Proceedings
The International Conference of Advancements in Nursing Care (ADNURS)
Volume 3 Issue 2 (2026)
E-ISSN: 3110-0120

Section: General Nursing

The effect of leaflet-based nutrition education on potassium and phosphorus knowledge and dietary adherence among patients receiving haemodialysis

Mugi Hartoyo, Faridha Najib Hannyfah, Supriyadi, Budiyati

Authors information
Department of Nursing, Poltekkes Kemenkes Semarang, Indonesia

Contactable email: mugihartoyo.209@gmail.com / Article DOI: *On process*

Abstract
Chronic kidney disease (CKD) is a long-term condition characterized by a progressive decline in kidney function, affecting more than 850 million people worldwide. Patients undergoing haemodialysis often face challenges in managing their potassium and phosphorus intake, which may increase the risk of serious complications, including cardiovascular disease and bone disorders. This study aimed to examine the effect of leaflet-based nutrition education on patients' knowledge and dietary compliance regarding potassium and phosphorus intake among individuals with CKD undergoing haemodialysis. A one-group pretest–post-test design was employed, involving 30 respondents selected through purposive sampling. Nutrition education on potassium and phosphorus management was delivered using leaflets over a one-week period. Data were collected using validated and reliable questionnaires assessing patients' knowledge and dietary compliance. The instruments were reviewed by three experts: a consultant nephrologist and hypertension specialist, a clinical nutrition specialist, and a haemodialysis nurse. Before the intervention, the mean knowledge score was 2.70, while the mean dietary compliance score was 1.67. Following the intervention, these scores increased to 4.57 and 2.40, respectively. Statistically significant improvements were observed in both knowledge (p<0.001) and dietary compliance (p<0.001). These findings suggest that leaflet-based nutrition education may improve patients' knowledge and dietary compliance regarding potassium and phosphorus management. Therefore, this educational approach could serve as a practical strategy to support dietary management among patients with CKD undergoing haemodialysis.

Keywords: Chronic kidney disease, dietary adherence, haemodialysis, nutrition education, potassium and phosphorus management.

Introduction

Chronic Kidney Disease (CKD) is a medical condition characterized by a progressive and irreversible decline in kidney function lasting more than three months, with a glomerular filtration rate (GFR) of less than 60 mL/min/1.73 m^2 (Stevens et al., 2024; Mullens et al., 2020). CKD is often caused by hypertension, diabetes mellitus, urinary tract infections, and structural abnormalities of the kidneys (Wijaya, 2024), and contributes to increased global morbidity and mortality due to complications such as cardiovascular disease, electrolyte imbalances, anaemia, and mineral bone disorders (Agvall et al., 2023). The new data support the previous estimate that there are 850 million people with kidney disease globally, of whom 4.6 million are on KRT, and 1.5 million people annually (one every 20 seconds) die from CKD (Ortiz et al., 2026). The Global Burden of Disease (GBD) 2021 reported CKD as one of the leading causes of death globally, with more than 1.5 million deaths (Guo et al., 2025). In Indonesia, the 2023 Indonesian Health Survey (SKI) reported 638,178 CKD cases, with Central Java being one of the provinces with the highest prevalence (88,180 cases), and Semarang City recording 1,049 CKD cases (Dinas Kesehatan Kota Semarang, 2024).

Patients in stage IV and V CKD require haemodialysis (HD) therapy to replace severely declined kidney function (Tanoto & Zaenal, 2022). Haemodialysis helps maintain fluid and electrolyte balance and removes metabolic waste such as urea and creatinine (Jaya, 2023). However, HD patients remain at high risk of imbalances in potassium and phosphorus levels, which can lead to complications such as cardiac arrhythmias, vascular calcification, and bone disorders (Kim & Jung, 2020; Bansal & Pergola, 2020; Kalantar et al., 2023). Dietary management of potassium and phosphorus levels is a crucial component of HD patient care. Unfortunately, many patients remain non-compliant with recommended dietary guidelines, largely due to a lack of understanding regarding foods that should be limited, such as certain fruits, dairy products, processed foods, and legumes (Riyanti & Aminah, 2023). Poor patient knowledge about potassium and phosphorus intake management is a major factor contributing to low dietary compliance (Naryati & Nugrahandari, 2021). Nutrition education has been shown to significantly improve patient understanding and adherence to appropriate diets (Tazeem, 2024).

Leaflets, as a medium for health education, are considered effective in increasing patient understanding due to their accessibility, low cost, and ability to convey information in a concise, visual, and engaging manner (Hasanica et al., 2020; Kori et al., 2024). A study by Maryati and Yanti (2024) demonstrated that leaflets can enhance public knowledge through clear and appealing information delivery. However, studies specifically examining the effect of nutrition education using leaflets on potassium and phosphorus management in HD patients remain limited. A preliminary study of ten HD patients at the Lestari Kidney and Hypertension Clinic in Semarang revealed that seven patients lacked understanding of high-potassium and high-phosphorus foods, and six patients were non-compliant in avoiding restricted foods. These findings indicate the need for targeted educational interventions. Therefore, this study aims to analyze the effect of nutrition education using leaflet media on the knowledge and compliance levels of CKD patients in managing potassium and phosphorus intake at Lestari Kidney and Hypertension Clinic, Semarang.

Method

This study employed a quantitative research design using a pre- and post-test approach. It was conducted at the Hemodialysis Unit of Lestari Kidney and Hypertension Clinic, Semarang, from May 28 to June 7, 2025. The study population comprised all 162 patients undergoing haemodialysis at the clinic. A total of 30 respondents were selected using purposive sampling, with the sample size determined based on the Lemeshow formula. The research instruments consisted of three questionnaires. The first collected respondents' demographic and clinical characteristics, including gender, age, occupation, educational level, duration of haemodialysis, and frequency of haemodialysis sessions per week. The second assessed patients' knowledge of potassium and phosphorus dietary management, while the third evaluated their compliance with dietary recommendations for controlling potassium and phosphorus intake among patients with CKD undergoing haemodialysis.

Both the knowledge and compliance questionnaires were developed by the researcher and subjected to expert validation involving three professionals: a Consultant Nephrologist and Hypertension Specialist, a Clinical Nutrition Specialist, and a Haemodialysis Nurse. Based on their expert assessments, both instruments were considered appropriate and approved for use in the study. The validity testing showed that the correlation coefficients (r) ranged from 0.383 to 0.566 for the knowledge questionnaire and from 0.526 to 0.908 for the compliance questionnaire. All questionnaire items demonstrated statistically significant correlations, with p-values of less than 0.05. Reliability testing yielded Cronbach's alpha coefficients of 0.824 for the knowledge questionnaire and 0.953 for the compliance questionnaire, indicating good and excellent internal consistency, respectively. These results suggest that both instruments demonstrated satisfactory reliability for measuring patients' knowledge and dietary compliance. Data analysis involved univariate and bivariate analyses. Univariate analysis was performed to describe the characteristics of the respondents and the distribution of each study variable. Bivariate analysis was conducted to examine the effect of nutrition education using leaflets on changes in patients' knowledge of potassium and phosphorus dietary management and their compliance with the recommended dietary practices. The paired-samples t-test was used to compare the pre-test and post-test scores and determine whether the observed changes were statistically significant.

Results

As presented in Table 1, the majority of respondents were female (17 respondents, 56.7%), while the most represented age group was 55–64 years (14 respondents, 46.7%). Regarding educational attainment, most respondents had completed a bachelor's degree (S1), accounting for 16 respondents (53.3%). In terms of haemodialysis duration, the majority had been receiving treatment for more than two years (18 respondents, 60%). All 30 respondents underwent haemodialysis twice a week **(Table 1)**. The table presents the respondents' knowledge levels before and after the intervention. Before the intervention, the largest proportion of respondents had a poor level of knowledge (11 respondents, 36.7%), with a mean score of 2.70 (minimum=1, maximum=5, SD=1.179, CV=43.67%), indicating considerable variability in knowledge scores. Following the intervention, the majority of respondents demonstrated a very good level of knowledge (19 respondents, 63.3%). The mean score increased to 4.57 (minimum=3, maximum=5, SD=0.626, CV=13.70%), indicating reduced variability and a more consistent distribution of knowledge scores **(Table 2)**. The table presents respondents' compliance with potassium and phosphorus dietary recommendations before and after the intervention. Before the intervention, 53.3% of respondents demonstrated moderate compliance, with a mean score of 1.67 (minimum=1, maximum=3, SD=0.606, CV=39.29%), suggesting considerable variation in compliance levels. After the intervention, 60% of respondents remained in the moderate compliance category, while the mean score increased to 2.40 (minimum=2, maximum=3, SD=0.498, CV=20.75%). This finding indicates an overall improvement in dietary compliance, accompanied by a more consistent distribution of scores **(Table 3)**. As shown in table, the paired-samples t-test revealed a statistically significant difference in respondents' knowledge scores before and after the intervention (p=0.000, p<0.05). This finding indicates that nutrition education using leaflets significantly improved knowledge of potassium and phosphorus dietary management among patients with CKD undergoing haemodialysis **(Table 4)**. Similarly, the table presents the results of the paired-samples t-test, which demonstrated a statistically significant difference in dietary compliance scores before and after the intervention (p=0.000, p<0.05).

These findings suggest that nutrition education using leaflets significantly improved compliance with potassium and phosphorus dietary recommendations among patients with CKD undergoing haemodialysis **(Table 5)**.

Table 1. Respondent characteristics.

Respondent characteristics	F	%
Gender		
Male	13	43.3
Female	17	56.7
Age (years)		
15-24 years	0	0
25-34 years	3	10
35-44 years	9	30
45-54 years	5	16.7
55-64 years	12	40
>65 years	1	3.3
Educational background		
No Formal Educational	0	0
Elementary School	0	0
Junior High School	1	3.3
Senior High School	11	36.7
Bachelor's Degree	16	53.3
Master's Degree	2	6.7
Doctoral Degree	0	0
Duration of undergoing HD		
<1 year	2	6.7
1-2 year	10	33.3
>2 year	18	60
Hemodialysis frequency per week		
Once a week	0	0
Twice a week	30	100
Three times a week	0	0
Occupation		
Employed	19	63.3
Unemployed	11	36.7

Table 2. Univariate analysis of the knowledge level related to potassium and phosphorus diet.

Variable	Classification	f	%	Min.	Max.	Mean	SD
Knowledge level							
Pre-test				1	5	2.70	1.179
Very Poor	0-4	4	13.3				
Poor	5-8	11	36.7				
Moderate	9-12	8	26.7				
Good	13-16	4	13.3				
Very good	17-20	3	10				
Post-test				3	5	4.57	0.626
Very poor	0-4	0	0				
Poor	5-8	0	0				
Moderate	9-12	2	6,7				
Good	13-16	9	30				
Very good	17-20	19	63.3				

Discussion

The results of the paired t-test showed a significant effect of nutrition education using leaflets on patients' knowledge of the potassium and phosphorus diet. Leaflets, as written educational media, have proven effective in enhancing patient knowledge because they provide concise, clear, and easy-to-understand information. Furthermore, this medium is accessible and can be reread at any time, helping reinforce patients' long-term understanding (Maryati & Yanti, 2024). By presenting information in a focused and structured manner, leaflets facilitate comprehension and ultimately contribute to improved patient knowledge (Rizki et al., 2019). These findings are consistent with a study by Purnamasari (2022) at Panembahan Senopati Hospital in Bantul, which demonstrated that leaflet-based education

significantly improved family knowledge of nutrition among patients with CKD. The one-week intervention period was considered sufficient for patients to receive, understand, and begin applying the information provided. This time frame also helped establish an educational relationship that fostered trust and motivation to adhere to medical recommendations (Listuhayu et al., 2023). Similarly, research conducted by Aprilla and Fayasari (2022) at Bhayangkara Hospital found a significant improvement in patient knowledge following one week of self-care education.

Table 3. Univariate analysis of compliance level related to potassium and phosphorus diet.

Variable	Classification	f	%	Min.	Max.	Mean	SD
Compliance Level							
Pre-test				1	3	1.67	0.606
Non-compliant	20-52	12	40				
Fairly compliant	53-76	16	53.3				
Compliant	77-100	2	6.7				
Post-test				2	3	2.40	0.498
Non-compliant	20-52	0	0				
Fairly compliant	53-76	18	60				
Compliant	77-100	12	40				

Table 4. Paired t-test analysis on the effect of nutrition education.

Intervention outcome	Mean difference	SD	Std. error mean	Sig. (2-tailed)
Pre- and post-test for knowledge level	-6.800	3.438	0.628	0.000

Table 5. Paired t-test analysis on the effect of compliance level.

Intervention outcome	Mean difference	SD	Std. error mean	Sig. (2-tailed)
Pre- and post-test for compliance	-14.167	6.665	1.217	0.000

The paired t-test results demonstrated that nutrition education using leaflets on potassium and phosphorus dietary management significantly improved compliance among patients with CKD undergoing haemodialysis at Lestari Kidney and Hypertension Clinic. Leaflets, designed to provide concise and informative content, are considered effective educational tools because of their practicality, ease of use, and combination of simple language, written information, and visual elements, enabling patients to understand the material more effectively (Kusumawardani et al., 2021). The effectiveness of this educational medium is supported by findings from Siskawati and Simanullang (2022), who reported a significant improvement in dietary compliance among haemodialysis patients at Aminah Hospital, Tangerang, following leaflet-based education. Although the intervention was relatively brief, a structured and intensive educational approach was found to be effective in establishing basic knowledge and encouraging positive behavioural changes (Aprilla & Fayasari, 2022). Furthermore, Listuhayu et al. (2023), in a study conducted at a hospital in Bandung, reported that self-management education delivered during three days of hospitalisation and followed by one week of post-discharge monitoring successfully improved patients' self-management scores, with the mean score increasing from 53 to 67.

Nurses play an essential role in improving dietary knowledge and compliance among patients with CKD undergoing haemodialysis through continuous education, health promotion, and patient-centred interventions. As healthcare professionals who interact regularly with patients, nurses are well positioned to identify individual learning needs, assess existing knowledge, and provide tailored information regarding potassium and phosphorus dietary restrictions. The use of leaflets can support nursing educational interventions by providing patients with accessible and structured information that can be reviewed independently at home. Outside delivering information, nurses should also reinforce dietary recommendations, monitor patients' adherence, identify barriers to dietary management, and involve family members in supporting appropriate dietary practices. This educational and supportive role reflects the importance of nurses in promoting patient self-management, strengthening treatment adherence, and preventing potential complications associated with inadequate potassium and phosphorus control.

Conclusion

Nutrition education delivered through leaflets significantly improved patients' knowledge of potassium and phosphorus dietary management. It also significantly increased adherence to dietary recommendations for controlling potassium and phosphorus intake. Nurses and nutritionists are encouraged to provide more targeted education on dietary management, particularly potassium and phosphorus restriction, using educational materials such as leaflets

to facilitate effective information delivery. Patients should also be encouraged to monitor their dietary intake and follow recommended guidelines, particularly regarding potassium and phosphorus consumption, to maintain their health and quality of life during haemodialysis. Leaflets can serve as an accessible source of information to strengthen patients' understanding and adherence to dietary recommendations. Future educational initiatives should incorporate structured programmes, such as regular nutritional counselling and visual educational materials, to improve patients' understanding of low-potassium and low-phosphorus diets. Further research should employ longitudinal designs with extended follow-up periods and repeated assessments to evaluate the sustainability of educational effects. Including control groups and recruiting participants from multiple research settings would also strengthen the generalisability of the findings. Furthermore, potential confounding variables, including age, educational level, and health status, should be considered in subsequent analyses. Overall, leaflet-based education is a valuable educational approach for improving knowledge and dietary adherence among haemodialysis patients in managing potassium and phosphorus intake.

References

Agvall, B., Ashfaq, A., Bjurström, K., Etminani, K., Friberg, L., Lidén, J., & Lingman, M. (2023). Characteristics, management and outcomes in patients with CKD in a healthcare region in Sweden: a population-based, observational study. BMJ open, 13(7), e069313

Aprilla, A., & Fayasari, A. (2022). Pemberian edukasi leaflet self-care terhadap kepatuhan diet pada pasien penyakit ginjal kronis dengan hemodialisa di Rumah Sakit Bhayangkara Tk. I R. Said Sukanto. Jurnal Pangan Kesehatan Dan Gizi Universitas Binawan, 3(1), 23–34. https://doi.org/10.54771/jakagi.v3i1.615

Bansal, S., & Pergola, P. E. (2020). Current management of hyperkalemia in patients on dialysis. Kidney International Reports, 5(6), 779–789. https://doi.org/10.1016/j.ekir.2020.02.1028

Dinas Kesehatan Kota Semarang. (2024). Data PTM 2023 per kelurahan. Dinas Kesehatan Kota Semarang.

Guo, J., Liu, Z., Wang, P., Wu, H., Fan, K., Jin, J., Zheng, L., Liu, Z., Xie, R., & Li, C. (2025). Global, regional, and national burden inequality of chronic kidney disease, 1990–2021: A systematic analysis for the Global Burden of Disease Study 2021. Frontiers in Medicine, 11, 1501175. https://doi.org/10.3389/fmed.2024.1501175

Hasanica, N., Ramic-Catak, A., Mujezinovic, A., Begagic, S., Galijasevic, K., & Oruc, M. (2020). The effectiveness of leaflets and posters as a health education method. Materia Socio-Medica, 32(2), 135–139. https://doi.org/10.5455/msm.2020.32.135-139

Jaya, I. F. (2023). Edukasi pengetahuan pembatasan cairan pada pasien gagal ginjal kronik yang menjalani hemodialisis. Indonesian Journal of Community Service, 3(2), 61–68. http://ijocs.rcipublisher.org/index.php/ijocs/article/view/254/195

Kalantar-Zadeh, K., Forfang, D., Bakris, G., Martin, K. J., Moe, S. M., & Sprague, S. M. (2023). Managing phosphate burden in patients receiving dialysis: beyond phosphate binders and diet. Kidney360, 4(11), 1650–1656. https://doi.org/10.34067/KID.0000000000000262

Kim, S. M., & Jung, J. Y. (2020). Nutritional management in patients with chronic kidney disease. Korean Journal of Internal Medicine, 35(6), 1279–1290. https://doi.org/10.3904/kjim.2020.408

Kusumawardani, S., Agustina, W., & Handian, F. I. (2021). Perbandingan efektivitas media audiovisual dan leaflet terhadap kepatuhan pembatasan cairan pasien GGK. Jurnal Ilmiah Media Husada, 10(2), 160–168. https://doi.org/10.33475/jikmh.v7i2.21

Listuhayu, D., Kurniawan, T., & Nursiswati, N. (2023). Edukasi manajemen diri pada pasien dengan chronic kidney disease: Studi kasus. Sentri: Jurnal Riset Ilmiah, 2(8), 2912–2921. https://doi.org/10.55681/sentri.v2i8.1305

Maryati, S., & Yanti, D. (2024). Promosi kesehatan dengan media booklet dan media leaflet dalam meningkatkan pengetahuan ibu hamil tentang asi eksklusif. Journal of Health (JoH), 11(1), 001–006. https://doi.org/10.30590/joh.v11n1.643

Mullens, W., Damman, K., Testani, J. M., Martens, P., Mueller, C., Lassus, J., Tang, W. H. W., Skouri, H., Verbrugge, F. H., Orso, F., Hill, L., Ural, D., Lainscak, M., Rossignol, P., Metra, M., Mebazaa, A., Seferovic, P., Ruschitzka, F., & Coats, A. (2020). Evaluation of kidney function throughout the heart failure trajectory: A position statement from the Heart Failure Association of the European Society of Cardiology. European Journal of Heart Failure, 22(4), 584–603. https://doi.org/10.1002/ejhf.1697

Naryati, N., & Nugrahandari, M. E. (2021). Faktor-faktor yang berhubungan dengan kepatuhan diet pada pasien gagal ginjal kronik melalui terapi hemodialisis. Jurnal Ilmiah Keperawatan (Scientific Journal of Nursing), 7(2), 256–265. https://doi.org/10.33023/jikep.v7i2.799

Ortiz, A., Lees, J. S., Torra, R., Stel, V. S., Kramer, A., & Mark, P. B. (2026). The updated global burden of chronic kidney disease: one death every 20 seconds. Nephrology, dialysis, transplantation:, 41(10), 1899–1908. https://doi.org/10.1093/ndt/gfag040

Purnamasari, R. (2022). Penggunaan leaflet modifikasi dalam edukasi gizi untuk meningkatkan pengetahuan keluarga pasien gagal ginjal kronik di RSUD Panembahan Senopati Bantul (Doctoral dissertation, Poltekkes Kemenkes Yogyakarta).

Riyanti, D., & Aminah, S. (2023). Hubungan tingkat pengetahuan dengan kualitas hidup pasien yang menjalani

hemodilisis di RS Islam Jakarta tahun 2023. Innovative: Journal Of Social Science Research, 3(2), 14647-14656.
Rizki, F. A., Hartoyo, M., & Sudiarto. (2019). Health education using the leaflet media reduce anxiety levels in pre operation patients. Jendela Nursing Journal, 3(1), 49–57. http://ejournal.poltekkes-smg.ac.id/ojs/index.php/jnj/article/view/1589
Siskawati, & Simanullang, R. H. (2022). Pengaruh edukasi terhadap kepatuhan pasien chronic kidney disease dalam pembatasan intake cairan di ruang haemodialisa di Rumah Sakit Aminah Tangerang. Jurnal Ilmiah Keperawatan IMELDA, 8(1), 5–11.
Stevens, P. E., Ahmed, S. B., Carrero, J. J., Foster, B., Francis, A., Hall, R. K., Herrington, W. G., Hill, G., Inker, L. A., Kazancıoğlu, R., Lamb, E., Lin, P., Madero, M., McIntyre, N., Morrow, K., Roberts, G., Sabanayagam, D., Schaeffner, E., Shlipak, M., … Levin, A. (2024). KDIGO 2024 clinical practice guideline for the evaluation and management of chronic kidney disease. Kidney International, 105(4), S117–S314. https://doi.org/10.1016/j.kint.2023.10.018
Tanoto, W., & Zaenal B., M. (2022). Therapy compliance level of chronic kidney failure patients with hemodialysis in the hemodialysis room. Journal of Applied Nursing and Health, 4(1), 112–129. https://doi.org/10.55018/janh.v4i1.65
Tazeem Akhtar, T. (2024). Assessment of effectiveness of nutritional education interventions for patients with chronic kidney disease undergoing hemodialysis: A systematic review and meta-analysis. Journal of Health and Rehabilitation Research, 4(3). https://doi.org/10.61919/jhrr.v4i3.1324
Wijaya, D. S. (2024). Gagal ginjal kronik pada anak. Jurnal Medika Hutama, 5(4), 4029-4035.