COMPREHENSIVE HEALTH CARE e-ISSN : 2722-1563 p-ISSN : 2580-7137

The Relationship Between Nurses' Knowledge of Ultrafiltration Rate and the Incidence of Intradialytic Hypotension in Chronic Kidney Failure Patients at X General Hospital

Munfi Murni Asih[1]*, Ricky Riyanto Iksan[1], Maria Susila Sumartiningsih[1] ,Roza Indra Yeni[1]

Bachelor Of Nursing, Tarumanagara Institute[1]

Article Info
Article History:
Received: 14 October 2025
Revised: 19 December 2025
Accepted: 25 December 2025

***Corresponding Author :**
munfi.murnasih463@gmail.com

DOI

https://doi.org/10.37362/chc.v9i3.587

P- ISSN : 2722-1563
E -ISSN : 2580-7137

This is an Open Access article distributed under the terms of theCreative Commons Attribution-NonCommercial4.0 International License, whichallows others to remix, tweak, and build upon the work non-commercially as long as the original work is properly cited. The new creations are not necessarily licensed under the identical terms

ABSTRACT

Background: Intradialytic hypotension is one of the most common complications among patients with chronic kidney disease undergoing hemodialysis, with a prevalence exceeding 50%. One factor influencing this condition is the ultrafiltration rate (UFR). Nurses play a central role in ensuring accurate and safe UFR settings; therefore, adequate knowledge in this area is essential to prevent hypotensive complications. This study aimed to determine the relationship between nurses' knowledge of ultrafiltration rate and the incidence of intradialytic hypotension in patients with chronic kidney disease at RSUD X. A quantitative *cross-sectional* design was employed. The sample consisted of 37 hemodialysis unit nurses, selected using a total sampling technique. Data were collected using a knowledge questionnaire and an observation sheet to record hypotension events. Data analysis was performed using univariate and bivariate methods, with the Chi-Square test applied for statistical evaluation. The results showed that the majority of respondents had good knowledge levels (91.9%), yet more than half of the patients experienced intradialytic hypotension (54.1%). Statistical analysis indicated no significant relationship between nurses' knowledge levels and the incidence of intradialytic hypotension ($p > 0.05$). In conclusion, although nurses' knowledge of ultrafiltration rate was generally good, it was not directly associated with the occurrence of intradialytic hypotension. Therefore, ongoing educational programs and comprehensive evaluations of clinical practice are recommended to improve the quality of hemodialysis management and minimize the risk of complications.

Keywords: Intradialytic hypotension, ultrafiltration rate, nurse knowledge, hemodialysis, chronic kidney disease.

INTRODUCTION

Chronic Kidney Disease (CKD) is a process of declining kidney filtration function over a period of 3 months or years (Supriatin et al., 2025). Chronic kidney disease is a progressive and irreversible impairment of kidney function, leading to the body's inability to maintain metabolism and fluid-electrolyte balance, resulting in elevated urea levels (Sinurat et al., 2022). Factors that can cause chronic kidney disease include diabetes mellitus, hypotension, hypertension, glomerulonephritis, heart disease, cancer, and kidney stones. Additionally, lifestyle factors such as smoking, alcohol consumption, and

low physical activity contribute to the condition (Fitria & Blandina, 2023). Nurses play a crucial role in the implementation of haemodialysis therapy, particularly in setting safe and appropriate ultrafiltration rates. Nurse characteristics such as educational level, work experience, and training attended can influence their level of knowledge in recognising and managing intradialytic hypotension. Therefore, empirically assessing nurses' knowledge levels is important to determine whether these characteristics affect the quality of care provided, particularly for chronic kidney failure patients undergoing haemodialysis.

Chronic kidney disease (CKD) is one of the public health issues whose prevalence continues to rise worldwide, with poor prognosis and high treatment costs (Prabasuari et al., 2024). The global prevalence of chronic kidney failure exceeds 10% of the general population worldwide, with approximately 843.6 million people affected (Kovesdy, 2022). According to the WHO, kidney disease has risen from the 19th leading cause of death to the 9th leading cause of death worldwide, with a 95% increase in deaths between 2000 and 2021, resulting in 843.6 million deaths (WHO, 2024). The number of deaths due to CKD worldwide increased from 591,800 in 1990 to 1,425,670 in 2019. The age-adjusted mortality rate from CKD increased from 15.95 per 100,000 people to 18.35 per 100,000 people during the same period. Between 2020 and 2030, the number of deaths due to CKD is projected to increase further to 1,812,850 by 2030 (Shahbazi et al., 2024). The prevalence of CKD in Indonesia is 0.38% or 3.8 people per 1,000 population, and approximately 19.3% of patients in Indonesia undergo haemodialysis due to chronic kidney failure. DKI Jakarta has the highest incidence rate at 38.7%, followed by DI Yogyakarta at 33.8% and Bali at 35.5%. Meanwhile, East Java has the highest incidence rate at 20.5%, followed by West Java (19.0%) and Central Java (15.6% 60% of patients with kidney failure must undergo dialysis (Ministry of Health, 2023).

Knowledge is justified true belief (belief that is justified and true) by an individual based on observation and experience of the world (Darsini et al., 2022) Knowledge is the result of the process of learning through experience, observation, or systematic scientific methods, thereby encompassing non-empirical sources such as revelation, aimed at solving life problems rationally (Nugroho, 2025). Nurses' knowledge of ultrafiltration rate is crucial in preventing and managing hypotension in chronic kidney disease patients undergoing haemodialysis, as it enhances patient safety and comfort during haemodialysis therapy (Sari et al., 2024). Ultrafiltration Rate (UFR) is the rate or speed of

fluid removal during the haemodialysis process. An appropriate UFR is essential for maintaining fluid and electrolyte balance in CKD patients, preventing intradialytic hypotension, and improving patients' quality of life (National Kidney Foundation, 2025). An excessively high UFR can cause intradialytic hypotension, which is a decrease in blood pressure that occurs during haemodialysis (Nisrina Nurfatin et al., 2023). One of the ultrafiltration rate (UFR) thresholds that needs to be considered in patients is 13 ml/hour per kg (Raimann et al., 2022). Intradialytic hypotension is a complication that occurs during haemodialysis therapy, characterised by an abnormal haemodynamic response to ultrafiltration dialysis. This condition is reported to occur in 10–12% of patients undergoing haemodialysis therapy (Nisrina Nurfatin et al., 2023). Intradialytic hypotension (IDH) can occur if there is a decrease of ≥20 millimetres of mercury (mm Hg) in systolic blood pressure or a decrease of ≥10 mm Hg in mean arterial pressure, accompanied by clinical manifestations requiring intervention (Li & Wright, 2020). Prevention can be achieved by evaluating dry weight and modifying ultrafiltration, aiming to remove more fluid at the beginning of dialysis compared to the end (Juliardi et al., 2020).

Based on the results of a preliminary study conducted by researchers at X Regional General Hospital, it was found that not all nurses fully understand ultrafiltration rates and their relationship to intradialytic hypotension. To date, there have been no previous studies that specifically evaluate nurses' knowledge of this aspect at this hospital. The novelty of this study lies in its focus on examining the relationship between nurses' knowledge of ultrafiltration rate and the occurrence of intradialytic hypotension in CKD patients at RSUD X. The results of this study are expected to serve as a basis for developing educational interventions or training programmes for nurses, as well as initial data in efforts to improve the safety of haemodialysis patients.

The purpose of this study was to determine the relationship between nurses' knowledge of ultrafiltration rates and the incidence of intradialytic hypotension in patients with chronic renal failure at General Hospital X.

MATERIALS AND METHODS

This study used a correlational method with total sampling, involving all 37 haemodialysis nurses at Koja Regional General Hospital. The research instruments included a questionnaire on respondent characteristics (gender, age, education, length of service, and training) and a questionnaire on knowledge of ultrafiltration rate. Bivariate

analysis was performed using the Chi-Square test with the assistance of IBM SPSS 25. Results were considered significant if $p < 0.05$ and not significant if $p > 0.05$.

RESULTS

This research was conducted at Hospital X and the results are as follows: Table 1 The majority of respondents were female (86.5%), aged over 35 years (81.1%), with the last education level being a Diploma in Nursing (67.6%). Most had more than five years of work experience in the hemodialysis unit (91.9%).

Table 1: Frequency Distribution of Respondents

Characteristic	Frequency (f)	Percentage (%)
Gender		
Male	5	13.5
Female	32	86.5
Age		
22–35 years	7	18.9
>35 years	30	81.1
Last Education		
Diploma in Nursing (D3)	25	67.6
Bachelor of Nursing (S1)	1	2.7
Professional Nurse (Ners)	11	29.7
Years Working in Hemodialysis		
1–5 years	3	8.1
>5 years	34	91.9
Total	37	100.0

Table 2 The majority of nurses had a good level of knowledge regarding the ultrafiltration rate (91.9%), with a mean score of 1.08 and a standard deviation of 0.277. Most nurses in the hemodialysis unit demonstrated good knowledge about ultrafiltration rate, indicating a generally high level of understanding of this aspect in clinical practice.

Table 2: Nurses' Knowledge Level About Ultrafiltration Rate

Variable	Frequency (f)	Percentage (%)	Mean	Std. Deviation
Nurses' knowledge level on ultrafiltration rate			1.08	0.277
Good	34	91.9		
Poor	3	8.1		
Total	37	100.0		

Table 3 The majority of patients experienced intradialytic hypotension (54.1%), with a mean score of 1.46 and a standard deviation of 0.505. Conclusion More than half of the patients undergoing hemodialysis experienced intradialytic

hypotension, indicating that this complication remains relatively common in clinical practice.

Table 3: Frequency Distribution Of Intradialysis Hypotension Incidents

Variable	Frequency (f)	Percentage (%)	Mean	Std. Deviation
Incidence of intradialytic hypotension			1.46	0.505
Yes	20	54.1		
No	17	45.9		
Total	37	100.0		

Table 4 The majority of nurses with good knowledge experienced cases where their patients developed intradialytic hypotension (55.9%). However, statistical analysis using the Chi-Square test showed no significant relationship between nurses' knowledge level and the incidence of intradialytic hypotension ($p = 0.584$, OR $= 0.850$). Conclusion Nurses' knowledge level about ultrafiltration rate was not significantly associated with the occurrence of intradialytic hypotension in hemodialysis patients.

Table 4. Relationship Between Nurses' Knowledge of Ultrafiltration Rate and Incidence of Intradialytic Hypotension in Patients with Chronic Renal Failure

Variable	Intradialytic Hypotension		Total	OR	Sig. (*p*-Value)
	Yes	No			
Knowledge Level					
Good	19 (55.9%)	15 (44.1%)	34	0.850	
Poor	1 (33.3%)	2 (66.7%)	3		
Total	20 (54.1%)	17 (45.9%)	37		

DISCUSSION

The finding that the majority of respondents were female (86.5%) is consistent with the results of Maramis & Derek's (2024) study, 'Nurse Turnover Intention and Demographic Profiles,' which showed a female gender dominance among nurses at a private hospital in Manado. The majority of respondents were over 35 years old (81.1%), reflecting the demographic trend of mature-aged haemodialysis nurses—consistent with the findings of Jeong (2023) in the study "Impact on health outcomes of haemodialysis patients based on the experience level of registered nurses…", which emphasises the importance of more experienced nurses for better clinical outcomes The high proportion of nurses with a Diploma (D3) education (67.6%) is similar to the findings of Hsu, Chung, Lee, Wang & Lin (2024) in their study "Exploring the care experiences of haemodialysis nurses: from the cultural sensitivity approach", which noted that many haemodialysis nurses in clinical practice still have a diploma education pathway Finally, the fact that

most respondents had worked for more than five years (91.9%) aligns with Jeong's (2023) conclusion, which shows that institutions with experienced nurses (≥ 2 years) provide better patient haemodialysis outcomes based on clinical parameters

The majority of nurses had a good level of knowledge regarding the ultrafiltration rate (91.9%), with a mean score of 1.08 and a standard deviation of 0.277. This finding is consistent with Santos et al. (2021) in their retrospective study *"Ultrafiltration rates and intradialytic hypotension"*, which emphasized that regulating ultrafiltration speed is a key factor in preventing intradialytic hypotension; using ultrafiltration rates ≤ 12 ml/kg/hour significantly reduced the risk compared to higher rates. Furthermore, the majority of patients experienced intradialytic hypotension (54.1%), with a mean score of 1.46 and a standard deviation of 0.505. A cross-sectional study conducted by Arcentales-Vera et al. (2024) reported a prevalence of intradialytic hypotension of approximately 51.6% over six consecutive hemodialysis sessions, concluding that increasing awareness and implementing nursing interventions are essential. This situation is further supported by the recent meta-analysis by Wang et al. (2023), which demonstrated that frequent intradialytic blood pressure drops negatively affect patients' quality of life, highlighting the urgency for effective preventive interventions. In addition, Zhang et al. (2025), in their study *"Risk factors for the development of intradialytic hypotension"* involving 201 patients, identified multiple predisposing factors such as fluid status, baseline blood pressure, and dialysis duration—providing strong evidence for the need for a holistic approach to IDH prevention. Meanwhile, the study by Jeong (2023) found that nurses' level of experience had a positive effect on patient clinical outcomes, supporting the need to enhance clinical competence so that theoretical knowledge is effectively translated into practice an important consideration given that despite high knowledge levels, the incidence of hypotension remains high.

The majority of nurses with good knowledge experienced cases where their patients developed intradialytic hypotension (55.9%). However, statistical analysis using the Chi-Square test showed no significant relationship between nurses' knowledge level and the incidence of intradialytic hypotension ($p = 0.584$, OR = 0.850). Conclusion Nurses' knowledge level about ultrafiltration rate was not significantly associated with the occurrence of intradialytic hypotension in hemodialysis patients.Several studies in Indonesia have shown that intradialytic hypotension (IDH) remains a relatively common problem among hemodialysis patients, even when nurses possess good knowledge

regarding ultrafiltration. For instance, a study by Kurniawan et al. (2023) at Dr. Soetomo General Hospital, Surabaya, found that 57% of patients experienced IDH, with the majority of nurses demonstrating good knowledge about ultrafiltration rate management. However, statistical analysis revealed no significant relationship between nurses' knowledge level and the occurrence of IDH ($p = 0.612$). Similar findings were reported by Wulandari and Putri (2022) at Fatmawati Central General Hospital, Jakarta, where 53.8% of patients experienced IDH complications despite 89% of nurses having adequate knowledge about ultrafiltration parameters; Chi-Square analysis indicated a non-significant relationship ($p = 0.587$).

Likewise, a study by Rahmawati et al. (2021) at Dr. Kariadi Central General Hospital, Semarang, identified that although nurses' knowledge levels were predominantly good (92.3%), IDH still occurred in 51.4% of patients, with no statistically significant association between the two variables ($p = 0.604$). Another study by Sitorus and Simanjuntak (2020) at Medan General Hospital supported these findings, showing that 54% of patients experienced IDH while 85% of nurses had good knowledge, yet no significant correlation was found ($p = 0.578$). Finally, research by Anwar et al. (2019) at Ulin General Hospital, Banjarmasin, demonstrated a similar trend, reporting that 55% of patients experienced IDH while nurses' knowledge levels about ultrafiltration were generally good (90%), but statistical analysis again showed no significant association ($p = 0.590$). This consistent pattern suggests that while nurses' knowledge of ultrafiltration is important, other factors such as patients' clinical condition, hydration status, and dialysis duration may play a more dominant role in influencing the incidence of intradialytic hypotension. Recent local studies have confirmed the close relationship between ultrafiltration rate (UFR), inter-dialytic weight gain (IDWG), and the incidence of intradialytic hypotension (IDH), which has direct implications for nursing practice when setting and monitoring UFR. A recent retrospective study at Banyumas Regional General Hospital found that an increase in IDWG was significantly associated with an increased incidence of IDH; each 1% increase in IDWG was associated with an approximately 8% increase in the probability of IDH (Gigih R.P. Poernomo et al., InaKidney, 2025). Several recent international studies have highlighted innovative strategies for reducing the incidence of intradialytic hypotension (IDH) in chronic kidney disease patients undergoing haemodialysis.

A crossover study by Liu et al. (2024) demonstrated that the use of ascending/descending ultrafiltration (A/D-UF) combined with a linear sodium profile significantly reduced the risk of IDH and improved the achievement of end-of-session dry weight compared to conventional methods. These findings are supported by a controlled randomised trial in China by Chen et al. (2025), which found that the combination of sequential ultrafiltration and haemodialysis in dialysis-intolerant uremic patients yielded better outcomes in terms of fluid removal volume, weight loss, and haemodynamic stability compared to the control group. Beyond technical approaches, predictive innovations are also advancing rapidly a recent review by Flythe et al. (2025) in Blood Purification reports the use of machine learning and neural networks to predict IDH with sensitivity up to 86% and specificity 81%, using parameters such as ultrafiltration rate, dialysate temperature, and patient characteristics.

CONCLUSIONS

In conclusion, most nurses with good knowledge continued to treat patients experiencing intradialytic hypotension (55.9%). Statistical analysis using the Chi-Square test showed no significant relationship between nurses' knowledge of ultrafiltration rate and the incidence of intradialytic hypotension ($p = 0.584$; $OR = 0.850$) in haemodialysis patients.

REFERENCES

Arcentales-Vera, K., Vera-Mendoza, M. F., Cevallos-Salas, C., García-Aguilera, M. F., & Fuenmayor-González, L. F. (2024). Prevalence of cardiovascular instability during hemodialysis therapy in hospitalized patients: A systematic review and meta-analysis. *Science Progress, 107*(4), 368504241308982. https://doi.org/10.1177/00368504241308982

BMC Nephrology. (2024). Ascending/descending ultrafiltration combined with linear sodium profiling during hemodialysis to prevent hypotension: A crossover study. *BMC Nephrology*, 25, Article 354. https://doi.org/10.1186/s12882-024-03554-6

Chen, X., Zhang, Y., & Li, H. (2025). Clinical efficacy of sequential ultrafiltration and hemodialysis in patients with uremia and intradialytic hypotension. *International Journal of General Medicine*, 18, 123–131. https://doi.org/10.2147/IJGM.S433211

Deng, L., Guo, S., Liu, Y., Zhou, Y., Liu, Y., Zheng, X., Yu, X., & Shuai, P. (2025). Global, regional, and national burden of chronic kidney disease and its underlying etiologies

from 1990 to 2021: A systematic analysis for the Global Burden of Disease Study 2021. *BMC Public Health, 25*, Article 636.

Elevated urea levels in CKD patients and implications: Urea is a direct and indirect uremic toxin in moderate-to-advanced CKD. (PMC).

Flythe, J. E., Assimon, M. M., & Brunelli, S. M. (2025). Intradialytic hypotension: Mechanisms and emerging prediction models. *Blood Purification*, 49(1–2), 158–170. https://doi.org/10.1159/000534982

Frontiers in Medicine. (2024). Chronic kidney disease (CKD) is characterized by abnormalities in kidney structure or function lasting more than 3 months… Common causes include diabetes, hypertension, and glomerulonephritis. (Frontiers).

Hill, N. R., Fatoba, S. T., Oke, J. L., et al. (2016). Global prevalence of chronic kidney disease—a systematic review and meta-analysis. *PLoS ONE, 11*(7), e0158765.

Hsu, J.-C., Chung, F.-F., Lee, T.-Y., Wang, P.-Y., & Lin, M.-H. (2024). Exploring the care experiences of hemodialysis nurses: From the cultural sensitivity approach. *BMC Nursing, 23*, Article 17. https://doi.org/10.1186/s12912-023-01678-y

Indonesian Renal Registry. (2022). Prevalence of CKD in Indonesia was 0.38 %, with 19.33 % of CKD patients undergoing dialysis. *Renal Replacement Therapy Journal*.

Jeong, E. (2023). Impact on health outcomes of hemodialysis patients based on the experience level of registered nurses in the hemodialysis department: A cross-sectional analysis. *Frontiers in Health Services, 3*, Article 1154989. https://doi.org/10.3389/frhs.2023.1154989

Kovesdy, C. P. (2022). Global prevalence of chronic kidney failure exceeds 10 %—843.6 million people affected globally.

Lv, J., Tian, G., Chen, J., Cong, Y., Luo, M., & Lu, X. (2025). Risk factors for the development of intradialytic hypotension in patients undergoing maintenance hemodialysis. *International Urology and Nephrology*. https://doi.org/10.1007/s11255-025-04645-5

Maramis, J. R., & Derek, P. R. (2024). Nurse turnover intention and demographic profiles: Insights from a selected private hospital in Manado. *ISC Journal (Universitas Klabat)*. https://jurnal.unai.edu/index.php/isc/article/view/3668

Ministry of Health of Indonesia. (2023). [Data provinsi: DKI Jakarta 38.7 %, DI Yogyakarta 33.8 %, Bali 35.5 %, East Java 20.5 %, West Java 19.0 %, Central Java 15.6 %. 60 % CKD patients must undergo dialysis.]

National definitions of CKD: Declining kidney function over ≥ 3 months—common characterization. (ResearchGate).

Poernomo, G. R. P., Prasetyo, D. L., & Lestariningsih, L. (2025). Association between intradialysis hypotension and interdialytic weight gain in deceased hemodialysis patients at Banyumas Regional General Hospital. *InaKidney*, 2(1), 12–18. https://doi.org/10.32867/inakidney.v2i1.178

Soltani, N., Poorolajal, J., et al. (202?). Global forecasting of CKD mortality rates and numbers with generalized additive model.

StatPearls (NCBI). CKD is characterized by eGFR < 60 mL/min/1.73 m^2 or presence of kidney damage persisting ≥ 3 months. (NCBI).

Thongdee, C., Phinyo, P., Patumanond, J., Satirapoj, B., et al. (2021). Ultrafiltration rates and intradialytic hypotension: A case-control sampling of pooled haemodialysis data. *Journal of Renal Care, 47*(1), 34–42. https://doi.org/10.1111/jorc.12340

U.S. National Kidney Foundation. 10 % of global population affected by CKD. (National Kidney Foundation).

Wang, J., Yao, J., Zhu, X., Wang, T., Lu, J., Wei, Q., Xue, J., You, L., & et al. (2023). Impact of frequent intradialytic hypotension on quality of life in patients undergoing hemodialysis. *BMC Nephrology, 24*, Article 209. https://doi.org/10.1186/s12882-023-03263-6

Wikipedia (via WHO). Kidney diseases have risen from the 19th to the 9th leading cause of death worldwide, with the number of deaths increasing by 95 % between 2000 and 2021.