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Association between polypharmacy, medication adherence, and quality of life in patients with chronic kidney disease: a preliminary study in the Brazilian Amazon

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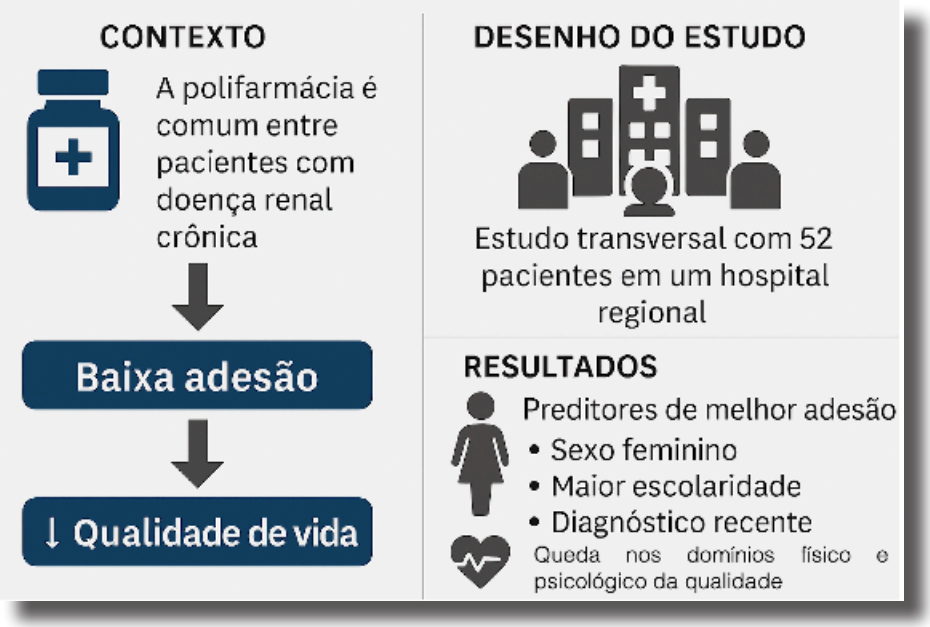
Highlights

- *Polypharmacy was associated with low adherence among patients with chronic kidney disease.*
- *Low treatment adherence significantly reduced quality-of-life scores ($p < 0.0001$).*
- *Female sex, higher educational level, and recent diagnosis were predictors of better adherence.*
- *No patient exhibited high adherence in the evaluated population.*
- *The physical and psychological domains of quality of life were the most affected by low adherence.*

Graphical Abstract



Abstract

Chronic kidney disease (CKD) is a progressive condition that requires complex pharmacological management, with polypharmacy being highly prevalent and potentially compromising treatment adherence and quality of life. This cross-sectional study included 52 patients with CKD treated at a regional hospital in northern Brazil. Its objective was to examine the association between polypharmacy, treatment adherence, and quality of life. Adherence was assessed using the Morisky-Green Test, while quality of life was measured with the abbreviated version of the WHOQOL-BREF instrument. Results demonstrated that 65% of patients presented moderate adherence, while 35% exhibited low adherence, which was significantly associated with lower quality-of-life scores, particularly in the physical and psychological domains. Female sex, higher educational level, and recent diagnosis (1–3 years) were predictors of better adherence. Statistical analyses included chi-square tests and logistic regression, with a 5% significance level and adjustments for sociodemographic variables. These findings reinforce the negative impact of low adherence to pharmacotherapy on the quality of life of patients with CKD and highlight the importance of targeted interventions, including individualized pharmacotherapy review, health education programs, and psychosocial support, to improve adherence and promote patient well-being.

Keywords: Chronic Kidney Disease. Treatment Adherence. Quality of Life.

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INTRODUCTION

Chronic kidney disease (CKD) represents a serious global public health problem, affecting approximately 850 million people and ranking among the leading causes of premature morbidity and mortality worldwide[1,2]. It is characterized by the progressive and irreversible loss of renal function, progressing through clinical stages that often require renal replacement therapies such as hemodialysis, peritoneal dialysis, or kidney transplantation[3,4]. Beyond its pathophysiological burden, CKD imposes significant economic, social, and psychological consequences, negatively impacting treatment adherence and patients' quality of life[5,6].

In this context, polypharmacy — defined as the concomitant use of five or more medications — has emerged as one of the main therapeutic challenges in CKD management[7,8]. Due to the complexity of the disease and the high prevalence of comorbidities, CKD patients are frequently subjected to extensive pharmacotherapeutic regimens, which include antihypertensives, renin-angiotensin system inhibitors, erythropoiesis-stimulating agents, phosphate binders, and medications for glycemic control[9,10]. However, excessive use of medications may compromise treatment adherence, increase the incidence of adverse drug reactions and drug–drug interactions, and ultimately reduce clinical effectiveness and patient well-being[11,12].

Treatment adherence plays a crucial role in slowing CKD progression and preventing complications such as cardiovascular events and hospitalizations[13,14]. Nevertheless, adherence is modulated by multiple determinants, including educational level, socioeconomic status, access to healthcare services, presence of mental disorders, and factors related to the therapeutic regimen, such as complexity, dosing frequency, and cost[15-19]. Socially vulnerable patients, in particular, face numerous barriers that hinder continuity of care.

Despite increasing attention to the effects of polypharmacy and adherence in CKD, to date no studies have been identified that simultaneously investigate the association between polypharmacy, treatment adherence, and quality of life in CKD patients in the Brazilian Amazon region. This gap underscores the need to generate contextually specific data that reflect the sociocultural and healthcare access conditions of remote and historically underserved areas.

Considering this scenario, the present study aims to analyze the association between polypharmacy, treatment adherence, and quality of life in patients with CKD treated at a regional public hospital in northern Brazil. By exploring this relationship in a context of limited resources and marked social vulnerability, this research seeks to support the development of more integrated, safe, and effective clinical strategies for CKD patient care.

METHODS

Study Design and Population

This is an observational, descriptive, cross-sectional study developed with the objective of analyzing factors associated with adherence to pharmacological treatment and quality of life in patients with CKD undergoing polypharmacy.

The sample was obtained by convenience, totaling 52 patients followed at the nephrology outpatient clinic of Hospital Santo Antônio Maria Zaccaria (HSAMZ), selected between June and December 2024. Individuals classified in stages 3 to 5 of CKD, according to clinical and laboratory criteria established by Kidney Disease: Improving Global Outcomes (KDIGO), were included. Among the participants, there were both pre-dialysis patients (n = 24) and those undergoing dialysis therapy (hemodialysis or peritoneal dialysis, n = 28).

Sample size calculation indicated a minimum requirement of 350 patients to ensure adequate statistical power (80%, $\alpha = 0.05$), considering an estimated adherence rate of 65%, a 5% margin of error, and a 95% confidence level. However, due to logistical constraints and the cross-sectional design, a reduced sample was used. This aspect represents an important methodological limitation, which should be considered in the interpretation and generalization of the findings.

Study Setting

The research was conducted at the nephrology outpatient clinic of Hospital Santo Antônio Maria Zaccaria (HSAMZ), located in Bragança, Pará State, Brazil. HSAMZ is a regional referral center for nephrology, providing care to approximately 120 patients with chronic kidney disease per month, totaling around 1,440 visits annually.

The institution offers renal replacement therapies (hemodialysis and peritoneal dialysis), in

addition to services aimed at managing frequent comorbidities such as diabetes mellitus, hypertension, and mineral and bone disorders. Care is delivered by a multidisciplinary team composed of nephrologists, nurses, pharmacists, psychologists, and social workers, ensuring an integrated approach to patient management.

Hospital infrastructure includes 25 hemodialysis machines, a clinical laboratory for monitoring biochemical parameters, and a hospital pharmacy responsible for dispensing essential medications, including those provided through the Specialized Component of Pharmaceutical Assistance (*Componente Especializado da Assistência Farmacêutica – CEAF*).

Inclusion and Exclusion Criteria

Eligibility criteria were defined to ensure sample uniformity and the reliability of collected data. To be included in the study, participants had to be at least 18 years of age, of either sex, have a confirmed diagnosis of CKD stages 3 to 5 according to clinical and laboratory criteria, and be undergoing outpatient follow-up in either the pre-dialysis phase or dialysis therapy (hemodialysis or peritoneal dialysis). Additionally, patients were required to be using five or more medications concomitantly for a minimum period of seven consecutive days, a criterion adopted to characterize polypharmacy according to widely used definitions in the literature[7,8,20]. Participants also needed to demonstrate sufficient verbal communication and comprehension skills to respond to the instruments applied and to voluntarily consent to participate by signing the Informed Consent Form (ICF).

Exclusion criteria included the presence of other chronic conditions that could significantly interfere with treatment adherence or quality of life, such as untreated severe psychiatric disorders or neurodegenerative diseases. Patients who had been hospitalized within 30 days prior to data collection were also excluded, in order to avoid the influence of acute conditions, as well as individuals participating in other clinical studies involving therapeutic or pharmacological interventions. Patients with severe cognitive deficits or communication disorders that could compromise the reliable collection of information were likewise excluded. Finally, refusal to sign the ICF or voluntary withdrawal after the start of data collection were also considered exclusion criteria.

Analysis of Patients' Sociodemographic, Clinical, and Therapeutic Profiles

Data collection was conducted through individual, in-person interviews in a private setting during consultations at the nephrology outpatient clinic. Interviews were administered by previously trained healthcare professionals, following standardized instructions to minimize interviewer bias. A pilot test with ten patients was conducted beforehand to assess item comprehension. Each interview lasted an average of 20 minutes and comprised two main sections.

The first section addressed sociodemographic and clinical characteristics, including sex, age, marital status, educational level, occupation, household composition, time since CKD diagnosis, autonomy in medication use, presence of comorbidities, and physical limitations such as mobility, vision, or hearing impairments. The second section focused on pharmacological treatment, based on information collected from medical records and/or prescriptions presented by patients, recording the route of administration, pharmaceutical form, therapeutic classes, and dosing regimen, in order to allow a comprehensive analysis of the individual therapeutic profile.

Treatment Adherence

Adherence was assessed using the Morisky-Green Test (MGT), internationally validated and adapted according to Almeida *et al.* (2014)[20]. The MGT consists of five questions evaluating patient behavior regarding medication use: Do you forget to take your medications? Do you always take your medications at the same time? Do you stop taking your medications when you start to feel better? Do you stop taking your medications when you start to feel worse? Do you double the dose of your medication? Each response was scored according to the frequency reported by the patient: a score of 0 was assigned to the answer "Never," while a score of 1 was assigned to the options "Rarely," "Sometimes," "Frequently," "Almost always," and "Always." Final adherence classification was determined by summing the five response scores: a score of 0 indicated high adherence, scores between 1 and 2 were considered moderate adherence, and a score of 3 or higher was classified as low adherence.

Quality of Life Assessment

Quality of life (QoL) was assessed using the WHOQOL-BREF, an instrument developed by the World Health Organization (WHO) and validated for the Brazilian context, designed to measure well-being across four main domains: physical, psychological, social, and environmental. The questionnaire consists of 26 items, rated on a five-point Likert scale (1 = very poor; 5 = very good), resulting in a total score ranging from 26 to 130 points.

To facilitate comparative analysis among do-

mains and enhance international comparability, the scores obtained were converted to a 0–100 scale, in accordance with WHO methodological guidelines[21].

Statistical Analysis

Descriptive analyses were conducted through frequency tables for categorical variables and calculation of measures of central tendency (mean, minimum, and maximum values) and dispersion (standard deviation) for continuous variables. For group comparisons, the chi-square (χ^2) test was applied to categorical variables, while Student's t-test was used, when appropriate, to assess mean differences between adherence levels.

In addition, the progressive association between the number of prescribed medications, adherence scores, and quality-of-life scores was explored in order to identify potential trends between higher pharmacotherapeutic burden and assessed outcomes. For greater robustness, logistic regression analysis adjusted for relevant sociodemographic variables was performed to estimate independent predictors of adherence.

All analyses were conducted using BioEstat software, version 5.3, adopting a 5% significance level ($p < 0.05$) for rejection of the null hypothesis.

Ethical Considerations

This study was conducted in compliance with Resolution No. 466/12 of the Brazilian National Health Council, ensuring the confidentiality and anonymity of all participants. The research protocol was approved by the Research Ethics Committee for Human Subjects of the Núcleo de Medicina Tropical, Federal University of Pará, under consolidated opinion No. 6.871.936.

RESULTS

Sociodemographic and Clinical Profile of Patients

A total of 52 patients were analyzed, and their sociodemographic characteristics and self-reported health data are presented in Table 1.

Table 1 - Sociodemographic and Clinical Characteristics of Patients with Chronic Kidney Disease under Polypharmacy.

Characteristics	n (%)	Mean ± Standard Deviation
Age		**52.2±17.8**
18-30 years	7 (13%)	
30-40 years	9 (17%)	
40-50 years	8 (15%)	
50-60 years	5 (10%)	
>60 years	23 (44%)	
Sex		
Male	23 (44%)	
Female	29 (56%)	---
Educational level		
Illiterate	9 (17%)	
Elementary school (complete/incomplete)	22 (42%)	
High school (complete/incomplete)	20 (38%)	---
Higher education	1 (2%)	
Marital status		
Single		
Married/Stable union	23 (44%)	
Divorced	23 (44%)	---
Widowed	2 (4%)	
Occupation	**4 (8%)**	
Retired		
Retired	29 (56%)	
Other	7 (13%)	---
Household composition	**16 (31%)**	
Up to 2 people		
> 2 people	16 (31%)	

to be continued...

continuation - Table 1.

Characteristics	n (%)	Mean ± Standard Deviation
Limitations (mobility, vision, hearing, etc.)	**36 (69%)**	**---**
Yes		
No	11 (21%)	---
Autonomy in medication use	**41 (79%)**	
With assistance		
Without assistance	17 (33%)	---
Comorbidities (diabetes, hypertension, heart disease, etc.)	**35 (67%)**	
Yes		
No	38 (73%)	---
Time since diagnosis	**14 (27%)**	**10.4±6.1**
< 1 year	2 (4%)	
1-3 years	18 (35%)	
3-4 years	10 (19%)	
5-6 years	8 (15%)	
> 6 years	14 (27%)	

Medications Used

The results indicated that all pharmacological classes were used by the patients, including erythropoiesis-stimulating agents and anti-anemic drugs (100%), as well as phosphate binders (73%) (Table 2).

Table 2 - Identification of Medications Used in the Treatment of Chronic Kidney Disease in Patients under Polypharmacy.

Pharmacological Class	Group AM* (n, %)	Group AB* (n, %)	Pharmaceutical Form	Route of Administration	Dosage**
Erythropoiesis-stimulating agent – Alfaepoetin 4,000 IU/mL	52 (100%)	52 (100%)	Injectable solution	Subcutaneous	Maintenance dose (PCDT, 2017**)
Erythropoiesis-stimulating agent Epoetin alfa 4,000 IU/mL	52 (100 %)	52 (100 %)	Injectable solution	Subcutaneous	Maintenance dose PCDT (2017)***
Vitamin D analog – Calcitriol 0.25 mg	4 (8%)	4 (8%)	Capsule	Oral	Min: once daily / Max: four times daily
Calcimimetic – Cinacalcet 30 mg	19 (37%)	8 (15%)	*Tablet*	Oral	Min: once daily / Max: four times daily
Anti-anemic agent – Ferric Sucrose Hydroxide Complex 100 mg	52 (100%)	52 (100%)	Injectable solution	Intravenous	Maintenance dose (PCDT, 2017**)
Phosphate binder – Sevelamer 800 mg	25 (48%)	13 (25%)	Tablet	Oral	Three times daily with meals

*AM: Moderate adherence; AB: Low adherence.
**Dosage: minimum and maximum values among patients in the study.
***PCDT: Clinical Protocol and Therapeutic Guidelines for Anemia in Chronic Kidney Disease (2017).

Mean Weight and Height of Patients

The mean weight and height of the patients were 57.34 ± 13.53 kg and 1.56 ± 0.14 m, respectively. Among the groups, patients with moderate adherence had a mean weight of 56.89 ± 14.56 kg and a mean height of 1.55 ± 0.14 m, whereas the low-adherence group presented a mean weight of 58.17 ± 11.68 kg and a mean height of 1.58 ± 0.06 m. The body surface area (BSA) of the participants was calculated using the Mosteller formula (Table 3).

Table 3 - Estimates of Mean Weight and Height of Patients with Chronic Kidney Disease under Polypharmacy.

Gruup	Patients (mean ± standard deviation)		BSA (Mosteller method)
	Weight	Height	
All patients	57.34 ± 13.53 kg	1.56 ± 0.14 m	1.58 m²
Moderate adherence	56.89 ± 14.56 kg	1.55 ± 0.14 m	1.57 m²
Low adherence	58,17 kg ±11,68	1,58 m ±0,06	1,60 m²

Treatment Adherence

Classification of patients using the Morisky-Green Test (MGT) did not identify any cases of high adherence. Of the 52 participants, 34 (65%) presented scores between 1 and 2, being categorized as moderate adherence, whereas 18 (35%) obtained scores equal to or greater than 3, characterizing low adherence.

Comparative analyses revealed statistically significant associations between adherence levels and several sociodemographic and clinical variables. Among patients with moderate adherence, significant associations were found for marital status, functional limitations, and time since diagnosis (1–3 years), all with $p < 0.0001$. In the low-adherence group, educational level demonstrated a particularly relevant association, with 38% of individuals having only elementary or high school education (complete or incomplete), also with $p < 0.0001$ (Table 4).

Other variables also showed statistical relevance: female sex was associated with higher adherence levels ($p = 0.0077$), educational level maintained a strong correlation ($p = 0.0001$), and marital status showed additional significance ($p = 0.0006$). In contrast, occupation ($p = 0.6461$) and household composition ($p = 0.3522$) did not present statistical significance, indicating no consistent association with adherence patterns.

Functional limitations maintained a significant association ($p = 0.0080$), while autonomy in medication use, although showing a trend toward relevance, did not reach statistical significance ($p = 0.0743$). Similarly, the presence of comorbidities was not significantly associated with adherence ($p = 0.3304$). Time since diagnosis, in turn, stood out as the variable with the greatest impact, with robust significance for the 1–3 year range ($p < 0.0001$), suggesting that therapeutic engagement is higher in the early stages of chronic kidney disease and progressively declines throughout the clinical course.

Table 4 - Classification and Distribution of Patients According to the Morisky-Green Questionnaire: Moderate and Low Adherence in Relation to Multiple Variables.

Characteristics	AM* n, %, (p)	AB* n, %, (p)	AB vs. AM (p)
Sex			
Male	10 (29%)	13 (72%)	(p)=0.0077
Female	24 (71%)	5 (28%)	
	(p)=0.0258	(p)=0.099	
Educational level			
Illiterate	8 (24%)	1 (6%)	
Elementary (complete & incomplete)	13 (38%)	10 (56%)	
High school (complete & incomplete)	13 (38%)	6 (33%)	(p)=0.0001
Higher education	0	1 (6%)	
	(p)=0.4794	(p)=<0.0001	
Marital status			
Single	16 (47%)	7 (39%)	
Married–stable union	13 (38%)	10 (56%)	
Divorced	1 (3%)	1 (6%)	
Divorced	4 (12%)	0	(p)=0.0006
	(p)=<0.0001	(p)=0.0302	
Occupation			
Retired	19 (56%)	6 (33%)	
Housewife	5 (15%)	12 (67%)	(p)=0,3522
Other	10 (29%)	(p)=0,2386	

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continuation - Table 3.

Characteristics	AM* n, %, (p)	AB* n, %, (p)	AB vs. AM (p)
	(p)=0.0118	(p)=0.0118	
Limitações (mobilidade, visão, audição etc.)			
Yes	4 (12%)	5 (28%)	
No	30 (88%)	13 (72%)	(p)=0.0080
	(p)=<0.0001	(p)=0.0990	
Autonomia no uso de medicamentos			
With assistance	14 (41%)	5 (28%)	
Without assistance	20 (59%)	13 (72%)	(p)=0.0743
	(p)=0.3912	(p)=0.0990	
Comorbidities (diabetes, hypertension, heart disease, etc.)			
Yes	24 (71%)	14 (78%)	
No	10 (29%)	4 (22%)	(p)=0.3304
	(p)=0.0258	(p)=0.0339	
Time since diagnosis			
< 1 year	0	2 (11%)	
1-3 years	18 (53%)	4 (22%)	
3-4 years	3 (9%)	2 (11%)	(p)=<0.0001
5-6 years	3 (9%)	4 (22%)	
> 6 years	10 (29%)	6 (33%)	
	(p)=<0.0001	(p)=0.0018	

*AM: moderate adherence; AB = low adherence.

Quality of Life

The domains of physical health, psychological health, social relationships, and environment were analyzed individually and in association with adherence levels, distinguishing patients classified as having moderate adherence from those with low adherence. Highly significant differences were identified between the groups in all evaluated domains ($p < 0.0001$), demonstrating a robust statistical distinction between different adherence patterns.

Regarding overall quality of life (QoL), statistical significance was also observed ($p < 0.0001$), indicating relevant differences between the groups. Patients with low adherence presented lower mean scores in all domains as well as in the overall QoL assessment, reflecting a substantially negative impact associated with nonadherence. The p values (< 0.0001) reinforce the robustness of the observed differences, suggesting a strong correlation between pharmacotherapeutic adherence and perception of quality of life (Table 5).

Table 5 - Distribution of Mean Quality-of-Life Scores Stratified by Treatment Adherence Levels in Patients with Chronic Kidney Disease under Polypharmacy.

Domains and Global Quality of Life (QoL)	Patients (mean ± standard deviation)		
	All patients	AM*	AB*
Physical	55.7 ± 15.45	35.67 ± 28.99	20.09 ± 29.32
Psychological	64.40 ± 9.93	42.53 ± 32.32	21.86 ± 30.83
Social relationships	71.30 ± 13.96	46.21 ± 35.93	25.09 ± 35.61
Environment	69.98 ± 10.56	46.40 ± 35.00	23.57 ± 33.42
Overall quality of life (QoL)	64.75 ± 7.13	42.25 ± 5.18	22.25 ± 2.21

DISCUSSION

The findings of this study highlight significant challenges related to treatment adherence and quality of life (QoL) in patients with CKD under polypharmacy. A particularly alarming result was the complete absence of patients with high adherence, with 65% classified as moderate adherence and 35% as low adherence. This scenario suggests that systemic barriers — such as treatment complexity, financial constraints, difficulties in accessing healthcare services, and medication burden—play a

substantial role in nonadherence[22].

Adherence rates showed statistically significant associations with educational level (p = 0.0001), sex (p = 0.0077), marital status (p = 0.0006), and functional limitations (p = 0.0080). Women demonstrated higher adherence, a finding consistent with previous studies indicating that females exhibit more proactive health behaviors, greater ability in medication management, and higher engagement with healthcare services[23,34]. Conversely, lower educational levels were strongly associated with nonadherence, possibly due to difficulties in understanding prescriptions, organizing complex therapeutic regimens, and perceiving the risks of nonadherence. Although 79% of participants reported no significant functional limitations, this finding may reflect self-report bias or undiagnosed mild deficits that still impact adherence. Additionally, patients with a recent diagnosis (between 1 and 3 years) showed higher adherence rates (53%), whereas those diagnosed for more than six years presented higher rates of nonadherence (33%), suggesting that engagement is greater in the early stages of CKD but may decline over time due to "treatment fatigue"[25,26].

Polypharmacy poses a dual challenge in CKD management: while it is essential for controlling comorbidities such as hypertension, diabetes, and metabolic disorders, it also increases therapeutic complexity, medication burden, and the risk of drug–drug interactions[27]. In this study, all patients used erythropoiesis-stimulating agents and anti-anemic drugs (100%), while 73% used phosphate binders. These findings are consistent with CKD therapeutic protocols; however, the predominant use of fixed regimens, rather than adjustments based on weight or body surface area, raises concerns about exposure to subtherapeutic or toxic drug levels[28]. A critical challenge in medication management is adverse effects, which frequently discourage adherence[17,28]. Although this study did not directly evaluate adverse reactions or drug interactions, previous research indicates that polypharmacy in CKD patients significantly increases the likelihood of medication discontinuation, especially in the context of complex therapeutic regimens[18,19,20]. Future studies should investigate pharmacokinetic variations and self-reported adverse effects in order to optimize pharmacotherapy and promote greater adherence.

Economic constraints further exacerbate adherence issues, particularly considering the high proportion of retirees and beneficiaries of the *Benefício de Prestação Continuada* (56%), which suggests reliance on fixed and limited incomes, often insufficient to cover treatment-related costs[21]. Beyond medications, financial burdens related to transportation to healthcare facilities, acquisition of non-standardized drugs, and specific dietary requirements represent additional challenges[21,23]. Previous studies have demonstrated that financial hardship is strongly correlated with medication rationing, delays in care, and increased hospitalizations[21-24]. Although CEAF facilitates access to essential CKD medications, its costs and bureaucratic barriers still represent substantial obstacles. Expanding pharmaceutical assistance programs, providing subsidies for transportation, and implementing financial guidance initiatives are promising strategies to mitigate these barriers and improve adherence[25,26].

One of the main findings of this study was the strong correlation between low adherence and reduced QoL across all WHOQOL-BREF domains (p < 0.0001). Patients with low adherence presented significantly lower mean scores in the physical (20.09 ± 29.32) and psychological (21.86 ± 30.83) domains compared to those with moderate adherence (35.67 ± 28.99 and 42.53 ± 32.32, respectively). The physical domain, which encompasses aspects such as pain, mobility, and energy levels, had the lowest scores, suggesting that patients with low adherence experience greater functional limitations and higher symptom burden[13,21]. This finding is consistent with the literature showing that nonadherence accelerates CKD progression, increases hospitalization rates, and compromises long-term clinical outcomes[26,27]. Psychological distress was also highly prevalent among patients with low adherence, reinforcing the bidirectional relationship between mental health and treatment adherence. Anxiety, depression, frustration, and fear of disease progression may reduce motivation to follow the prescribed therapeutic regimen[28].

Among the domains assessed by the WHOQOL-BREF, the highest scores were observed in the social relationships domain, with moderate-adherence patients averaging 46.21 ± 35.93 and low-adherence patients averaging 25.09 ± 35.61. This suggests that family and social support networks may play a protective role in adherence behavior[29]. However, these scores remain lower than those reported in other populations with chronic diseases, indicating that CKD patients face specific social challenges, such as stigmatization, fatigue-related isolation, and dependence on caregivers. The environmental domain, which includes safety, housing, transportation, and access to healthcare, was also significantly associated with adherence levels. Patients with low adherence had substantially lower scores in this domain (23.57 ± 33.42), reflecting

vulnerabilities related to housing conditions and healthcare accessibility. Studies demonstrate that poor housing, long distances to treatment centers, and lack of public transportation disproportionately affect CKD patients, highlighting the need for integrated social policies that extend beyond the healthcare sector[6,10,30].

These findings reinforce the urgent need for adherence-promotion strategies that transcend traditional clinical approaches[30]. Considering that economic, educational, and environmental factors significantly influence treatment adherence, interventions must be multidisciplinary and guided by public policies[3]. Core recommendations include the implementation of health literacy programs, particularly for patients with low educational attainment, aimed at improving medication comprehension and self-management skills[29,30]. Pharmacist-led interventions should play an expanded role in medication reconciliation, dosage adjustments, and therapeutic counseling[22]. Expanding financial support initiatives—such as government subsidies for transportation, acquisition of non-standardized medications, and nutritional support—may help alleviate economic burdens[27,29]. Furthermore, the integration of mental health services into CKD care is essential, given the high prevalence of psychological distress. Finally, transitioning from fixed regimens to strategies based on pharmacokinetic parameters may optimize therapeutic outcomes and reduce the risk of toxicity[31].

This study has several limitations that should be considered when interpreting the results. The cross-sectional design precludes establishing causal relationships between adherence, quality of life, and other variables, restricting conclusions to observed associations. Additionally, the small sample size, due to logistical constraints, may limit statistical power and generalizability to other CKD populations. The absence of more detailed stratification by dialysis type, as well as the lack of assessment of adverse effects, drug interactions, or pharmacokinetic parameters, limits a comprehensive understanding of the impact of polypharmacy on adherence. Finally, the use of self-reported instruments may be subject to recall bias or social desirability bias. Despite these restrictions, the results provide important preliminary evidence that reinforces the need for longitudinal investigations with larger samples.

This study highlights the complex and multidimensional nature of treatment adherence in CKD patients under polypharmacy. The absence of high adherence, the strong correlation between nonadherence and reduced QoL, and the significant influence of sociodemographic and economic factors underscore the urgency of patient-centered interventions that are multidisciplinary and guided by public policy[24,31]. Future studies should prioritize longitudinal designs to monitor adherence behavior over time, explore pharmacogenetic influences on drug metabolism, and evaluate interventions that integrate both medical and social determinants of adherence.

CONCLUSION

This study demonstrates the complex interplay of factors influencing treatment adherence and QoL in patients with chronic kidney disease undergoing polypharmacy. Sociodemographic variables, particularly educational level and socioeconomic status, had a significant impact on adherence, as lower levels of education and financial limitations impaired patients' ability to adequately follow medical guidance. Polypharmacy further exacerbated this scenario, increasing the risk of drug interactions and adverse effects, thereby reinforcing the need for rational prescriptions and individualized therapeutic adjustments. Application of the MGT revealed considerable variability in adherence levels, with a substantial proportion of patients exhibiting low adherence, underscoring the importance of tailored strategies that address health literacy and the challenges of disease management. Quality of life, assessed using the WHOQOL-BREF, showed lower scores in the physical and psychological domains, while the social relationships domain suggested a potential compensatory role. The strong correlation between higher adherence and better QoL indicators—particularly in symptom control and functional capacity—emphasizes the importance of comprehensive interventions, including health education, psychological support, and the strengthening of social support networks, as fundamental strategies to promote therapeutic adherence and overall well-being in this population.

CRediT author statement

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the workreported in this paper.

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