings suggest that targeted educational and counseling interventions, as discussed by Bossola et al. (2022), can effectively support patients in adhering to fluid restrictions, ultimately improving both their IDWG and overall health outcomes. Continued research and systematic reviews in this area remain essential for developing comprehensive management strategies for chronic kidney disease patients undergoing hemodialysis.

CONCLUSION

In conclusion, the body of research highlights the critical importance of managing interdialytic weight gain (IDWG) in hemodialysis patients to improve health outcomes. Key factors, including individual characteristics, sodium concentration in dialysate, and adherence to fluid restrictions, have been shown to significantly impact IDWG and overall patient well-being. To enhance fluid management and reduce the risk of adverse health outcomes, including increased mortality, it is recommended that healthcare providers implement tailored education and counseling interventions. Moreover, future research should explore innovative educational approaches and the potential of digital health tools in fluid management to further support patients and provide actionable strategies for practitioners and policymakers.

REFERENCES

Alshelleh, S., Alhouri, A., Taifour, A., Abu-Hussein, B., Alwreikat, F., Abdelghani, M., Badran, M., Al-Asa'd, Y., Alhawari, H., & Oweis, A. O. (2022). Prevelance of depression and anxiety with their effect on quality of life in chronic kidney disease patients. *Scientific Reports*, *12*(1), 17627.

Bossola, M., Mariani, I., Sacco, M., Antocicco, M., Pepe, G., & Di Stasio, E. (2024). Interdialytic weight gain and low dialysate sodium concentration in patients on chronic hemodialysis: a systematic review and meta-analysis. *International Urology and Nephrology*, 1–11.

Bossola, M., Pepe, G., Antocicco, M., Severino, A., & Di Stasio, E. (2022). Interdialytic weight gain and educational/cognitive, counseling/behavioral and psychological/affective interventions in patients on chronic hemodialysis: a systematic review and meta-analysis. *Journal of Nephrology*, *35*(8), 1973–1983.

Dantas, L. G. G., de Seixas Rocha, M., Junior, J. A. M., Paschoalin, E. L., Paschoalin, S. R. K. P., & Sampaio Cruz, C. M. (2019). Non-adherence to haemodialysis, interdialytic weight gain and cardiovascular mortality: a cohort study. *BMC Nephrology*, *20*, 1–10.

Gondokesumo, M. E., Putra, G. S., Suhud, F., & Sulistyowaty, M. I. (2021). In-silico studies and synthesis of 1, 3-benzoxazine derivatives as antimalarial agent through PfATP4 receptor inhibition. *International Jurnal Of Pharmaceutical Research*, *12*(2).

Halle, M. P., Nelson, M., Kaze, F. F., Jean Pierre, N. M., Denis, T., Fouda, H., & Ashuntantang, E. G. (2020). Non-adherence to hemodialysis regimens among patients on maintenance hemodialysis in sub-Saharan Africa: an example from Cameroon. *Renal Failure*, *42*(1), 1022–1028.

Isnaini, N. (2020). Description of interdialytic weight gain (IDWG) chronic kidney diseases (CKD) patients who have hemodialized therapy. *UMPPRESS UMPPRESS*, 20.

Jalalzadeh, M., Mousavinasab, S., Villavicencio, C., Aameish, M., Chaudhari, S., & Baumstein, D. (2021). Consequences of interdialytic weight gain among hemodialysis patients. *Cureus*, *13*(5).

Kaplan, A., & Karadağ, S. (2022). The determination of adherence to fluid control and symptoms of patients undergoing hemodialysis. *African Health Sciences*, *22*(3), 359–368.

Kim, H., Jeong, I. S., & Cho, M.-K. (2022). Effect of treatment adherence improvement program in hemodialysis patients: a systematic review and meta-analysis. *International Journal of Environmental Research and Public Health*, *19*(18), 11657.

Mostafa, R., & El-Atawi, K. (2024). Strategies to measure and improve emergency department performance: a review. *Cureus*, *16*(1).

Mujtaba, F., Qureshi, R., Dhrolia, M., Nasir, K., & Ahmad, A. (2022). Frequency of intradialytic hypertension using Kidney Disease: Improving Global Outcomes (KDIGO) suggested definition in a single hemodialysis centre in Pakistan. *Cureus*, *14*(12).

Ouirdani, M., Boutib, A., Azizi, A., Chergaoui, S., Saad, E. M., Hilali, A., Marfak, A., & Youlyouz-Marfak, I. (2024). Impact of Nutrition Education on Various Health-Related Components of Hemodialysis Patients: A Systematic Review. *Healthcare*, *12*(12), 1197.

Pruimboom, L., & Muskiet, F. A. J. (2018). Intermittent living; the use of ancient challenges as a vaccine against the deleterious effects of modern life – A hypothesis. *Medical Hypotheses*, *120*, 28–42. https://doi.org/10.1016/j.mehy.2018.08.002

Radke, E. G., Glenn, B., Galizia, A., Persad, A., Nachman, R., Bateson, T., Wright, J. M., Navas-Acien, A., Arroyave, W. D., Puett, R. C., Harville, E. W., Pollack, A. Z., Burns, J. S., Lynch, C. D., Sagiv, S. K., Stein, C., & Cooper, G. S. (2019). Development of outcome-specific criteria for study evaluation in systematic reviews of epidemiology studies. *Environment International*, *130*, 104884. https://doi.org/10.1016/j.envint.2019.05.078

Rocco, M. V., Rigaud, M., Ertel, C., Russell, G., Zemdegs, J., & Vecchio, M. (2023). Fluid Intake Management in Maintenance Hemodialysis Using a Smartphone-Based Application: A Pilot Study. *Kidney Medicine*, *5*(9), 100703. https://doi.org/10.1016/j.xkme.2023.100703

Schrauben, S. J., Rivera, E., Bocage, C., Eriksen, W., Amaral, S., Dember, L. M., Feldman, H. I., & Barg, F. K. (2022). A Qualitative Study of Facilitators and Barriers to Self-Management of CKD. *Kidney International Reports*, *7*(1), 46–55. https://doi.org/10.1016/j.ekir.2021.10.021

Sharif-Nia, H., Marôco, J., Froelicher, E. S., Barzegari, S., Sadeghi, N., & Fatehi, R. (2024). The relationship between fatigue, pruritus, and thirst distress with quality of life among patients

receiving hemodialysis: a mediator model to test concept of treatment adherence. *Scientific Reports*, *14*(1), 9981.

Sukartini, T., Efendi, F., & Putri, N. S. (2022). A phenomenological study to explore patient experience of fluid and dietary restrictions imposed by hemodialysis. *Journal of Vascular Nursing*, *40*(2), 105–111. https://doi.org/10.1016/j.jvn.2022.05.003

Weiner, D. E., Brunelli, S. M., Hunt, A., Schiller, B., Glassock, R., Maddux, F. W., Johnson, D., Parker, T., & Nissenson, A. (2014). Improving Clinical Outcomes Among Hemodialysis Patients: A Proposal for a "Volume First" Approach From the Chief Medical Officers of US Dialysis Providers. *American Journal of Kidney Diseases*, *64*(5), 685–695. https://doi.org/10.1053/j.ajkd.2014.07.003

Zeraatkar, D., Bhasin, A., Morassut, R. E., Churchill, I., Gupta, A., Lawson, D. O., Miroshnychenko, A., Sirotich, E., Aryal, K., Mikhail, D., Khan, T. A., Ha, V., Sievenpiper, J. L., Hanna, S. E., Beyene, J., & de Souza, R. J. (2021). Characteristics and quality of systematic reviews and meta-analyses of observational nutritional epidemiology: a cross-sectional study. *The American Journal of Clinical Nutrition*, *113*(6), 1578–1592. https://doi.org/10.1093/ajcn/nqab002