

Treatment Adherence in Relation to Emotion Regulation among Patients of CKD with and without Haemodialysis

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Abstract

Background: This cross-sectional study investigates medication non-adherence in Chronic Kidney Disease (CKD) patients, emphasizing the impact of emotion regulation. The research explores the extent of non-adherence and its association with factors such as patient demographics, focusing on CKD patients with and without haemodialysis. Addressing the deficiency in high-quality research, the study aims to provide insights for healthcare practitioners to implement effective adherence interventions in this population.

Methods: This cross-sectional study on CKD included 160 participants, equally distributed between those undergoing haemodialysis and those not. Sample size was determined using Green's table. Participants met specific inclusion criteria and were assessed using the Emotional Regulation Questionnaire and Morisky Medication Adherence Scale (MMAS). Data analysis involved SPSS 25.0, employing statistical tests for associations.

Results: In this study of 160 CKD patients, those undergoing dialysis ($n = 80$) faced higher medication non-adherence, with 57.5% reporting low adherence compared to 28.7% in the non-dialysis group ($n = 80$). Non-adherence reasons included forgetfulness and travel-related challenges. Emotion regulation analysis revealed significantly lower cognitive reappraisal ($p = 0.0087^*$) and expressive suppression ($p = 0.0001^*$) scores in dialysis patients. Demographic factors and pill burden did not impact adherence, but having multiple co-morbidities significantly correlated with non-adherence in dialysis patients ($p = 0.0076^*$). Emotion regulation strategies did not significantly influence adherence in either patient group.

Conclusion: Findings indicated prevalent non-adherence, with 57.5% of dialysis patients exhibiting low adherence. Emotion regulation was lower in dialysis patients. Forgetfulness was a primary non-adherence reason. Demographic factors minimally impacted adherence, but multiple co-morbidities affected dialysis patients. The study emphasizes the need for targeted interventions to enhance medication adherence in CKD.

Key words: Medication adherence, dialysis, Chronic kidney disease, emotion regulation.

Introduction

Adherence to treatment involves a collaborative agreement between patients and healthcare providers, measured by how closely individual behavior aligns with jointly established health recommendations¹. This behaviour is intricate, dynamic, and varies among individuals, featuring unique and evolving reasons for non-adherence. The management of chronic conditions, such as Chronic Kidney Disease (CKD) with multiple medications, poses adherence challenges². Globally, CKD is a significant public health concern, and non-adherence heightens health risks and healthcare costs^{3,4}. Current literature suggests that non-adherence to medication regimens may signal cognitive decline and emotional or psychological issues, including depression⁵⁻¹⁰. Consequently, researchers are increasingly exploring emotion regulation and psychological flexibility in chronic diseases, acknowledging their potential impact

on treatment non-adherence. It is imperative to address these factors in adherence interventions. Despite the importance of medication adherence in CKD patients, there is a deficiency in high-quality research on this topic, posing challenges for healthcare practitioners in implementing effective non-adherence measures. This cross-sectional study aimed to shed light on the extent of non-adherence and its association with various factors, including patient demographics, emotion regulation in CKD patients with and without haemodialysis.

Methods

Sample

This research focused on individuals who had CKD, encompassing those undergoing haemodialysis. The study involved participants from the outpatient department and

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dialysis unit at SGT University and hospitals in the NCR-Delhi, with selection based on specific inclusion and exclusion criteria. Initially, 185 individuals were invited, but 22 declined participation. Thus, 163 participants were initially enrolled, with three later excluded, leaving a final analysis of 160 participants, evenly distributed between those on dialysis and those not.

Sample size analysis

The sample size was determined using Green's computed table, considering multiple correlation co-efficients for MMAS-8, and ERQ questionnaires, each with 8, and 10 predictors, respectively. Power analysis, factoring in alpha, power, and effect size, indicated a need for 117 participants to achieve 0.8 power at $\alpha = 0.05$. To facilitate calculation, the study included a total of 160 participants.

Inclusion criteria

- Adults (18 years or older) of any gender.
- Clinically stable CKD patients (stage 3 onwards) with or without haemodialysis for at least 3 months.

Exclusion criteria

- No current hospitalisation or history of hospitalisation in the previous month.
- No history of substance abuse, psychiatric illness, cognitive impairment, or conditions hindering participation.
- No concurrent psychological treatment at the time of recruitment or within the previous three months.

Study design

The study adopted a cross-sectional design, examining emotion regulation and treatment adherence among CKD patients with or without haemodialysis. Data collection occurred at a single point in time.

Measures

Emotional Regulation Questionnaire (ERQ) (Gross and John, 2003)¹¹: The Emotion Regulation Questionnaire (ERQ) is a 10-item scale measuring individuals' emotional regulation tendencies through Cognitive Reappraisal and Expressive Suppression. The cognitive reappraisal section of the ERQ encompasses a scale of 6 to 42, while the expressive suppression section ranges from 4 to 28. Higher scores on either subscale indicate a higher degree of employing the respective strategy. Participants rate each item on a Likert scale from 1 to 7. Established by Gross and John, the ERQ demonstrates good reliability (Cronbach's alpha of .79 for

reappraisal and .73 for suppression) and test-retest reliability of .69 over three months. Convergent and discriminant validity analyses indicate correlations of reappraisal with reinterpretation ($\alpha = 0.43$; $p < 0.05$) and emotional state management ($\alpha = 0.20$; $p < 0.05$), and suppression with a sense of inauthenticity ($\alpha = 0.47$; $p < 0.05$). In the present study, Cronbach's alpha was .717, affirming high internal consistency.

Morisky Medication Adherence Scale (MMAS-8) questionnaire (Morisky *et al*)¹²: MMAS-8, a diagnostic tool for non-adherence, comprised 8 questions. Treatment adherence was categorised as low, moderate, or good. The MMAS-8 exhibited a reliability of .539 in this study.

Procedure

The cross-sectional study enrolled 160 subjects through a convenient sampling technique. Informed written consent was obtained, and participants were briefed about the research and ethical considerations. Socio-demographic and clinical characteristics were collected, and participants underwent interviews and completed questionnaires assessing emotion regulation and medication adherence. A pilot study with 30 - 40 participants informed protocol modifications.

Statistical analysis

Data analysis involved SPSS version 25.0. Categorical variables were presented using frequencies and percentages, while numerical variables were expressed through means and standard deviations. Scale scores were graphically represented. The association between treatment adherence and independent variables was assessed using statistical tests such as the Chi-square test for categorical variables and independent paired t-test for continuous variables. A significance level of $p < 0.05$ was considered statistically significant.

Results

Among 160 individuals, the dialysis group ($n = 80$) exhibited a mean age of 51.85 ± 13.96 years, ranging from 20 to 75 years, while the non-dialysis group ($n = 80$) had a mean age of 55.37 ± 14.40 years, ranging from 19 to 88 years. In the non-dialysis cohort, a significant majority were married (91.2%), unemployed (75%), and literate (87.5%). Among those undergoing dialysis, the majority were men (63.7%), married (85%), unemployed (81.2%), and literate (75%). Stage 3 and stage 4 CKD collectively constituted more than 98% of patients not receiving dialysis. The demographic and clinical characteristics of participants are summarised in Table I. The prevalent comorbidity was hypertension,

followed by diabetes with hypertension and cardiovascular disease.

For CKD patients with and without dialysis, the average number of prescribed medicines per prescription was 6.38 ± 2.81 and 5.07 ± 1.92 , respectively. Patients undergoing dialysis experienced a higher pill burden, with over three-fourths of them taking more than five medications per prescription.

Table I: Demographic and clinical characteristic of the study participants.

S.N.	Variables	Dialysis group	Non-dialysis group
1.	Gender		
	Male	51 (63.7)	43 (53.7)
	Female	29 (36.3)	37 (46.3)
2.	Age mean \pm SD (years)	51.85 \pm 13.96	55.37 \pm 14.40
	18 - 40 years	21 (26.3)	13 (16.3)
	41 - 60 years	32 (40)	38 (47.5)
	61 - 80 years	27 (33.7)	25 (31.2)
	>80 years	0	4 (5)
3.	Stages of CKD		
	Stage 5 (eGFR < 15 ml/min)	80 (100)	1 (1.25)
	Stage 4 (eGFR 15-29 ml/min)	-	39 (48.75)
	Stage 3 (eGFR 30-59 ml/min)	-	40 (50)
4.	Co-morbidities along with CKD		
	Hypertension	43 (53.6)	54 (67.5)
	Diabetes	5 (6.3)	0
	Diabetes and hypertension	22 (27.5)	19 (23.7)
	Cardiovascular disease along with hypertension	5 (6.3)	2 (2.5)
	Cardiovascular disease along with diabetes and hypertension	5 (6.3)	5 (6.3)
5.	Duration of dialysis (Months)	29.52 \pm 24.58	-
	• <6	4 (6.7)	-
	• 6 - 12	25 (31.7)	-
	• >12	51 (61.6)	-
6.	Frequency of Dialysis		
	• Two times/week	37 (46.2)	-
	• Three times/week	43 (53.8)	-
7.	Medications		
	Average medication prescribed	6.38 \pm 2.81	5.07 \pm 1.92
	• <5	14 (17.5)	39 (48.75)
	• \geq 5	66 (82.5)	41 (51.25)

Figures in parentheses represent the percentage of patients who answered the respective question.

Table II: Participants response about medicines.

S. No.	Problem statement associated with the respondents (The 8-item Morisky Adherence Questions)	Dialysis group	Non-dialysis group
1.	Forget to take medications	35 (43.7)	52 (65)
2.	Miss to take medications for reasons other than forgetting.	19 (23.7)	27 (33.8)
3.	Discontinued taking medications without notifying doctors since the patient felt worse when he or she took them.	17 (21.3)	26 (32.5)
4.	During travel or leave home, sometimes forget to bring medications.	29 (36.3)	24 (30)
5.	Did you take your medications yesterday?	61 (76.3)	58 (72.5)
6.	When responders believe their health is under control, they stop taking medications.	28 (35)	24 (30)
7.	Feel hassled about sticking to treatment plan	29 (36.3)	36 (45)
8.	Difficulty remembering to take all the medications		
	• Never/rarely	26 (32.5)	37 (46.3)
	• Once in a while	10 (12.5)	15 (18.7)
	• Sometimes	13 (16.3)	24 (30)
	• Usually	14 (17.5)	3 (3.8)
	• All the time	17 (21.2)	1 (1.2)

Figures in parentheses represent the percentage of patients who answered the respective question. N = 80 in each group.

In the study, it was found that 21.2% of individuals undergoing dialysis faced challenges in remembering to take medications at all the time, whereas only 1.2% of those not undergoing dialysis encountered similar difficulties. The most commonly cited reasons for non-adherence included forgetting to take medications, feeling compelled to adhere to a treatment plan, and neglecting to pack medications when traveling (refer to Table II).

The survey revealed that a substantial majority of participants, exceeding 90%, indicated low to moderate adherence levels in both dialysis and non-dialysis groups. Specifically, in the MMAS-8 assessment, 57.5% of individuals undergoing dialysis reported low adherence, compared to 28.7% in the non-dialysis group. Moderate adherence was reported by 38.7% of dialysis patients versus 70% of non-dialysis patients, while good adherence was reported by 3.8% of dialysis patients and 1.2% of non-dialysis patients. Fig. 1 illustrates a comparative analysis of medication non-adherence on the MMAS-8 scale between dialysis and non-dialysis group.

Emotion regulation

Cognitive reappraisal scores were 22.32 ± 8.40 for dialysis patients and 25.48 ± 6.53 for non-dialysis patients,

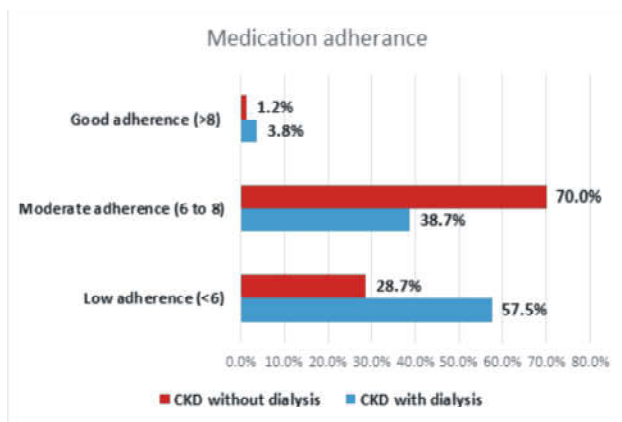


Fig. 1: Morisky Medication Adherence Scale score in dialysis and non-dialysis group.

signifying a statistically significant difference ($p = 0.0087^*$). Expressive suppression scores were 14.11 ± 5.80 for dialysis patients and 17.33 ± 4.86 for non-dialysis patients, showing a highly significant distinction ($p = 0.0001^*$). Notably, nearly half of CKD patients displayed low emotion regulation. Importantly, non-dialysis patients exhibited higher cognitive reappraisal and expressive suppression scores, suggesting more frequent and effective utilisation of these strategies than their dialysis counterparts.

Table III: Emotion regulation in patients with and without dialysis on emotion regulation questionnaire scale.

Emotion regulation strategy	Likert scale score	Dialysis group		Non-dialysis group		p value
		N (%)	Mean \pm SD	N (%)	Mean \pm SD	
Cognitive reappraisal	Agree (score 25 to 42)	30 (37.6)	30.66 ± 5.23	46 (57.5)	29.74 ± 3.84	0.0087*
	Disagree to neutral responses (score 19 to 24)	25 (31.2)	21.76 ± 1.53	26 (32.5)	21.88 ± 1.70	
	Disagree (score 06 to 18)	25 (31.2)	12.88 ± 4.28	08 (10)	12.5 ± 3.85	
Total		80	22.32 ± 8.40	80	25.48 ± 6.53	
Expressive suppression	Agree (score 17 to 28)	25 (31.2)	20.96 ± 3.42	44 (55)	20.97 ± 2.92	0.0001*
	Disagree to neutral responses (Score 13 to 16)	24 (30)	14.20 ± 1.17	26 (32.5)	14.11 ± 1.14	
	Disagree (score 4 to 12)	31 (38.8)	8.51 ± 2.61	10 (12.5)	9.7 ± 1.88	
Total		80	14.11 ± 5.80	80	17.33 ± 4.86	

*Independent t-test statistics, $p < 0.05$ significant at 95% CI. N = 80 in each group.

Factors affecting medication adherence

Tables IV and V compare adherence factors among dialysis and non-dialysis patients. Gender, age, education, and employment status showed no significant impact on adherence in both groups ($p > 0.05$). Regardless of gender, age categories (18 - 40, 41 - 60, >60 years), literacy, or employment, adherence remained consistent. Pill burden also did not significantly affect adherence ($p > 0.05$). However, having multiple co-morbidities was significantly linked to non-adherence in dialysis patients ($p = 0.0076^*$), suggesting a potential barrier. Emotion regulation strategies, cognitive reappraisal, and expressive suppression did not significantly influence adherence in either patient group ($p > 0.05$).

Table IV: Factors affecting medication adherence in dialysis group.

S. No.	Variables	Non-adherence [#]	Adherence [^]	p value
1.	Gender			
	Male	26	25	0.3028
	Female	20	9	
2.	Age			
	18 - 40 years	9	12	0.408
	41 - 60 years	20	12	
	>60 years	17	10	
3.	Education			
	Illiterate	10	11	0.3565
	Literate	36	23	
4.	Employment status			
	Employed	7	8	0.5109
	Unemployed	39	26	
5.	Pill burden			
	<5 Medication/prescription	8	6	0.8709
	≥ 5 medication/prescription	38	28	
6.	Co-morbidities			
	Single	23	24	0.0076*
	Multiple	23	10	
7.	Emotion regulation			
	a) Cognitive reappraisal			
	Score >25	20	10	0.3038
	Score <25	26	24	
	b) Expressive Suppression			
	Score >17	13	12	0.4773
	Score <17	33	22	

*chi square statistics, p value < 0.05 considered significant at 95% CI #N = 46 ^N = 34.

Table V: Factors affecting medication adherence in non-dialysis group.

S. No. Factors	Non-adherence ^f	Adherence [^]	p value
1. Gender			
Male	12	31	0.741
Female	11	26	
2. Age			
18 - 40 years	4	9	0.9776
41 - 60 years	11	27	
>60 years	8	21	
3. Education			
Illiterate	2	8	0.884
Literate	21	49	
4. Employment status			
Employed	8	12	0.5188
Unemployed	15	45	
5. Pill burden			
<5 medication/prescription	13	28	0.7051
≥5 medication/prescription	10	29	
6. Co-morbidities			
Single	14	28	0.4014
Multiple	9	29	
7. Emotion regulation			
a) Cognitive reappraisal			
Score >25	13	33	0.860
Score <25	10	24	
b) Expressive Suppression			
Score >17	12	32	0.7006
Score <17	11	25	

*chi square statistics, p value <0.05 considered significant at 95%, CI *N = 23, ^N = 57.

Discussion

The increase in life expectancy and aging populations have influenced the use of lifelong medications for chronic diseases. Unfortunately, almost half of the patients do not follow their prescribed drug regimens, leading to the frequent underestimation of the full benefits of these treatments. Clinical studies have revealed that people with acute illnesses are more likely to adhere to their medications compared to those with chronic conditions^{13,14}. Effectively managing chronic illnesses such as CKD is crucial to minimise their impact, improve health outcomes, prevent further progression, and reduce healthcare costs^{15,16}. Given the complexity of medication schedules and the varied

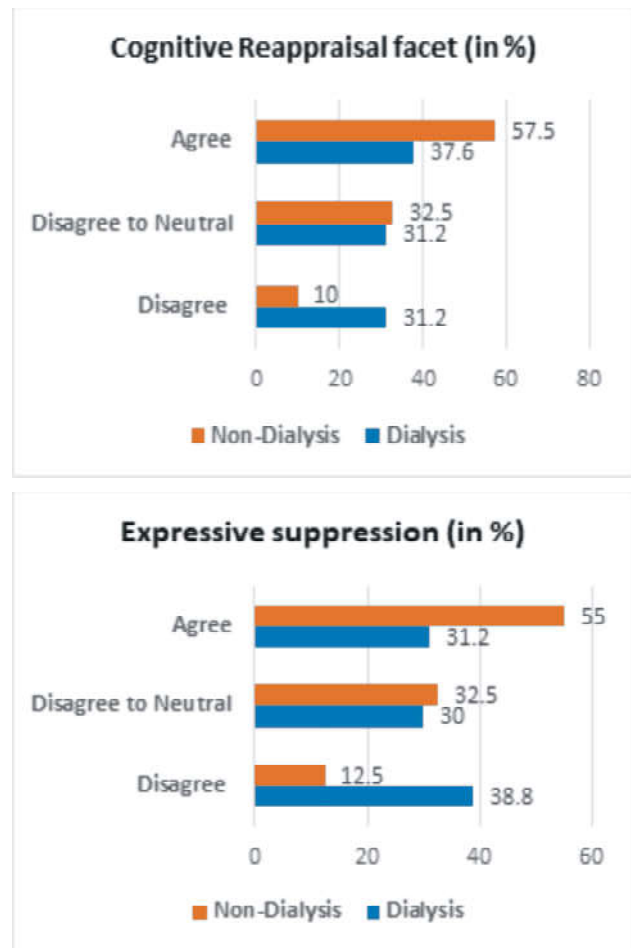


Fig. 2: Emotion regulation on emotion regulation questionnaire scale in dialysis and non-dialysis group.

behaviours related to treatment adherence, it is reasonable to expect a significant amount of non-adherence in CKD patients.

Non-adherence to treatment can stem from individual and evolving reasons, and attitudes towards following treatment plans may vary for different medications. CKD patients, whether on dialysis or not, often go through emotional disturbances that significantly impact their overall quality of life. These disturbances encompass various aspects such as mental, emotional, spiritual, social, physical, and financial concerns^{18,17}. Existing literature has highlighted that non-adherence to medication regimens could be indicative of cognitive decline and emotional or psychological issues⁵⁻¹⁰. As a result, researchers have been increasingly focusing on studying emotion regulation in chronic diseases, recognising their potential impact on treatment non-adherence. It is crucial to address these factors in adherence interventions. There is a lack of high-quality research on this subject, which can present challenges for healthcare practitioners in implementing

effective non-adherence measures for their patients. This cross-sectional study aimed to provide insights into the extent of non-adherence and its correlation with various factors, including patient demographics, emotion regulation, in patients with and without haemodialysis.

Numerous studies have investigated the adherence to pharmacological treatments among individuals with or without maintenance haemodialysis¹⁸⁻²¹. These studies report a wide range of statistics depending on the specific aspect of drug therapy being addressed, but overall, they consistently reveal that poor drug adherence is prevalent among CKD patients. The significant disparities in low adherence rates can be attributed to several factors. Firstly, there is no consensus on the ideal percentage of non-adherence, as the definition of drug adherence often lacks clarity. Secondly, the methods used to measure drug adherence are not highly reliable and tend to overestimate adherence levels. The lack of user-friendly and accurate tools for monitoring drug adherence remains a major obstacle to making significant progress in addressing medication adherence challenges, and it also contributes to the clinical practice's insufficient attention to drug adherence. In this study, we selected the Morisky questionnaire because it is a reliable and widely used tool in numerous other research studies.

In the present study, results revealed that among patients undergoing dialysis, a majority of respondents (57.5%) displayed low adherence to medication regimens, while only a small percentage (3.8%) demonstrated good adherence based on the MMAS-8 scale. Among patients not receiving dialysis, more than one fourth (28.7%) showed low adherence, and only a minimal percentage (1.2%) exhibited good adherence using the same scale. Moreover, patients on dialysis tended to have a slightly higher average number of prescribed medications compared to those not on dialysis. The existing literature has demonstrated that estimates of medication non-adherence vary depending on the assessment method used. For CKD patients, non-adherence estimates ranged from 17% to 74%, while for hemodialysis patients, the range was from 3% to 80% in different studies [18,22,23]. This variability can be attributed to differences in how non-adherence is defined and measured across these studies.

Emotion regulation is a complex psychological process involving various strategies that individuals use to influence the emotions they experience, when they experience them, and how they express these emotions²⁴. This process has implications for a wide range of psychological and physical outcomes related to disease management and treatment. Gross and John suggest two main strategies for down-regulating emotions: Cognitive reappraisal was described as the process of reinterpreting and reevaluating

emotional responses to specific situations, which helps individuals effectively manage and cope with their emotions; and expressive suppression, on the other hand, involves controlling or concealing emotions by inhibiting emotional displays¹¹. The study's findings indicated that patients not receiving dialysis demonstrated higher levels of emotion regulation and tended to employ cognitive reappraisal and expressive suppression more frequently or effectively compared to patients on dialysis. These results suggest that patients not undergoing dialysis may possess more effective emotion regulation strategies, as they appeared to be more adept at reevaluating their emotional responses and controlling their outward emotional expressions. Conversely, patients on dialysis may have encountered more challenges in managing their emotions, leading to lower scores in both cognitive reappraisal and expressive suppression.

The study revealed a high prevalence of medication-related problems, such as forgetting to take medications, discontinuing medications without informing doctors, and facing difficulties in adhering to medication regimens during travel or when feeling well. Similar findings have been consistently observed in other studies, highlighting that forgetfulness is a primary reason for non-adherence in patients with chronic diseases²⁵. These responses highlight specific areas where targeted interventions and support can be employed to improve medication adherence in both patient groups.

Medication adherence is a complex issue influenced by various factors, including age, gender, education, employment status, pill burden (polypharmacy), and comorbidities¹⁸. These characteristics can vary significantly among individuals and may change over time, making it challenging to address non-adherence using a one-size-fits-all approach. The study findings suggested that certain factors, such as the presence of multiple co-morbidities might have some influence on treatment adherence among patients on dialysis. However, overall, the study revealed that adherence behavior was not significantly affected by factors like gender, age, education, employment status, pill burden, or emotion regulation strategies for both patient groups. These findings were consistent with another study conducted by²⁶. These insights are valuable for healthcare professionals as they shed light on factors that may impact patient adherence and can help in designing targeted interventions to improve treatment compliance, particularly in the context of patients undergoing dialysis.

When interpreting the findings of this study, it is important to consider certain limitations. Firstly, the study did not identify specific drug classes or subclasses that may be associated with non-adherence to prescribed medications.

Secondly, the research was unable to analyse chemical indicators of non-adherence. Further investigations are needed to gain a comprehensive understanding of the factors and mechanisms influencing emotion regulation and psychological flexibility in individuals with CKD.

Despite these limitations, the current study conducted in patients undergoing maintenance haemodialysis in India contributes to advancing our understanding of this topic. There is a scarcity of studies that specifically address medication non-adherence among CKD patients, whether they are receiving dialysis or not. Therefore, these results provide valuable insights into the differences in emotion regulation strategies between patients on dialysis and those who are not. While more research is required to fill the gaps in knowledge, this study serves as an important step in examining the factors that may impact medication adherence in CKD patients undergoing dialysis.

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