

## DOMAIN-SPECIFIC ASSOCIATIONS BETWEEN THERAPY REGIMEN ADHERENCE AND HEALTH-RELATED QUALITY OF LIFE IN HEMODIALYSIS PATIENTS

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### ABSTRAK

Penyakit ginjal kronik stadium akhir menuntut pasien menjalani hemodialisis jangka panjang yang memerlukan kepatuhan terapi tinggi untuk mempertahankan kualitas hidup. Namun, hubungan antara kepatuhan multi domain dan kualitas hidup terkait kesehatan (HRQoL) masih menunjukkan hasil yang inkonsisten. Penelitian ini bertujuan menganalisis hubungan antara tingkat kepatuhan terapi dan HRQoL pada pasien hemodialisis. Penelitian kuantitatif dengan desain potong lintang dilakukan pada 190 pasien hemodialisis. Kepatuhan terapi diukur menggunakan ESRD-Adherence Questionnaire (ESRD-AQ), sedangkan HRQoL dinilai menggunakan KDQoL-36. Analisis korelasi Kendall's tau-b digunakan untuk menguji hubungan antar variabel. Sebagian besar responden menunjukkan tingkat kepatuhan tinggi (76.3%). Kepatuhan tertinggi terdapat pada kehadiran sesi hemodialisis (mean  $4.18 \pm 1.12$ ), sedangkan terendah pada pembatasan diet (mean  $3.22 \pm 1.24$ ). skor HRQoL menunjukkan beban penyakit ginjal relatif tinggi ( $60.00 \pm 30.22$ ), dengan komponen fisik lebih rendah dibanding mental. Analisis korelasi menunjukkan hubungan signifikan antara kepatuhan terapi dan domain gejala/ masalah ( $r = -0.149$ ;  $p = 0.034$ ), sementara domain lainnya tidak menunjukkan hubungan bermakna. Temuan ini mengungkap bahwa meskipun tingkat kepatuhan pasien relatif tinggi, dampaknya terhadap kualitas hidup tidak bersifat menyeluruh pada seluruh domain. Novelty penelitian ini terletak pada analisis kepatuhan berbasis domain spesifik yang menunjukkan bahwa pengendalian gejala merupakan aspek kualitas hidup yang paling sensitif terhadap kepatuhan terapi. Intervensi klinis sebaiknya tidak hanya berfokus pada kepatuhan prosedural, tetapi juga pada strategi manajemen gejala yang terintegrasi.

**Kata kunci** : hemodialisis, kepatuhan terapi, kualitas hidup terkait kesehatan, manajemen gejala, penyakit ginjal kronik stadium akhir

### ABSTRACT

*End-stage renal disease requires patients to undergo long-term hemodialysis, demanding high therapeutic adherence to maintain health-related quality of life (HRQoL). A quantitative cross-sectional study was conducted involving 190 hemodialysis patients. Therapy adherence was assessed using the ESRD-Adherence Questionnaire (ESRD-AQ), while HRQoL was measured using the KDQoL-36. Kendall's tau-b correlation analysis was performed to determine associations between variables. Most participants demonstrated high adherence (76.3%). The highest adherence score was observed in attendance to hemodialysis sessions (mean  $4.18 \pm 1.12$ ), whereas dietary restriction adherence showed the lowest score (mean  $3.22 \pm 1.24$ ). HRQoL results indicated a relatively high burden of kidney disease ( $60.00 \pm 30.22$ ), with lower physical composite scores compared to mental components. A significant correlation analysis was found between therapy adherence and the symptoms/problems domain ( $r = -0.149$ ;  $p = 0.034$ ), while other domains showed no significant association. These findings suggest that although overall adherence levels are high, their impact on HRQoL is domain-specific rather than global. The novelty of this study lies in its domain-based adherence analysis, highlighting symptom control as the HRQoL dimension most sensitive to therapeutic adherence. Clinical interventions should therefore extend beyond procedural compliance and integrate structured symptom management strategies.*

**Keywords** : hemodialysis, therapy adherence, health-related quality of life, end-stage renal disease, symptom management

## INTRODUCTION

End-stage renal disease (ESRD) remains a major global health problem and continues to increase in prevalence across both developed and developing countries. As kidney function declines irreversibly, many patients require renal replacement therapy to sustain life, with hemodialysis being the most frequently used treatment modality worldwide (Thurlow et al., 2021; Htay et al., 2021). In low- and middle-income countries, hemodialysis often becomes the primary long-term treatment because access to kidney transplantation and other renal replacement options remains limited. Although hemodialysis prolongs survival, it also imposes substantial demands on patients' daily lives. Patients must adapt to repeated hospital visits, prolonged treatment sessions, fluid restrictions, dietary control, medication regimens, and persistent physical symptoms. As a result, the burden of treatment extends beyond physiological management and affects broader aspects of daily functioning and well-being (Bikbov et al., 2020; Kalantar-Zadeh et al., 2021).

These treatment demands make health-related quality of life (HRQoL) an essential outcome in the care of hemodialysis patients. Unlike laboratory indicators or mortality outcomes, HRQoL captures how patients experience their illness and treatment in everyday life. HRQoL reflects not only physical functioning, but also symptom burden, emotional status, perceived disease impact, and the ability to maintain social roles. In patients receiving long-term hemodialysis, this outcome is especially important because survival alone does not fully represent treatment success. Many patients remain clinically stable while still experiencing profound fatigue, sleep disturbances, physical limitations, dependency, and reduced life satisfaction. Therefore, evaluating HRQoL provides a more patient-centered understanding of treatment outcomes and helps clinicians identify dimensions of care that routine biomedical indicators may fail to detect (Bikbov et al., 2020; van Oevelen et al., 2024).

In clinical and research settings, HRQoL in hemodialysis patients is commonly measured using the Kidney Disease Quality of Life-36 (KDQoL-36), which assesses five specific domains: symptoms/problems, effects of kidney disease, burden of kidney disease, physical composite score, and mental composite score (Rokhman et al., 2023). This domain-based structure is particularly relevant because patients do not experience quality of life as a single uniform construct. Instead, they may report relatively stable emotional adaptation while simultaneously facing severe physical exhaustion or symptom distress. Previous studies have shown that symptom burden, perceived treatment restrictions, and the psychological meaning of chronic illness influence HRQoL differently across domains (Rikos et al., 2023; van Oevelen et al., 2024). This variability suggests that HRQoL is shaped by multiple interacting factors, including not only disease severity but also patients' daily health behaviors and self-management practices (Pretto et al., 2020).

One of the most clinically relevant behavioral factors is therapy adherence. In hemodialysis patients, therapy adherence includes regular attendance at dialysis sessions, compliance with prescribed medications, adherence to fluid restriction, and adherence to dietary recommendations (Murali et al., 2019). These behaviors directly influence physiological stability between dialysis sessions and may affect symptom experience over time. Patients who adhere consistently to fluid and dietary restrictions are less likely to experience excessive interdialytic weight gain, edema, dyspnea, electrolyte imbalance, and other discomforts that can worsen daily functioning. Similarly, adherence to medications and dialysis schedules may help maintain treatment effectiveness and reduce preventable complications. In this way, therapy adherence does not only support disease control in a biomedical sense, but may also shape how patients physically and subjectively experience life while living with ESRD (Alikari et al., 2021; Anita & Novitasari, 2017).

This relationship becomes even more important when viewed through a cause-and-effect perspective. Therapy adherence may improve HRQoL because it contributes to better symptom control, greater treatment stability, and fewer disruptions in everyday functioning. However, this effect is unlikely to occur equally across all HRQoL domains. For example, adherence may have a more immediate influence on symptom-related outcomes than on broader psychological or social dimensions, which are often affected by family support, financial burden, illness perception, coping style, and emotional resilience. Thus, the effect of therapy adherence on HRQoL should not be assumed to be global or uniform. Instead, the association may be selective and domain-dependent. Understanding this mechanism is important because it helps clarify why some patients who appear highly adherent still report poor quality of life in certain aspects of their daily experience (Luo et al., 2023; Cardol et al., 2022).

Previous studies have examined the relationship between therapy adherence and HRQoL in hemodialysis populations, yet the findings remain inconsistent. Some studies reported that better adherence was associated with better HRQoL, while others found weak, partial, or non-significant relationships (Alikari et al., 2021; Thapa et al., 2021). A likely reason for this inconsistency is that many earlier studies treated adherence and HRQoL as broad overall constructs, rather than analyzing how specific adherence behaviors relate to specific HRQoL domains. This approach may have masked clinically meaningful patterns. A patient may, for example, attend dialysis regularly but still struggle with fluid restriction or dietary control, and these differences may affect symptoms more strongly than emotional well-being or perceived social burden. Therefore, the key research gap is not simply whether adherence is associated with HRQoL, but which dimensions of HRQoL are actually responsive to therapy adherence and which are not.

In addition to this conceptual gap, limited evidence has specifically applied a domain-based analytical approach to examine the multidimensional relationship between therapy adherence and HRQoL among hemodialysis patients in routine clinical settings. This gap is important because patient management in dialysis care often emphasizes procedural adherence, particularly attendance and medication-taking, without fully distinguishing which adherence components have the greatest relevance to patient-reported outcomes. A more detailed analysis may help explain why high overall adherence does not always translate into better overall quality of life. It may also support more efficient intervention planning by directing clinical attention toward the adherence behaviors most strongly linked to patient-perceived health outcomes. Such evidence is particularly relevant for hemodialysis services that aim to improve not only treatment completion but also the lived experience of patients undergoing long-term care.

Based on these considerations, this study examines the association between therapy adherence and each HRQoL domain measured by KDQoL-36 among patients undergoing maintenance hemodialysis. The novelty of this study lies in its domain-specific analytical framework, which moves beyond global scoring to identify the HRQoL dimension most sensitive to therapy adherence. By focusing on domain-level relationships, this study seeks to determine whether adherence is linked primarily to symptom-related outcomes or also to broader physical and mental well-being. The findings are expected to provide more precise evidence for patient-centered care and to support the development of interventions that target not only procedural compliance, but also meaningful improvements in quality of life.

## METHOD

This study used a quantitative descriptive design with a cross-sectional approach to examine the association between therapy adherence and health-related quality of life

(HRQoL) among patients undergoing maintenance hemodialysis. The study was conducted in 2026 at the Hemodialysis Unit of Panembahan Senopati Regional General Hospital, Bantul, Indonesia, a secondary referral hospital that provides routine hemodialysis services for patients with chronic kidney disease (CKD). The study population consisted of all patients with CKD who were undergoing maintenance hemodialysis at the study site. A total of 190 respondents were recruited using a total sampling technique. Patients were eligible to participate if they were aged  $\geq 18$  years, had undergone routine hemodialysis, and were willing to participate in the study. Patients were excluded if they had physical conditions that prevented them from completing the questionnaire or if they declined participation during the data collection process.

Data were collected using self-administered questionnaires during hemodialysis sessions, with attention given to the respondents' physical comfort and clinical condition. The researchers provided clarification when necessary without influencing participants' responses. Therapy adherence was measured using the End-Stage Renal Disease Adherence Questionnaire (ESRD-AQ), a multidimensional instrument that assesses adherence across several treatment-related behaviors, including attendance at hemodialysis sessions, medication use, fluid restriction, and dietary compliance. Previous studies have reported acceptable psychometric properties of the instrument in hemodialysis populations, including satisfactory construct validity and internal consistency. Health-related quality of life was assessed using the Kidney Disease Quality of Life-36 (KDQoL-36), a disease-specific instrument that evaluates five domains: Symptoms/Problems, Effects of Kidney Disease, Burden of Kidney Disease, Physical Composite Score (PCS), and Mental Composite Score (MCS). The KDQoL-36 has demonstrated strong psychometric performance, with internal consistency reliability ranging from 0.72 to 0.91 across domains, and has also been applied in Indonesian dialysis populations with satisfactory cultural applicability and reliability.

Descriptive statistics were used to summarize respondents' sociodemographic and clinical characteristics, levels of therapy adherence, and HRQoL scores. To examine the association between therapy adherence and HRQoL domains, bivariate analysis was performed using Kendall's tau-b correlation test. This test was selected because the study variables were treated as ordinal and the data were not normally distributed. Statistical significance was determined at  $p < 0.05$ . This study received ethical approval from the Health Research Ethics Committee of Universitas 'Aisyiyah Yogyakarta (Ethical Approval No. 4954/KEP-UNISA/XII/2025) and research permission from Panembahan Senopati Regional General Hospital (No. B/000.9.2/06083). All participants provided informed consent before participation and were assured of confidentiality, anonymity, and their right to withdraw from the study at any time without any consequences.

## RESULTS

**Table 1. Sociodemographic and Clinical Characteristics of Hemodialysis Patients (n= 190)**

Variable	Category	n	%
Age	16-18 years	1	0.5
	25-44 years	35	18.4
	45-59 years	92	48.4
	$\geq 60$ years	62	32.6
Sex	Male	94	49.5
	Female	96	50.5
Religion	Islam	176	92.6
	Catholic	6	3.2
	Christian	8	4.2
Education Level	No formal education	10	5.3
	Primary school	39	20.5

	Junior high school	37	19.5
	Senior high school	76	40.0
	Higher education	28	14.7
<b>Employment Status</b>	Unemployed	75	39.5
	Housewife	48	25.3
	Laborer	18	9.5
	Entrepreneur	15	7.9
	Retired	12	6.3
	Farmer/Fisherman	9	4.7
	Private employee	5	2.6
	Civil servant	4	2.1
	Military/Police	1	0.5
	Other	3	1.6
<b>Marital Status</b>	Married	160	84.2
	Widowed	17	8.9
	Single	11	5.8
	Divorced	2	1.1
<b>Duration of Hemodialysis</b>	< 6 months	11	5.8
	6-12 months	26	13.7
	1-3 years	81	42.6
	≥ 3 years	72	37.9
<b>Living Arrangement</b>	With spouse	131	68.9
	With children	29	15.3
	With parents	20	10.5
	Alone	10	5.3

Most participants in this study were aged 45-59 years and 60 years or older. This finding is consistent with the progressive nature of CKD, which becomes more common with increasing age due to long-term exposure to hypertension, diabetes, and other metabolic disorders (Bikbov et al., 2020). Global data also show that CKD prevalence rises significantly after the age of 40. Similar age patterns have been reported in hemodialysis populations in Asia and other developing countries (Kalantar-Zadeh et al., 2021). The proportion of male and female patients in this study was nearly equal. This differs from previous reports indicating that men are more likely to undergo dialysis (Anita et al., 2022; Pallet et al., 2018). The balanced distribution found here may reflect improved access to dialysis services for women or local healthcare patterns. This suggests that gender-sensitive education and support strategies remain important for both groups.

Most respondents were married and living with their spouse. Living with family members, especially a spouse, is often associated with better emotional support and stronger encouragement to follow treatment recommendations (Sousa et al., 2019). Family support can improve patients' confidence in managing fluid restriction, medication, and dietary adjustments (Alatawi et al., 2024). However, even with strong family presence, patients may still experience physical discomfort and disease burden, as shown in the later finding of this study. This indicates that family support alone may not fully reduce the challenge of long-term dialysis. Regarding education and employment, many participants had completed senior high school, and a large proportion were unemployed. Unemployment among hemodialysis patients is common due to physical limitations and treatment schedules (Motiei et al., 2024; Tsutsui et al., 2017). Previous studies have linked lower socioeconomic status to greater symptom burden and greater difficulty maintaining lifestyle-related adherence, such as diet adherence (Cardol et al., 2022; Gani, 2025). This socioeconomic background provides important context when interpreting adherence and quality-of-life outcomes.

Most participants had been on hemodialysis for one year or more. Patients in this stage often become accustomed to routine dialysis procedures, but prolonged exposure to treatment may increase fatigue and perceive disease burden (Al-Naamani et al., 2024). Therefore, the

duration of dialysis may influence how patients experience symptoms and adapt to treatment demands. The important point from these baseline findings is not merely the demographic profile, but the context they create. This study describes a population that is relatively stable in terms of family support and treatment duration, yet continues to face ongoing physical challenges. Understanding this background is essential to interpreting how adherence behaviors relate specifically to symptom-related quality of life, which becomes a key focus of this research.

**Table 2. Overall Level of Therapy Adherence**

Adherence Level	n	%
Low	19	10.0
Moderate	26	13.7
High	145	76.3

**Table 3. Domain-Specific Adherence Scores (ESRD-AQ)**

Domain	Mean $\pm$ SD
Hemodialysis session adherence	4.18 $\pm$ 1.12
Medication adherence	3.78 $\pm$ 1.24
Fluid restriction adherence	3.60 $\pm$ 1.28
Dietary restriction adherence	3.22 $\pm$ 1.24

The findings showed that 76.3% of patients demonstrated high overall therapy adherence (Table 2). This suggests that most participants complied with the prescribed treatment recommendations. High adherence levels among hemodialysis patients have also been reported in previous studies, particularly in structured clinical settings where dialysis attendance is closely monitored. Regular scheduling and continuous supervision by healthcare providers may help maintain procedural compliance (Tseng et al., 2021). However, when adherence was analyzed by domain, important differences emerged. Attendance at hemodialysis session had the highest mean score (4.18  $\pm$  1.12), indicating strong commitment to scheduled treatments. In contrast, dietary restriction adherence showed the lowest mean score (3.22  $\pm$  1.24), followed by fluid restriction adherence (Table 3). This research showing that behaviors requiring daily self-regulation outside the hospital setting, such as diet and fluid control, are more difficult to maintain compared to attendance-based adherence (Sousa et al., 2023).

Medication adherence in this study showed moderate to high levels (Table 3), which aligns with findings suggesting that medication-taking behavior is influenced by patients' understanding of disease severity and perceived benefits of treatment. Nonetheless, lifestyle-related adherence remains a persistent challenge across dialysis populations (Cardol et al., 2022). The contrast between high procedural adherence and lower lifestyle adherence highlights the multidimensional nature of therapy compliance. This distinction is clinically important. Hemodialysis attendance alone may ensure toxin removal during sessions, but inadequate dietary and fluid control can still contribute to symptom burden and physiological instability between sessions (Maurya, 2025). Therefore, evaluating adherence as a single global score may obscure meaningful behavioral differences (Ekholm et al., 2025; Murali & Lonergan, 2020). The novelty of this study lies in examining adherence not only at a general level but also through domain-specific analysis. This approach allows a clearer understanding of which behavioral components are strongest and which require targeted intervention. Such differentiation is essential for developing patient-centered strategies that address the most vulnerable aspects of self-management.

**Table 4. Health-Related Quality of Life Scores Based on KDQoL-36 Scale (n= 190)**

KDQoL-36 Domain	Mean $\pm$ SD
Symptoms/Problems	14.69 $\pm$ 10.80
Effects of Kidney Disease	16.24 $\pm$ 15.24
Burden of Kidney Disease	60.00 $\pm$ 30.22
SF-12 Physical Composite	35.99 $\pm$ 8.57
SF-12 Mental Composite	48.35 $\pm$ 8.90

**Table 5. Domain-Specific Correlation Between Therapy Adherence and HRQoL (n= 190)**

KDQoL-36 Domain	r (Kendall's tau-b)	p-value
Symptoms/Problems	-0.149	0.034*
Effects of Kidney Disease	0.038	0.592
Burden of Kidney Disease	0.121	0.073
SF-12 Physical Composite	-0.057	0.423
SF-12 Mental Composite	0.037	0.598

The assessment of health-related quality of life (HRQoL) revealed that patients experienced varying levels of well-being across domains. The Physical Composite Score (35.99  $\pm$  8.57) was notably lower than the Mental Composite Score (48.35  $\pm$  8.90), indicating that physical functioning was more impaired than mental health in this population (Table 4). This pattern is consistent with previous studies reporting that fatigue, muscle weakness, and physical limitations remain dominant complaints among hemodialysis patients (Bossola et al., 2018). The repetitive and physically demanding nature of dialysis therapy may contribute to persistent physical discomfort even when psychological adaptation improves over time (Lateef, 2022).

## DISCUSSION

The Burden of Kidney Disease domain showed a relatively high mean score (60.00  $\pm$  30.22), reflecting the substantial impact of long-term treatment on daily life (Table 4). Hemodialysis requires strict scheduling, dietary adjustment, and dependency on medical facilities, which can affect social roles and employment stability (Alatawi et al., 2024). Similar findings have been reported in international studies, in which dialysis patients describe treatment as life-sustaining yet restrictive. Interestingly, correlation analysis demonstrated a statistically significant association only between therapy adherence and the Symptoms/Problems domain ( $r = -0.149$ ;  $p = 0.034$ ; Table 5). Higher adherence was linked to better symptom control. However, no significant relationships were found between adherence and the Effects of Kidney Disease, Burden of Kidney Disease, Physical Composite, or Mental Composite domains. This domain-specific pattern is particularly important. Previous research has often examined adherence and HRQoL using global scores, resulting in mixed or inconsistent findings. By analyzing each HRQoL domain separately, this study demonstrates that adherence behaviors appear to influence symptom-related outcomes more directly than broader psychosocial or mental dimensions (Rao et al., 2022). Symptom control may therefore act as an intermediary pathway through which adherence affects patient's perceived well-being (Luo et al., 2023).

The absence of significant associations with mental and broader burden domains suggests that quality of life in hemodialysis patients is shaped not only by medical adherence but also by psychological resilience, social support, economic stability, and long-term illness perception. This finding reinforces the idea that improving adherence alone may not be sufficient to enhance overall quality of life. The novelty of this study lies in identifying symptom-related quality of life as the domain most responsive to adherence behaviors within

a structured dialysis population. Rather than assuming a uniform impact of adherence on overall HRQoL, the findings support a more nuanced interpretation (van Oevelen et al., 2024). Clinically, this implies that adherence interventions should be integrated with structured symptom management strategies to achieve broader improvements in patient well-being (Anita et al., 2025).

This study has several limitations that should be considered when interpreting the findings. First, the cross-sectional design limits the ability to establish causal relationships between therapy adherence and health-related quality of life. Second, data were collected using self-reported questionnaires, which may be subject to recall bias or social desirability bias. Finally, the study was conducted in a single hospital setting, which may limit the generalizability of the results to other dialysis populations with different demographic or healthcare characteristics. Despite these limitations, the study provides valuable insight into domain-specific associations between adherence and quality of life among hemodialysis patients.

## CONCLUSION

Therapy adherence among hemodialysis patients was generally high; however, its impact on health-related quality of life was not uniform across domain. A significant association was observed only with the symptom/problems domain, while no meaningful relationships were found with the effect of kidney disease, burden of kidney disease, or physical and mental composite scores. These findings indicate that adherence behaviors primarily contribute to symptom control rather than to broader perceptions of disease impact or psychosocial well-being. Therefore, strategies to improve patient outcomes should extend beyond reinforcing adherence and incorporate structured symptom management and holistic support to achieve more comprehensive improvements in quality of life.

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