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Original Article

Factors associated with treatment adherence among individuals with chronic kidney disease undergoing hemodialysis*

Fatores associados à adesão ao tratamento de pessoas com doença renal crônica em hemodiálise

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Ingrid Fernanda de Oliveira Vieira[1]
Mônica La Salette da Costa Godinho[1]
Zélia Marilda Rodrigues Resck[1]
Denismar Alves Nogueira[1]
Patrícia Scotini Freitas[1]
Fábio de Souza Terra[1]

ABSTRACT

Objective: to analyze factors associated with treatment adherence among individuals with chronic kidney disease undergoing hemodialysis. **Methods:** a cross-sectional, descriptive-analytical study conducted with 142 hemodialysis patients at a philanthropic general hospital. A validated instrument was used to assess treatment adherence and a questionnaire including sociodemographic and clinical variables. Associations were analyzed using the Mann-Whitney test, with a significance level of 5% ($p<0.05$). **Results:** most participants were male, aged 60 to 69 years, Catholic, with incomes up to R$1,500.00, married or in a stable union, with diabetes mellitus as the cause of the disease, and up to one year of treatment. An association was observed between the hemodialysis adherence domain and four independent variables; medication, with three; fluid restriction, with nine; dietary adherence, with eleven. **Conclusion:** the associations identified between adherence domains and independent variables such as marital status, monthly family income, and hemodialysis duration, among others, expand the understanding of factors influencing adherence to hemodialysis treatment, contributing to the strengthening, knowledge, and interaction of healthcare professionals in health education. **Contributions to practice:** the study provides support for improving nursing practice, reinforcing professionals' engagement in promoting adherence among patients undergoing hemodialysis.

Descriptors: Renal Dialysis; Renal Insufficiency; Treatment Adherence and Compliance; Nursing.

RESUMO

Objetivo: analisar os fatores associados à adesão ao tratamento de pessoas com doença renal crônica em hemodiálise. **Métodos:** pesquisa transversal, descritiva-analítica, realizada com 142 pacientes em hemodiálise de um hospital geral filantrópico. Utilizou-se instrumento validado para avaliação da adesão ao tratamento e questionário contendo variáveis sociodemográficas e clínicas. As associações foram analisadas pelo teste Mann-Whitney, com nível de significância 5% ($p<0,05$). **Resultados:** maioria dos participantes do sexo masculino, entre 60 e 69 anos, católica, renda até R$1.500,00, casada ou em união estável, com diabetes mellitus como causa da doença e até um ano de tratamento. Observou-se associação entre domínio da adesão referente à hemodiálise com quatro variáveis independentes; medicação, com três; restrição de líquidos, com nove; adesão à dieta, com 11. **Conclusão:** as associações identificadas entre domínios da adesão e variáveis independentes, como estado civil, renda familiar mensal, tempo de hemodiálise, dentre outros, ampliam a compreensão dos fatores que influenciam a adesão ao tratamento da hemodiálise, colaborando para o fortalecimento, conhecimento e interação dos profissionais de saúde na educação em saúde. **Contribuições para a prática:** o estudo fornece subsídios para o aprimoramento da prática de enfermagem, fortalecendo a atuação dos profissionais na adesão dos pacientes em hemodiálise.

Descritores: Diálise Renal; Insuficiência Renal; Cooperação e Adesão ao Tratamento; Enfermagem.

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[1]Universidade Federal de Alfenas.
Alfenas, MG, Brazil.

Corresponding author:
Ingrid Fernanda de Oliveira Vieira
Rua Gabriel Monteiro da Silva, 700. Centro.
CEP: 37130-001. Alfenas, MG, Brazil.
E-mail: ingrid.vieira@sou.unifal-mg.edu.br

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Introduction

Chronic kidney disease (CKD) is among the chronic noncommunicable diseases that have shown increasing prevalence over the years[1]. This condition is associated with risk factors such as sociodemographic conditions unhealthy behaviors or lifestyles, and chronic diseases including diabetes, hypertension, hypercholesterolemia, smoking, alcohol consumption, overweight or obesity, diet, and advanced age[2].

Hemodialysis is one of the main forms of renal replacement therapy, in which blood is filtered by a machine through vascular access and a semipermeable membrane. This treatment imposes physical, mental, and social restrictions, affecting quality of life, autonomy, lifestyle, income, work activities, and personal relationships[3-4].

This type of treatment is vital for individuals with end-stage renal disease; however, it requires them to take responsibility for many aspects of their care, maintaining full adherence. Lack of adherence may lead to complications, hospitalizations, and lower survival, as treatment-related, lifestyle, and sociodemographic factors can interfere with this adherence process[5].

It is therefore necessary and essential to analyze adherence behavior among individuals with CKD, particularly regarding aspects that directly influence morbidity and mortality rates. Actions targeting individual care and specific needs become critical to support improvement in adherence practices by emphasizing affirmative actions and reinforcing those aspects lacking in treatment[6-7].

The concept of adherence, which underpins this study, is defined as the act of following health recommendations, as well as the degree of alignment between healthcare professionals' recommendations and the way patients follow them. Thus, adherence is understood as favorable behavior toward the recommended therapeutic regimen[8-9].

Through this research, the aim is to explore a topic that has been little investigated and still presents gaps. It also seeks to link teaching to practice by identifying and presenting factors and variables related to socioeconomic conditions, lifestyle, chronic diseases, and information regarding the illness and its treatment that are associated with adherence among individuals with CKD undergoing hemodialysis. Such understanding is intended to support public policies and professional actions in healthcare attention for these individuals. Additionally, it offers the possibility of stimulating reflections that help people undergoing hemodialysis adhere to treatment as a means of coping with the disease and consequently improving their quality of life, by presenting factors and variables associated with adherence in the domains of hemodialysis, medication, fluid restriction, and diet.

The objective was to analyze factors associated with treatment adherence among individuals with chronic kidney disease undergoing hemodialysis.

Methods

Type and place of study

A cross-sectional, descriptive-analytical study conducted at a philanthropic general hospital located in a municipality in the southern region of Minas Gerais.

Study population

The study population comprised all patients undergoing hemodialysis treatment between January and May 2024, totaling 176 individuals. No sample size calculation was performed because all patients receiving care at the service were invited to participate. Among them, 142 met the inclusion criteria and agreed to participate; 13 declined and 21 did not meet the established criteria. Thus, the final population corresponded to 80.7% of individuals undergoing hemodialysis treatment at the hospital, being considered representative.

Inclusion criteria included patients aged 18 years or older, of both genders, regardless of educational level, with a confirmed diagnosis of CKD, undergoing

hemodialysis treatment at the service, and capable of responding to the research instruments. Exclusion criteria comprised patients receiving hemodialysis at another facility, those who refused participation, or those unable to respond, such as individuals with Alzheimer's disease, tracheostomy, hearing impairment, Down syndrome, or poor health status.

Data collection

To assess treatment adherence, the The End-Stage Renal Disease Adherence Questionnaire (ESRDAQ) was used, translated, adapted, and validated into Portuguese in 2017, resulting in the *Questionário de Avaliação sobre a Adesão do Portador de Doença Renal Crônica em Hemodiálise* (QADRC-HD). The instrument comprises 46 questions organized into five domains: general information (five items), hemodialysis (14 items), medication (nine items), fluid restriction (10 items), and diet (eight items), with responses structured in Likert scale, multiple-choice, and dichotomous formats[7].

Six questions assess adherence itself (14, 17, 18, 26, 31, and 46), with higher scores indicating stronger adherence. The scale does not present a cutoff point or classification. There are three questions for the hemodialysis domain, with total scores ranging from 0 to 600 points. For the other domains (medication, fluid intake, and diet), adherence is assessed by one question each, with scores ranging from 0 to 200 points. In the present study, the four domains were maintained as described by the original authors, without further grouping or subdivision[6-7].

The score assigned to each item reflects the relevance of the treatment aspect to clinical outcomes; therefore, the hemodialysis domain holds greater weight compared to the others. An important characteristic of the instrument refers to the causes of certain behaviors. For instance, if a patient misses a hemodialysis session for medical reasons, they receive the full score. The instrument also evaluates individuals' perception and knowledge of the treatment (questions 11, 12, 22, 23, 32, 33, 41, and 42) and the educational actions provided by healthcare professionals related to treatment, allowing an understanding of the causes of nonadherence behaviors[6-7]. Authorization for the use of the instrument was requested from the authors of both the original and translated versions.

In addition, a characterization questionnaire was administered to participants, adapted with authorization from the author for use and modification. This instrument was developed to avoid overlap with the adherence questionnaire and included 14 open- and closed-ended questions distributed into three categories: socioeconomic data (7), lifestyle habits and chronic diseases (5), and information on the disease and treatment (2)[10]. The variables included gender, age, religious belief, number of children, monthly family income, receipt of benefits, type of housing, alcohol consumption, smoking, physical activity, presence of chronic diseases, use of continuous medication, etiology of chronic renal failure, and type of access for hemodialysis. The original categories were preserved.

Data collection was conducted individually during hemodialysis sessions, following the signing of the Informed Consent Form. Interviews lasted approximately 25 minutes and were conducted by the researcher, who read the instruments aloud due to the patients' limitations in completing them independently during the procedure.

Data analysis

Collected data were double-entered into a Microsoft Excel spreadsheet, organized by coding for categorization and tabulation of results. To verify associations between the 44 independent variables selected for analysis and the four adherence domains (hemodialysis, medication, fluid intake, and diet), the Mann-Whitney test was applied, in accordance with data distribution and homogeneity. Results are presented through descriptive statistics (mean, median, standard deviation, minimum, and maximum) and inferential analysis with p-values. For this univariate analysis, divisions of the questions from both instruments were maintained as described and recommen-

ded by their respective authors, without the creation of additional groupings.

A significance level of 5% was adopted for all analyses. It is noteworthy that, to facilitate statistical analysis, some of the 44 independent variables were dichotomized. Multiple regression analysis was not performed because the residuals of the analysis failed to meet the assumptions as confirmed by the Shapiro-Wilk test at 5%. Accordingly, only univariate comparisons were carried out using the Mann-Whitney test at the same significance level.

Ethical aspects

For data recording and tabulation, participants were identified by numerical codes to ensure confidentiality, privacy, and security of information, preserving secrecy and anonymity of responses. The research project was submitted through Plataforma Brasil for review by the Research Ethics Committee of the Federal University of Alfenas and approved under opinion number 5,688,284/2022 and Certificate of Presentation for Ethical Consideration: 63113522.6.0000.5142.

Results

Regarding participants' characteristics, 79 (55.6%) were male and 43 (30.3%) were between 60 and 69 years of age. Most identified as Catholic, 99 (69.7%), had monthly incomes up to R$1,500.00, 73 (51.4%), and lived in a stable union or were married, 79 (55.6%). In addition, 64 (45.1%) had been undergoing hemodialysis treatment for up to one year.

Concerning lifestyle habits, regarding smoking throughout life, 128 (90.1%) reported not smoking at the time of data collection, and among these, 55 (42.9%) identified as former smokers at some point in life. Among study participants, 96 (67.6%) reported not being accompanied by another person when attending treatment, and the predominant type of access for hemodialysis was arteriovenous fistula, in 76 (53.5%), followed by central venous catheter, in 65 (45.8%).

Table 1 presents descriptive statistics for adherence among individuals with CKD undergoing hemodialysis in relation to the four adherence domains and as presented in the original instrument.

Table 1 – Descriptive statistics for adherence among individuals with chronic kidney disease undergoing hemodialysis in relation to the four adherence domains (n=142). Alfenas, MG, Brazil, 2024

Statements/Domains	Mean	Median	Standard Deviation	Minimum	Maximum
Hemodialysis domain					
14- Number of missed dialysis sessions	288.73	300.0	35.925	100	300
17- Frequency of requests to shorten hemodialysis sessions	195.77	200.0	21.048	0	200
18- Time of hemodialysis reduction	97.36	100.0	14.80	0	100
Sum of hemodialysis adherence scores	581.87	600.0	50.542	275	600
Medication domain					
26- Frequency of not taking prescribed medication	189.79	200.0	30.094	50	200
Fluid restriction domain					
31- Frequency of recommended fluid restriction	160.21	200.0	64.560	0	200
Diet domain					
46- Frequency of following recommended diet	156.34	200.0	66.005	0	200

In Table 1, scores range from 275 to 600 points for the hemodialysis sum domain and from 50 to 200 points for the medication, fluid restriction, and diet domains. The reduction in hemodialysis addressed in question 17 refers to how many times the person requested a reduction in hemodialysis time in the previous month (none, once, twice, three times, four times, or more). The reduction in hemodialysis in

question 18 refers to the number of minutes of hemodialysis reduced in the previous month (does not apply, 10 minutes or less, 11 to 20 minutes, 21 to 30 minutes, more than 31 minutes), and question 26 addresses the frequency of not taking prescribed medication during the previous week (never, very rarely, about half the time, most of the time, all the time), according to the QADRC-HD instrument.

It is noteworthy that, in the hemodialysis adherence domain, the mean of the three questions was 581.87. In the medication domain, the mean was 189.79. In the fluid restriction domain, the mean was 160.21. In the diet adherence domain, the mean was 156.34. The mean scores were high in all adherence domains (Table 1).

All 44 independent variables were cross-tabulated through univariate analysis with the four adherence domains established in the QADRC-HD instrument. These analyses are presented in the following tables, which show variables that presented statistical associations ($p<0.05$). It was not feasible to present all variables without statistical association due to the extensive length of these analyses (Table 2).

Higher mean scores indicated that hemodialysis-related adherence was greater among individuals with partners, nonsmokers, those who did not report difficulty restricting fluid intake, and those who reported no difficulty adhering to fluid restriction (Table 2). The remaining 40 variables did not show statistical association with the hemodialysis domain ($p>0.05$).

Table 3 shows the association of independent variables with the medication adherence score domain.

Table 2 – Association of independent variables with the hemodialysis adherence score domain (n=142). Alfenas, MG, Brazil, 2024

Variables	n	Mean	Median	Standard Deviation	Maximum	Minimum	p-value*
Marital status							
With a partner	79	586.72	600.0	42.949	600	400	0.044
Without a partner	63	575.44	600.0	61.144	600	275	
Smokers							
No	128	585.09	600.0	44.243	600	400	0.016
Yes	14	547.92	600.0	96.800	600	275	
Difficulty restricting fluid intake							
No	84	589.58	600.0	35.542	600	400	0.014
Yes	58	569.39	600.0	68.895	600	275	
Difficulty adhering to fluid restriction							
No	79	588.97	600.0	36.493	600	400	0.037
Yes	63	571.70	600.0	66.693	600	275	

*Mann-Whitney test with significant $p<0.05$

Table 3 – Association of independent variables with the medication adherence score domain (n=142). Alfenas, MG, Brazil, 2024

Variables	n	Mean	Median	Standard Deviation	Maximum	Minimum	p- value*
Monthly family income (reais)							
Up to 3,000.00	122	192.45	200.0	25.628	200	50	0.014
>3,000,00	20	166.67	200.0	55.635	200	50	
Time (months)†							
Up to 1	64	193.75	200.0	25.339	200	50	0.027
>1	78	185.38	200.0	36.145	200	50	
Difficulty taking prescribed medication							
No	125	193.33	200.0	23.066	200	50	0.003
Yes	17	162.50	200.0	59.161	200	50	

*Mann-Whitney test with significant $p<0.05$; †Time since a healthcare professional discussed the importance of taking prescribed medication

Higher mean scores indicated that medication-related adherence was greater among individuals with monthly family incomes up to R$3,000.00 those who had been advised by healthcare professionals on the importance of taking prescribed medication within the previous month, and those who reported no difficulty taking prescribed medication (Table 3). The remaining 41 variables did not show statistical association with the medication domain (p>0.05).

Table 4 presents the association of independent variables with the fluid restriction adherence score domain.

Table 4 – Association of independent variables with the fluid restriction adherence score domain (n=142). Alfenas, MG, Brazil, 2024

Variables	n	Mean	Median	Standard Deviation	Maximum	Minimum	p-value*
Age group (years old)							
Up to 59	73	138.14	150.0	75.051	200	0	0.000
≥60	69	189.52	200.0	30.214	200	50	
Religious belief							
Catholic	99	175.86	200.0	47.533	200	0	0.007
Other religions	43	180.88	200.0	44.406	200	50	
Convenient days and times for hemodialysis sessions							
Yes	128	165.91	200.0	58.235	200	0	0.027
No	14	122.73	200.0	93.176	200	0	
Difficulty remaining throughout hemodialysis sessions							
No	102	170.35	200.0	53.894	200	0	0.034
Yes	40	141.43	200.0	78.108	200	0	
Difficulty restricting fluid intake							
No	84	188.89	200.0	30.515	200	0	0.000
Yes	58	122.45	150.0	76.418	200	0	
Difficulty adhering to fluid restriction							
No	79	189.71	200.0	30.614	200	0	0.000
Yes	63	126.42	150.0	75.066	200	0	
Difficulty following the recommended diet							
No	81	170.14	200.0	56.705	200	0	0.036
Yes	61	150.0	200.0	69.970	200	0	
Perceived importance of restricting fluid intake							
Yes	139	164.29	200.0	60.766	200	0	0.003
No	3	25.00	25.00	35.355	50	0	
Perceived importance of monitoring daily food intake							
Yes	140	163.87	200.0	61.384	200	0	0.025
No	2	50.0	50.0	70.711	100	0	

*Mann-Whitney test, p<0.05

Higher mean scores indicated that adherence related to fluid restriction was greater among individuals aged 60 years or older, those with religious beliefs other than Catholicism, those who reported convenient days and times for hemodialysis sessions, those who did not report difficulty remaining throughout hemodialysis sessions, those who reported no difficulty restricting fluid intake or adhering to fluid restriction, those who did not report difficulty following the recommended diet, and those who considered it important to restrict fluid intake and monitor the types of food consumed daily (Table 4). The remaining 35 variables did not show statistical association with the fluid restriction domain (p>0.05).

Table 5 shows the association of independent variables with the diet adherence score domain.

Table 5 – Association of independent variables with the diet adherence score domain (n=142). Alfenas, MG, Brazil, 2024

Variables	n	Mean	Median	Standard Deviation	Maximum	Minimum	p-value*
Type of access for hemodialysis							
Fistula	76	139.84	150.0	75.161	200	0	0.003
Prosthesis or catheter	66	175.44	200.0	50.993	200	0	
Kidney transplantation							
No	132	159.38	200.0	65.941	200	0	0.011
Yes	10	122.22	150.0	75.462	200	0	
Companion							
Yes	46	178.75	200.0	45.132	200	0	0.004
No	96	145.68	200.0	73.399	200	0	
Time since a healthcare professional discussed the importance of completing hemodialysis sessions without reducing time (months)							
Up to 1	49	170.73	200.0	59.135	200	0	0.025
>1	93	149.38	200.0	70.033	200	0	
Time since a healthcare professional discussed the importance of taking prescribed medication							
Up to 1	63	171.43	200.0	52.964	200	0	0.014
>1	79	143.85	200.0	75.264	200	0	
Difficulty taking prescribed medication							
No	125	160.95	200.0	65.772	200	0	0.017
Yes	17	128.13	150.0	70.637	200	0	
Difficulty adhering to prescribed medication							
No	127	159.81	200.0	67.096	200	0	0.023
Yes	15	132.14	150.0	63.872	200	0	
Difficulty following the recommended diet							
No	88	179.75	200.0	42.757	200	0	0.000
Yes	54	113.10	100.0	81.943	200	0	
Difficulty adhering to the recommended diet							
No	81	180.56	200.0	44.051	200	0	0.000
Yes	61	121.43	150.0	79.057	200	0	
Perceived importance of completing all scheduled hemodialysis sessions							
Yes	139	158.47	200.0	66.121	200	0	0.030
No	3	133.33	200.0	115.47	200	0	
Perceived importance of monitoring daily food intake							
Yes	140	159.24	200.0	64.429	200	0	0.013
No	2	0	0	0	0	0	

*Mann-Whitney test with significant p<0.05

Higher mean scores indicated that diet-related adherence was greater among individuals with prostheses or catheters as hemodialysis access, those who had not undergone transplantation, those who attended the health service with a companion, those who reported that healthcare professionals had discussed the importance of completing hemodialysis sessions without reducing time and the importance of taking prescribed medication within the previous month, those who reported no difficulty taking prescribed medication, those who reported no difficulty following the recommended diet, and those who considered it important to complete all scheduled hemodialysis sessions and monitor the types of food consumed daily. The remaining 33 variables did not show statistical association with the diet domain (p>0.05).

Discussion

With the presentation of results and factors associated with adherence among individuals with CKD undergoing hemodialysis, according to the four adherence domains as defined in the original instrument, it is observed that, as in this study, when analyzing associations of variables in the hemodialysis domain, research that examined prevalence and factors associated with negative self-perceived health among 130 patients on hemodialysis identified that 57.7% had negative self-perception, associated with living alone and being a smoker[11].

In this sense, individuals with partners receive greater interaction and support from relatives and experience positive impacts on treatment adherence,

as they are assisted in adapting to the disease and receive greater collaboration in required care activities. Family support and other social interactions, such as neighbors and friends, contribute to coping with the health-disease process and foster adherence[12-13].

Furthermore, for treatment to be more effective, strict control of risk factors such as smoking is essential, as it negatively affects residual renal function in dialytic patients and is related to CKD progression. Smoking loads above 15 pack-years worsen the condition, while cessation reduces risks and brings the status of former smokers closer to that of nonsmokers[11,14-15].

Fluid control is an essential component of the therapeutic regimen of individuals with advanced CKD, directly influencing morbidity and mortality rates. Nonadherence to this recommendation impairs quality of life and increases healthcare costs; when intake targets are overly strict, patients may feel unmotivated, believing that the dialysis machine will remove excess fluid[16].

When examining the association between adherence scores and the medication domain, one study reports that individuals in higher income strata seek healthcare services for preventive reasons, whereas those with lower incomes tend to seek care mainly when ill, which favors CKD worsening and hinders treatment adherence[17]. Income therefore directly influences adherence: individuals with better financial conditions have greater access to transportation, medication, and tests, whereas low income limits access and makes therapeutic compliance more difficult[12-13].

Another variable associated with the medication domain concerns access to medication and professional guidance. Nonadherence leads to serious consequences, including therapeutic failure, hospitalizations, and premature death. Knowing the patient and their difficulties allows the development of individualized strategies and broadens psychosocial care. Nurses, as members of healthcare teams, play a central role in raising awareness among patients and families for prevention and health promotion actions[18].

Patients report that understanding their disease gives them greater autonomy. Learning during hemodialysis, dialogue with the team, especially nursing, and contact with other patients help them understand hemodialysis effects and cope with complications. Understanding their own body and treatment contributes to stronger adherence[19].

In the fluid restriction domain, aging stands out as one of the main risk factors for CKD due to the physiological reduction in glomerular filtration and the onset of renal injury associated with chronic diseases. Advanced age may therefore favor nonadherence to treatment[20-21].

Among older adults, faith and spirituality provide hope and determination to face the disease, functioning as emotional support and fostering adherence. Spirituality provides meaning and well-being, promotes resilience and biopsychosocial balance, and helps patients and their families cope with crises, set goals, and improve quality of life; it should therefore be taken into account by healthcare professionals in care and in their relationship with patients[22-23].

In this study, convenient days and times, the absence of difficulties remaining throughout sessions and adhering to fluid and dietary restrictions, and valuing these restrictions were associated with greater adherence to fluid restriction.

The regimen of fluid and dietary control is essential to prevent complications among individuals with end-stage CKD and to foster adherence to treatment[16]. Nonadherence to fluid restriction is among the most serious issues, as missing or shortening hemodialysis sessions is associated with higher mortality; when patients understand the importance of hemodialysis and dietary recommendations, adherence improves significantly[24].

As kidneys do not adequately eliminate toxins, it is also necessary to restrict certain foods. Adequate nutritional follow-up slows disease progression and reduces symptoms such as nausea and weakness. However, dietary changes, nonadherence to treatment, and financial constraints may generate frustration and hinder adherence[25].

In the diet domain, regarding vascular access for hemodialysis, and in contrast to the findings of the present study, research has identified central venous catheter use as a risk factor for adherence because it leads to repeated hospitalizations due to high risk of infection and thrombosis, discomfort, visual disturbances, and limited mobility. Nonetheless, individuals with arteriovenous fistula also report difficulties due to pain and discomfort during procedures[19].

Therefore, higher adherence associated with catheter or prosthesis use may be attributed to more intensive maintenance care provided by healthcare professionals, including nursing, and by patients themselves.

Regarding kidney transplantation, it is considered the most complete alternative for replacing renal function, as it restores functional capacity and reduces restrictions, improving quality of life, decreasing limitations, and increasing patient independence, which may favor adherence to CKD treatment[26-27].

The presence of a companion during hemodialysis was also associated with greater adherence to diet. Companions, usually relatives, provide emotional and practical support, assist in care, and help understand recommendations that extend to the home setting[11].

Additional associations with the diet domain relate to professional guidance on the disease, treatment, and restrictions, which is crucial since professionals directly influence adherence to care. Support networks involving users and healthcare teams, especially nursing, strengthen health promotion practices and encourage shared responsibility for treatment, fostering rapport, trust, and active listening[12].

Adherence to treatment across different domains (hemodialysis sessions, fluid restriction, medication, and diet) requires understanding and acceptance of the disease and positively influences quality of life and survival. Adequate dietary habits and fluid control contribute to improved laboratory parameters and fewer complications, such as hospitalizations due to acute pulmonary edema; acknowledging the importance of hemodialysis as part of daily life ensures greater well-being, better quality of life, and consequently higher adherence to treatment[28].

Medication adherence directly affects clinical outcomes and quality of life and is important for improvement of health status. It is further enhanced when there is shared responsibility among patients, families, healthcare teams, and social support networks, which allows continuity and effectiveness of therapy[21].

Study limitations

Study limitations include the cross-sectional design, which does not allow the analysis of cause--and-effect relationships, the relatively small number of participants, the use of lengthy instruments that at times became tiring for respondents, and the fact that the research was conducted in a single hemodialysis center. It is noteworthy, however, that administering questionnaires by a single researcher ensured uniformity in conducting interviews and contributed to the reliability of results.

For future research, shorter instruments are recommended, provided they still adequately address the proposed topic. Expanding the study to other hemodialysis centers with different designs, such as intervention studies, and including larger samples is also suggested to strengthen generalizability of findings.

Contributions to practice

The results of this research may foster substantial advances in knowledge in the field under study. Such contributions extend to scientific, educational, social, and care domains and may support practice, health promotion, and disease prevention in this field, particularly in nursing. By deepening understanding of adherence practices in CKD treatment, findings support the development of more effective guidance strategies for self-care and directly improve adherence among patients undergoing hemodialysis.

Furthermore, understanding factors that in-

fluence treatment adherence among individuals with CKD on hemodialysis contributes to enhancing health education actions, which may be implemented in other services, including primary healthcare, since patients use multiple levels of care. These actions can support more targeted and effective interventions to assist patients, promote autonomy, and improve therapeutic outcomes.

Conclusion

There was an association between the hemodialysis domain and four independent variables, the medication domain and three variables, the fluid restriction domain and nine variables, and the diet adherence domain and eleven independent variables, leading to the conclusion that the associations identified between adherence domains and independent variables broaden understanding of factors that may influence treatment adherence.

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Authors' contributions

Conception and project: **Vieira IFO, Freitas PS, Terra FS**. Data analysis and interpretation; critical review of the manuscript for important intellectual content; final approval of the version to be published; agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the manuscript are appropriately investigated and resolved: **Vieira IFO, Godinho MLSC, Resck ZMR, Nogueira DA, Freitas PS, Terra FS**.

Data availability

The authors state that data are fully available in the body of the article.

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