Journal of Public Health and Pharmacy
2775-4952 (Online - Elektronik)
Research Articles Open Access

Predictors of Quality of Life in Patients Undergoing Hemodialysis for Chronic Kidney Disease (CKD) in Surabaya, Indonesia

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ARTICLE INFO

Manuscript Received: 01 Dec, 2024
Revised: 23 Mar, 2025
Accepted: 16 Apr, 2025
Date of publication: 05 Dec, 2025
Volume: 6
Issue: 1
DOI: 10.56338/jphp.v6i1.6517

KEYWORDS

Quality of Life;
Hemodialysis;
Chronic Kidney Disease;
Nutrition

ABSTRACT

Introduction: Hemodialysis is the primary therapy for patients with end-stage chronic kidney disease. While it provides essential medical benefits, the procedure also imposes significant physical, psychological, and social challenges, impacting patients' quality of life. The quality of life of patients with Chronic Kidney Disease (CKD) is influenced by various factors, including individual characteristics such as age, nutritional status, duration of hemodialysis, occupation, gender, and level of education. Advanced age is often associated with a decline in physiological function and an increased risk of complications. Poor nutritional status or malnutrition is linked to higher morbidity and mortality rates. The length of time a patient undergoes hemodialysis may also affect their physical and psychological adaptation, either positively or negatively. This study aims to analyze the predictive factors influencing the quality of life among chronic kidney disease patients undergoing hemodialysis at a private hospital in Surabaya, Indonesia.
Methods: This study employed a cross-sectional design involving 160 respondents selected through probability random sampling. Data were collected using the Kidney Disease Quality of Life-Short Form (KDQOL-SF) questionnaire and analyzed using multiple logistic regression to determine significant factors associated with quality of life.
Results: The analysis revealed significant associations between age (p=0.001; OR=0.008), duration of hemodialysis (p=0.010; OR=25.916), and nutritional status (p=0.000; OR=0.003) with patients' quality of life. Patients with poor nutritional status and prolonged hemodialysis duration were at a higher risk of experiencing a decline in quality of life.
Conclusion: This study underscores the importance of routine nutritional assessments and targeted monitoring for elderly patients and those with long-term hemodialysis. These strategies are critical to optimizing the quality of life among hemodialysis patients.

Publisher: Pusat Pengembangan Teknologi Informasi dan Jurnal Universitas Muhammadiyah Palu

INTRODUCTION

Chronic kidney disease (CKD) is a serious medical condition that affects kidney function over an extended period. Patients with CKD require dialysis treatment to maintain fluid and electrolyte balance in the body. Although dialysis effectively maintains chemical balance, patients undergoing this procedure often face various health and lifestyle challenges that impact their quality of life (1, 2).

CKD affects approximately 9% of the global population, with around 2.5 million people receiving dialysis treatment in 2020 (3). According to the 2018 Basic Health Research data from the Republic of Indonesia, there were 713,783 people with chronic kidney disease in Indonesia. About 65% of those with kidney failure are managed with dialysis. A preliminary study at Haji Hospital Surabaya showed a prevalence of 963 cases of CKD patients undergoing dialysis at this hospital in 2022.

Hemodialysis, as a lifelong therapy, often leads to a decline in patients' quality of life. Several factors are suspected to influence quality of life, including age, education, duration of hemodialysis, and family support. Additionally, patients undergoing hemodialysis frequently experience significant lifestyle changes, including dietary restrictions, alterations in daily routines, nutrient loss during hemodialysis, medical complications associated with the disease, and the physical and psychological impacts of the hemodialysis procedure itself (4-9).

Although previous studies have identified several individual factors such as age, nutritional status, duration of hemodialysis, and employment status as potential predictors of quality of life in patients with chronic kidney disease (CKD), particularly those undergoing hemodialysis, the existing literature remains limited in capturing the complex and contextual interactions among these variables. Furthermore, many studies tend to examine these factors in isolation, without considering their cumulative or synergistic effects within real-world clinical settings. This gap underscores the need for more comprehensive and multidimensional analyses that reflect the actual conditions experienced by CKD patients undergoing hemodialysis, especially within diverse socio-demographic contexts and healthcare systems (4-9)

Among these factors, few studies have explored the most potent predictors of quality of life in kidney failure patients undergoing hemodialysis, particularly in our region. Identifying these predictive factors is crucial for sustaining the quality of life in kidney failure patients and requires further validation. Thus, it is essential to investigate the predictors of quality of life in hemodialysis patients as a basis for future therapy strategies. The lack of recent studies on quality-of-life predictors in kidney failure patients on hemodialysis underscores the need for this research, which aims to analyze the predictive factors affecting the quality of life of kidney failure patients undergoing hemodialysis treatment at Haji Hospital Surabaya.

METHOD

This study employed a cross-sectional design to investigate predictive factors affecting the quality of life among chronic kidney failure patients undergoing hemodialysis in a private hospital in Surabaya, Indonesia. The sample consisted of 160 respondents selected using probability random sampling. Data were collected between September 1 and December 30, 2023, from participants who met inclusion criteria, including willingness to participate and having undergone hemodialysis at least twice. Independent variables were assessed using a structured questionnaire and included: Gender (male, female), Age (17–25, 26–45, 46–55, 56–65, and over 65 years), Educational Level (primary, secondary (junior and senior high school), and higher education (diploma, undergraduate, and postgraduate), Employment Status (employed, unemployed), Duration of Hemodialysis (<1 year, 1–<2 years, 2–<3 years, >3 years), Nutritional Status, assessed using the Subjective Global Assessment (SGA) and categorized as good, moderate, or poor nutrition. Other confounding variables were controlled through the inclusion criteria,

Quality of life, the primary outcome variable, was evaluated using the validated Kidney Disease Quality of Life-Short Form (KDQOL-SF) questionnaire, with scores classified into normal (67–100), moderate (33–66), and poor (0–32) quality of life categories.

Data analysis aimed to identify significant predictors of quality of life in chronic kidney failure patients undergoing hemodialysis. Multiple logistic regression was performed, and statistical significance was set at a p-value of <0.05

Ethical Considerations

This study was ethically approved by the Ethical Committee of the Muhammadiyah University (Surabaya, Indonesia; 0412/KEPK/2023). The informed consent process highlighted participants' right to withdraw at any time, assured confidentiality of responses, and clarified that data would be used strictly for research purposes. All participants provided voluntary consent following a comprehensive briefing.

RESULTS

Characteristics of Respondents with Chronic kidney disease Undergoing Hemodialysis (n=160)

The majority of respondents were male, with the most common age range being 56–65 years. The highest educational background was secondary education (junior and senior high school), and most respondents were employed. Regarding the duration of hemodialysis, the majority had undergone the treatment for less than two years. Nutritional status was predominantly classified as good.

Table 1 presents the univariate analysis and percentage distribution of respondent characteristics across the study sample. Respondent characteristics variables include gender, age, education, employment, duration of hemodialysis, and nutritional status. The univariate analysis results indicate the percentage distribution for each variable.

Table 1. Distribution of Respondents Based on Gender, Age, Education, Employment, and Duration of Hemodialysis at a Public Hospital in Surabaya, Indonesia (n = 160)

Characteristic of Respondent	Frequency	Percentage
Gender		
Woman	56	35.0
Man	104	65.0
Age		
17-25 years	4	2.5
26-45 years	36	22.5
46-55 years	42	26.25
56-65 years	50	31.25
>65 years	28	17.5
Educational Level		
Primary	30	18.75
Secondary [junior and senior high school)	100	62.50
Higher education [diploma, undergraduate, and postgraduate])	30	18.75
Employment Sttus		
Employed	64	60.00
Unemployed	96	40.00
Duration of Hemodialysis		
<2 years	98	61.3
2-≤3 years	40	25.0
> 3 Years	22	13.75
Nutritional Status		
Moderate and poor nutrition	46	28.8
Good	114	71.2
Quality of life		
Moderate and poor	56	35.0
Normal	104	65.0

Correlation Between Independent Variables and Quality of Life in Chronic kidney disease Patients Undergoing Hemodialysis (n = 160).

In this study, the majority of respondents were male (65%), and most reported a good quality of life. The predominant age range was 56–65 years (31.25%). The majority of respondents had a secondary education level

(junior and senior high school), and most were unemployed (60%). The majority had undergone hemodialysis for less than two years, and most respondents had a good nutritional status.

Table 2. Correlations Between Independent Variables and Quality of Life in Chronic kidney disease Patients Undergoing Hemodialysis (n = 160).

Independent Variable/Factors	Quality of Life of Chronic kidney disease Patients Undergoing Hemodialysis				p-value *
	poor		normal		
	n	%	n	%	
Gender					
Man	28	17.5	76	47.5	0.004
women	28	17.5	28	17.5	
Age					
17-25 years	4	2.5	0	0.0	0.017
26-45 years	12	7.5	24	15.0	
46-55 years	10	6.3	32	20.0	
56-65 years	22	13.8	28	17.5	
>65 years	8	5.0	20	12.5	
Educational Level					
Primary	14	8.8	16	10.0	0.09
Secondary (junior and senior high school)	36	22.5	64	40.0	
Higher education [diploma, undergraduate, and postgraduate])	6	3.8	24	15.0	
Employment Sttus					
Employed	16	10.0	48	30.0	0.03
Unemployed	40	25.0	56	35.0	
Duration of Hemodialysis					
<2 years	36	22.5	62	38.8	0.746
2-≤3 years	12	7.5	28	17.5	
> 3 Years	8	5.0	14	8.8	
Nutritional Status					
Moderate and poor nutrition	40	25.0	6	3.8	0.000
Good	16	10.0	98	61.3	

*Significant at p<0.05.

Multivariate Analysis of Predictive Factors for Quality of Life in Chronic kidney disease Patients Undergoing Hemodialysis

The final analysis used multivariate analysis, with logistic regression results presented in Table 3. The study findings indicate that age (p=0.001, OR=0.008), duration of hemodialysis (p=0.010, OR=25.916), and nutritional status (p=0.000, OR=0.003) are significantly associated with the quality of life in kidney failure patients undergoing hemodialysis.

Table 3. Factors Affecting Quality of Life in Chronic kidney disease Patients Undergoing Hemodialysis (N=160)

Factors	Unstandardized Coefficients		Sig.	Exp (B)	95% CI	
	B	Std. Error			lower	Upper
Gender	0.457	0.702	0.515	0.633	0.160	2.508
Age	4.858	1.460	0.001	0.008	0.000	0.136
Educational	2.222	1.505	0.883	1.248	0.065	23.862
Employment Status	0.229	1.089	0.833	0.795	0.094	6.719
Duration of Hemodialysis	3.255	1.253	0.100	25.916	2.179	308.276
Nutritional Status	5.937	1.072	0.000	0.003	0.000	0.022

*Significant at p<0.05.

DISCUSSION

The study results indicate that the majority of chronic kidney disease (CKD) patients were male, with 52 respondents (65%). This finding aligns with research by Adiningrum at RSUD dr. Loekmono Hadi Kudus in 2020, which reported that CKD patients undergoing hemodialysis were predominantly male, with a percentage of 60% (10). This may be attributed to a faster disease progression and higher mortality rate among men compared to women, potentially due to anatomical differences in the kidneys and urinary tract. The male urinary tract is longer than that of females, which may lead to greater accumulation of substances in urine. Over time, this accumulation can lead to stone formation in the urinary tract or kidneys. If not addressed promptly and adequately, it may result in kidney dysfunction, which, if it progresses, can lead to end-stage renal failure requiring hemodialysis therapy to enable patients to maintain optimal daily functioning (11, 12)

Dietary factors also play a role in CKD, as men tend to consume higher amounts of protein and calories than women, potentially accelerating disease progression. Furthermore, testosterone in men can have a toxic effect on the kidneys, inducing podocytes and TGF-β1, which are associated with kidney sclerosis and fibrosis progression. Testosterone also induces the renin-angiotensin-aldosterone (RAA) system, causing both glomerular and systemic hypertension, whereas estrogen has a protective effect through RAA inhibition. This explains the higher incidence of CKD in men compared to women (13-18)

The study results also show that most respondents were in the late elderly age category (56-65 years, 31.25%). This finding aligns with Adiningrum's research at RSUD dr. Loekmono Hadi Kudus in 2020, where CKD patients undergoing hemodialysis were predominantly aged 56-65 years, with a percentage of 31% (10). Age can contribute to comorbid factors associated with CKD. Aging leads to macroscopic structural changes in the kidneys, with an overall decrease in kidney mass due to microscopic structural changes, including reduced nephron numbers and sizes due to glomerular sclerosis, pericapsular fibrosis, and tubular atrophy. Additionally, kidney function may decline with age, with some individuals experiencing an average creatinine clearance reduction of 0.75 mL/min per year, while others experience no decline (11, 12).

The study shows that the majority of respondents were unemployed (53.75%). This finding aligns with Adiningrum's research in 2020, where most CKD patients undergoing hemodialysis were unemployed (63%) (10). Employment is an essential factor significantly affecting the quality of life in CKD patients undergoing hemodialysis. Employed individuals may demonstrate self-efficacy, self-image, appearance, and self-esteem, which can enhance their quality of life. Other studies have shown that unemployment significantly impacts the reduction of health-related quality of life (HRQoL) in hemodialysis patients.

The study found that the average duration of hemodialysis among respondents was 1 year and 9 months, with most undergoing hemodialysis for 1-2 years (47.5%). Patients tend to adhere more closely to hemodialysis over time, likely because they have reached an acceptance stage and have received education from healthcare providers about the importance of regular hemodialysis (11, 12)

There is a significant correlation between nutritional status and quality of life in CKD patients undergoing hemodialysis at the Hemodialysis Unit of RSUD Haji, East Java Province, Surabaya. This finding is supported by a study by Sembiring & Hanifah in 2020, which reported a meaningful association between nutritional status and quality of life in CKD patients undergoing hemodialysis (19). Sembiring & Hanifah identified malnutrition status using the Subjective Global Assessment-Dialysis Malnutrition Score (SGA-DMS), and quality of life variables included physical and mental health aspects. The study found that quality of life is positively correlated with nutritional status (19). Specifically, malnutrition in CKD is caused by protein-energy wasting, which negatively impacts quality of life through reduced physical mobility, increased physical weakness, and psychological factors. Protein-energy wasting leads to anorexia, weight loss due to muscle mass loss, and inflammation. Inflammation triggers pro-inflammatory cytokines that contribute to depression through brain neurotransmitters and neurohormones. This condition can lead to body weakness, excessive fatigue, and a worsening loss of appetite, thus reducing physical activity (15, 20, 21)

The relationship between nutritional status and quality of life in CKD patients undergoing hemodialysis may also be due to reduced food intake, worsening body mass index, and physical changes such as gastrointestinal symptoms, decreased body function, loss of subcutaneous fat, muscle mass loss, ascites, and edema (22-24). Malnutrition in CKD is caused by protein-energy wasting, leading to anorexia, weight loss due to muscle mass loss, and inflammation. This condition triggers body weakness, excessive fatigue, nausea, vomiting, and worsened appetite

loss, leading to reduced physical activity, decreased physical mobility, malaise, headaches, and psychological issues. This inevitably affects the quality of life of CKD patients across physical, psychological, and social dimensions due to physical and psychological changes. Therefore, addressing malnutrition in CKD patients undergoing hemodialysis is essential to improve their quality of life (15, 20, 21).

In addition to the three primary factors identified as statistically significant age, duration of hemodialysis, and nutritional status the findings of this study also suggest the potential relevance of other variables which, although not statistically significant in the multivariate analysis, remain clinically important and warrant attention in the context of patient quality of life management.

Education and employment, for instance, did not emerge as significant predictors in the logistic regression model, yet revealed noteworthy trends. Patients with higher levels of education tended to report better quality of life, which may be attributed to greater comprehension of medical information, improved adherence to treatment regimens, and enhanced ability to access healthcare services. In the Indonesian context, challenges in accessing health information and understanding disease-related knowledge are common, especially among individuals with lower educational attainment. Therefore, structured and communicative health education should be integrated as a routine component of care for all hemodialysis patients, particularly those with limited formal education (15, 20, 21).

Similarly, employment status appeared to be associated with improved quality of life, not only due to economic factors, but also through its influence on social identity, active engagement, and a sense of purpose derived from productive activities. However, the capacity to remain employed during ongoing hemodialysis treatment is influenced by various factors including physical condition, family support, and workplace flexibility. Hence, healthcare providers may consider adopting a holistic approach that involves cross-sector collaboration for example, with social welfare or labor institutions to help patients maintain social and economic participation.

Regarding gender, although it did not reach statistical significance in the multivariate model, the predominance of male participants in this study population and prior evidence indicating faster disease progression in males remain notable. Future research with gender-stratified analyses may yield more specific insights into the tailored management needs of male and female patients (15, 20, 21).

Additionally, psychosocial factors such as family support, mental health status, and levels of stress or depression were not deeply explored in this study, yet have been consistently shown in previous research to influence patient adaptation to chronic illness and hemodialysis therapy. As such, the integration of psychosocial services into routine hemodialysis care programs may serve as an effective strategy for enhancing patient quality of life.

Overall, the findings of this study underscore the necessity of a multidimensional approach in managing patients with chronic kidney disease undergoing hemodialysis. Beyond medical and physiological aspects, social, economic, educational, and psychological factors must also be considered in a synergistic manner to optimally improve patients' quality of life.

CONCLUSION

This study indicates that age, duration of hemodialysis, and nutritional status are the main significant predictors of quality of life in chronic kidney failure patients undergoing hemodialysis. Patients of advanced age, poor nutritional status, and longer hemodialysis duration tend to experience a decline in quality of life. Therefore, it is essential to pay special attention to nutritional status and to regularly monitor patients with a long history of hemodialysis as well as those in older age groups. Interventions focused on improving nutritional status and managing elderly patients may contribute to enhanced quality of life for hemodialysis patients in the future. Accordingly, it is recommended to implement regular monitoring of nutritional status, provide special attention to elderly patients and those undergoing long-term hemodialysis, and ensure continuous education in order to improve the quality of life of hemodialysis patients

AUTHOR'S CONTRIBUTION STATEMENT

A.A.A.H., R.A., and S.M.L. participated in study design, methodological issues, analysis, interpretation of the study, and writing of the manuscript

CONFLICTS OF INTEREST

The authors declare no conflict of interest

DECLARATION OF GENERATIVE AI AND AI-ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

I declare that generative AI and AI-assisted technologies were used only to support language refinement and improve clarity in the writing process. All ideas, analyses, and conclusions in this thesis are entirely my own, and no AI tools were used to generate research data or substantive academic content.

SOURCE OF FUNDING STATEMENTS

No Funding

ACKNOWLEDGMENTS

We sincerely thank the Haji Hospital, Surabaya for their support and for providing the necessary educational and research facilities, enabling the successful completion of this study within the planned timeframe

BIBLIOGRAPHY

1. Kalantar-Zadeh K, Jafar TH, Nitsch D, Neuen BL, Perkovic V. Chronic kidney disease. The lancet. 2021;398(10302):786-802. DOI: 10.1016/S0140-6736(21)00519-5
2. Clavé S, Tsimaratos M, Boucekine M, Ranchin B, Salomon R, Dunand O, et al. Quality of life in adolescents with chronic kidney disease who initiate haemodialysis treatment. BMC nephrology. 2019;20:1-10. DOI: https://doi.org/10.1186/s12882-019-1365-3
3. Eckardt K-U, Delgado C, Heerspink HJ, Pecoits-Filho R, Ricardo AC, Stengel B, et al. Trends and perspectives for improving quality of chronic kidney disease care: conclusions from a Kidney Disease: Improving Global Outcomes (KDIGO) Controversies Conference. Kidney international. 2023;104(5):888-903. DOI. https://doi.org/10.1016/j.kint.2023.05.013
4. Laws R, Tapsell L, Kelly J. Nutritional status and its relationship to quality of life in a sample of chronic hemodialysis patients. Journal of Renal Nutrition. 2000;10(3):139-47. DOI: https://doi.org/10.1053/jren.2000.7412
5. Eldoushy EE, Shehata H. Impact of Maintenance Hemodialysis on Patients' Lifestyle and Well-Being. Int J Novel Res Healthc Nurs. 2019;6(1):523-42.
6. Su G, Saglimbene V, Wong G, Natale P, Ruospo M, Craig JC, et al. Healthy lifestyle and mortality among adults receiving hemodialysis: the DIET-HD study. American journal of kidney diseases. 2022;79(5):688-98. e1. DOI: https://doi.org/10.1053/j.ajkd.2021.07.022
7. Milenkova M, Trajceska L, Mladenovska D, Bedzeti B, Pushevski V, Rambabova-Busletikj I, et al. Family Support is Crucial for Dialysis Patients Compliance to Treatment and Quality of Life. Journal of Morphological Sciences. 2020;3(2):29-36.
8. Al Salmi I, Kamble P, Lazarus ER, D'Souza MS, Al Maimani Y, Hannawi S. Kidney Disease-Specific Quality of Life among Patients on Hemodialysis. International journal of nephrology. 2021;2021(1):8876559. DOI : https://doi.org/10.1155/2021/8876559
9. Hasan LM, Shaheen DA, El Kannishy GA, Sayed-Ahmed NA, Abd El Wahab AM. Is health-related quality of life associated with adequacy of hemodialysis in chronic kidney disease patients? BMC nephrology. 2021;22:1-12. DOI: https://doi.org/10.1186/s12882-021-02539-z
10. Adiningrum N, Andayani TM, Kristina SA. Analisis faktor klinik terhadap kualitas hidup pasien Hemodialisis di RSUD dr. Loekmono Hadi Kudus. J Farm Dan Ilmu Kefarmasian Indones. 2021;8(1):29.
11. Kattah AG, Garovic VD. Understanding sex differences in progression and prognosis of chronic kidney disease. Annals of translational medicine. 2020;8(14). DOI: https://doi.org/10.21037/atm.2020.03.62
12. Đukanović L, Dimković N, Ležaić V. Sex-specific differences in the epidemiology, progression, and outcomes of chronic kidney disease. Srpski arhiv za celokupno lekarstvo. 2023(00):71. DOI: https://doi.org/10.2298/SARH230321071D

13. Viramontes-Hörner D, Pittman Z, Selby NM, Taal MW. Impact of malnutrition on health-related quality of life in persons receiving dialysis: a prospective study. British Journal of Nutrition. 2022;127(11):1647-55. DOI: https://doi.org/10.1017/S000711452100249X
14. Nagy E, Mahmoud M, El-kannishy G, Sayed-Ahmed N. Impact of malnutrition on health-related quality of life in patients on maintenance hemodialysis. Therapeutic Apheresis and Dialysis. 2021;25(4):467-74.DOI: https://doi.org/10.1111/1744-9987.13588
15. Visiedo L, Rey L, Rivas F, López F, Tortajada B, Giménez R, et al. The impact of nutritional status on health-related quality of life in hemodialysis patients. Scientific Reports. 2022;12(1):3029.DOI: https://doi.org/10.1038/s41598-022-07055-0
16. Iseki K. Nutrition and quality of life in chronic kidney disease patients: a practical approach for salt restriction. Kidney research and clinical practice. 2022;41(6):657.DOI: https://doi.org/10.23876/j.krcp.21.203
17. Cai Q, Dekker LH, Vinke PC, Corpeleijn E, Bakker SJ, de Borst MH, et al. Diet quality and incident chronic kidney disease in the general population: The Lifelines Cohort Study. Clinical Nutrition. 2021;40(9):5099-105. DOI: https://doi.org/10.1016/j.clnu.2021.07.033
18. Daniel SC, Azuero A, Gutierrez OM, Heaton K. Examining the relationship between nutrition, quality of life, and depression in hemodialysis patients. Quality of life research. 2021;30:759-68. DOI: https://doi.org/10.1007/s11136-020-02684-2
19. Sembiring LP, Hanifah ZN. Hubungan status gizi terhadap kualitas hidup pada pasien penyakit ginjal kronik yang menjalani hemodialisis di RSUD Arifin Achmad Provinsi Riau. J Ilmu Kedokt. 2021;14(2):103.
20. Bashar MA, Haque ME, Islam MZ. Nutritional Status and Health Related Quality of Life Of Chronic Kidney Disease Patients. Journal of Preventive and Social Medicine. 2021;40(2):44-51. DOI: https://doi.org/10.3329/jopsom.v40i2.61796
21. Pawlaczyk W, Rogowski L, Kowalska J, Stefańska M, Gołębiowski T, Mazanowska O, et al. Assessment of the nutritional status and quality of life in chronic kidney disease and kidney transplant patients: a comparative analysis. Nutrients. 2022;14(22):4814. DOI: https://doi.org/10.3390/nu14224814
22. Hamidianshirazi M, Shafiee M, Ekramzadeh M, Jahromi MT, Nikaein F. Diet therapy along with nutrition education can improve renal function in people with stages 3–4 chronic kidney disease who do not have diabetes: a randomised controlled trial. British Journal of Nutrition. 2023;129(11):1877-87.DOI: 10.1017/S0007114522002094
23. Magalhães FG, Goulart RMM, Prearo LC. The impact of a nutrition intervention program targeting elderly people with chronic kidney disease. Ciencia & saude coletiva. 2018;23:2555-64.DOI : https://doi.org/10.1590/1413-81232018238.23972016
24. Chan W. Chronic kidney disease and nutrition support. Nutrition in Clinical Practice. 2021;36(2):312-30. DOI: https://doi.org/10.1002/ncp.10658