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Research Article

Exploring factors affecting hemodialysis patients' adherence in Iraqi patients: a cross-sectional study

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Abstract

Different factors are associated with hemodialysis patients' adherence to their complex therapeutic regimen. This study assessed the association between different patient characteristics, including health literacy and adherence levels. A cross-sectional study was conducted in the Dialysis Center of Baghdad Medical City, Baghdad, Iraq, and included 72 end-stage renal disease (ESRD) patients on maintenance hemodialysis. The adherence level was assessed using a self-reported end-stage renal disease adherence questionnaire (ESRD-AQ). This study identified one patient-related factor (being male) and one disease-related factor (having a higher number of dialysis sessions per week) to be associated with non-adherence behavior among Iraqi hemodialysis patients, and the number of dialysis sessions per week was found to be an independent predictor in multivariate analysis. In conclusion, it is essential to recognize and address these factors to enhance patients' experiences with their disease and healthcare system and design tailored interventions to support patients' adherence and outcomes.

Keywords

adherence, chronic kidney disease, hemodialysis, dialysis sessions, male sex

Introduction

Chronic kidney disease (CKD) is a not contagious, progressive condition characterized by structural or functional dysfunction of the kidneys persisting for over three months, resulting in detrimental effects. Chronic Kidney Disease (CKD) progresses from Stage 1 (mild) to Stage 5, which is classified as end-stage renal disease (ESRD) (KDIGO 2024). ESRD is a condition in which the kidneys cease functioning permanently, leading to the emerging need for renal replacement therapy to maintain a patient's life, including long-term hemodialysis, peritoneal dialysis, or kidney transplantation (Hashmi et al. 2024). Kidney disease has a significant impact on worldwide health by increasing global morbidity and mortality (GBD 2020). Recent data indicate that CKD affects approximately 13.4% of the world's population and is increasing worldwide (Lv and Zhang 2019). A specifically greater burden of chronic kidney disease is observed in low- and middle-income countries where resources are limited (Barsoum 2006). CKD is ranked as the 5th most life-threatening disease in Iraq, with a significant death rate. In 2015, about 6,879 patients died due to renal failure (Hassan and Moha 2022).

Hemodialysis is the most popular treatment for ESRD patients worldwide (De Rosa et al. 2017). Besides dialytic

procedures, a patient's ability to maintain appropriate behaviors regarding diet, fluid intake, and medicines is critical to maximizing good clinical outcomes (Fleming 2011).

Adherence is "the extent to which a person's behavior corresponds with the agreed-upon recommendations of a healthcare provider in terms of taking medications, following a recommended diet, and/or executing lifestyle changes" (World Health Organization 2003). Non-adherence to any or every element of dialysis therapy is linked to adverse outcomes, including increased emergency department visits and hospitalizations, bone demineralization, pulmonary edema, metabolic disorders, the onset of cardiovascular diseases, and ultimately, mortality (Denhaerynck et al. 2007). According to a previous meta-analysis including 11,209 hemodialysis patients, the pooled worldwide prevalence of non-adherence to diet (47.3–72.5%) and fluid restrictions (50–70.7%) is substantially high (Vr and Kaur Kang 2022). Non-adherence to fluid restrictions can lead to congestive heart failure, pulmonary edema, hypertension, and increased frequency of muscle cramps, anxiety, panic, vomiting, nausea, and hypotension during dialysis sessions (Vaiciuniene et al. 2012). Dietary recommendation is another important factor, where non-adherence can lead to several consequences that can signify morbidity and mortality (Magnard et al. 2013).

Missed or shortened hemodialysis sessions can increase hospital admissions and mortality risk among hemodialysis patients by 13% to 30% (Saran et al. 2003; Denhaerynck et al. 2007; Obialo et al. 2012). In addition, hemodialysis patients, like other non-communicable chronic diseases, are reported to have a high medication burden (Yahya et al. 2018; Kadhim Jwad et al. 2022). Non-adherence is an increasing worldwide burden, and Iraq is no exception, reporting suboptimal adherence among patients with different chronic diseases (Al-Ganmi et al. 2020; Saad et al. 2022; Ghayadh and Naji 2023; Zaboon and Lami 2024). Adherence levels of Iraqi hemodialysis patients have been reported as suboptimal, with most patients falling within the moderate adherence level (Athbi 2015; Abdul-Jabbar and Kadhim 2022).

The World Health Organization defines health literacy as "the cognitive and social skills which determine the motivation and ability of individuals to gain access to, understand, and use information in ways that promote and maintain good health" (Nutbeam 2000). This concept includes health literacy as the degree to which individuals can comprehend essential health information necessary for making appropriate health decisions (Andrus and Roth 2002). The complex nature of healthcare and health messaging prompted the establishment of health literacy assessments to evaluate patients' comprehension of health information for the enhancement of health promotion (Andrus and Roth 2002; Chew et al. 2004; Young 2013; Abdul-Jabbar and Kadhim 2022; Chen et al. 2024). A meta-analysis of fifteen studies showed that limited health literacy is common in chronic kidney disease patients. As a potentially modifiable factor influencing individual health, it is the focus of an expanding field of research (Taylor et al. 2017). Several other factors affect hemodialysis patients' adherence to their complex regimen, including age, sex, marital state, education level, HD duration, knowledge, self-efficacy skills, work, and financial state (Bame et al. 1993; Chan et al. 2012; Mellon et al. 2013; Ozen et al. 2019).

Thus, patients' characteristics can efficiently identify subgroups of patients at high risk by recognizing the factors and barriers influencing adherence behavior and developing tailored interventions to improve it. However, no previous study explored the factors affecting Iraqi hemodialysis patients' adherence. In this study, we aim to assess the correlation between the adherence of Iraqi hemodialysis patients and their characteristics.

Methods

Study design

This observational cross-sectional study assessed the factors associated with hemodialysis patients' non-adherence in Iraq. The study enrolled 72 patients after obtaining informed written consent to participate.

Eligibility criteria

Patients were included in the study if they were ≥ 18 years of age, ESRD patients on chronic hemodialysis for at least three months, or had poor or moderate adherence to their therapeutic regimen as measured by a self-reported adherence questionnaire specific to hemodialysis patients (Kim et al. 2010). We excluded patients who had difficulty communicating and answering the questions (cognitive impairment, being too fragile to communicate, etc.).

Setting

Baghdad, Iraq, from 10 March to 10 July 2024. The study was conducted at the Dialysis Center in Baghdad Medical City, Iraq. The study was conducted at the Dialysis Center of Baghdad Medical City, Baghdad, Iraq. The study started on 10 March and ended on 10 July 2024.

Data collection and measures

The authors collected information concerning demographic data and other patient characteristics; in addition, patient adherence data were collected using a self-reported adherence questionnaire specific to dialysis patients, "The End Stage Renal Disease Adherence Questionnaire" (ESRD-AQ) (Kim et al. 2010). This validated questionnaire included five sections. The first included questions about patients' characteristics and demographic data, and the other four sections included questions regarding adherence to each of the four adherence dimensions: dialysis program, medications, diet, and fluid restriction (see Suppl. material 1) (Kim et al. 2010).

Adherence is then represented as a score ranging from 0 to 1200. The total score is distributed over the four dimensions of adherence: the dialysis session score ranges from 0–600, the medication score ranges from 0–200, the diet score ranges from 0–200, and the fluid score ranges from 0–200. Patients were considered to have good adherence behavior if they scored 1000 and higher, moderate adherence behavior if they scored between 600 and 999, and low adherence behavior if they scored below 600 (Kim et al. 2010).

The patient characteristics section included information about the patient's age, sex, marital status, duration of hemodialysis, number of dialysis sessions per week, cause of chronic kidney failure, education, previous renal transplant, and comorbidity status.

The health literacy component, namely readability, was assessed using the Single Item Literacy Screener (SILS) developed by Morris and colleagues to efficiently identify patients who have difficulty reading health-related materials by asking about the amount of help needed to read and understand doctor- or pharmacy-written instructions. This instrument aims to identify patients who need help with written or printed material, regardless of the etiology (limited education, language barrier, physical impairment, etc.) (Morris et al. 2006). The SILS questionnaire consisted of one question: "How often do you ask someone for help to read the instructions and leaflets from a doctor or pharmacy?" Patients could choose one of the five-point Likert scale responses: 5—never, 4—rarely, 3—sometimes, 2—often, or 1—always. If a participant chooses sometimes, often, or always, this indicates limited health literacy regarding the readability of medical issues. Oppositely, choosing never and rarely indicates adequate readability of medical issues (Morris et al. 2006). A previously Arabic-evaluated version in the Iraq community was used in this study (Al-Jumaili et al. 2015).

Ethical considerations

Ethical approval was received from the University of Baghdad, College of Pharmacy, ethical committee (reference number RECAUCP872024G, date: 08 July 2023). Written informed consent was obtained from study participants before the study was conducted.

Statistical analysis

Statistical analysis was conducted using the Statistical Package for the Social Sciences (SPSS) version 25 and GraphPad Prism 10.3. Data were tested for normality using the Kolmogorov-Smirnov test. The Spearman correlation test was used to test the association between the outcome and other variables. Multivariate linear regression analysis was conducted to identify the factors that influenced non-adherence, with variables showing a significant P value of < 0.05 in the single comparisons included in the multivariate linear regression analysis as candidates. A p-value of less than 0.05 was considered statistically significant.

Results

All descriptive characteristics of patients are presented in Table 1. The total number of patients included in the study was 72 patients. The mean age of participants was 53.83 years, with 52.8% being male and 87.5% being married. Educational levels ranged from illiterate (12.5%) to academic education (30.6%), with (56.9%) of patients in the primary and secondary school education category. Regarding the number of dialysis sessions per week, 76.4% of patients were prescribed two sessions per week, while the rest (23.6%) were prescribed three sessions per week. The majority of patients had no previous renal transplantation (94.4%). The primary cause of CKD, which led to ESRD among patients, was diabetic nephropathy (37.5%), followed by hypertension (27.7%). Health literacy component—readability average of 3.33 (±1.583)—indicated limited readability for health-related issues among patients. ESRD-AQ average score was reported to be within the moderate adherence category (782.29 ± 133.245).

Table 1. Patients' characteristics and ESRD-AQ scores (n = 72).

Variables	Value	Variables	Value
Sex, number (%)		**Cause of disease, number (%)**	
Male	38 (52.8%)	Diabetes mellitus	27 (37.5%)
Female	34 (47.2%)	Hypertension	20 (27.8%)
Age (years), mean ± SD	53.83 ± 13.52	Polycystic kidney disease	6 (8.3%)
< 40, number (%)	11 (15.3%)	Other causes	19 (26.4%)
40–60, number (%)	36 (50%)	**Number of dialysis sessions per week, number (%)**	
> 60, number (%)	25 (34.7%)	Two sessions	55 (76.4%)
Education, number (%)		Three sessions	17 (23.6%)
Illiterate	9 (12.5%)	**Renal transplant, number (%)**	
Primary and secondary school	41 (56.9%)	No previous transplant	68 (94.4%)
Diploma, bachelor and higher	22 (30.6%)	Previous transplant	4 (5.6%)
Duration of dialysis (years), mean ± SD	2.46 ± 2.044	**Marital status, number (%)**	
3 months–1 year, number (%)	26 (36.1%)	Single	9 (12.5%)
> 1 year, number (%)	46 (63.9%)	Married	63 (87.5%)
Number of medications, mean ± SD	3.08 ± 1.172	**SILS, mean ± SD**	3.33 ± 1.583
Weight, mean ± SD	73.62 ± 16.57	**ESRD-AQ scores (0–1200), mean ± SD**	782.29 ± 133.245

This study showed a significant inverse association between total adherence and the number of dialysis sessions per week ($P < 0.001$, $r = -0.411$), with patients on two dialysis weekly schedules showing higher overall adherence than those on three dialysis sessions weekly schedules, as seen in Figs 1, 2A.

Another significant association between overall adherence and patients' sex was observed ($P = 0.008$, $r = 0.327$), with female patients showing higher adherence behavior, as seen in Figs 1, 2B.

No other remarkable associations were observed between total adherence and other factors, including health literacy, as seen in Fig. 1.

In multivariate analysis, the number of weekly dialysis sessions showed an independent inverse relationship with ESRD-AQ, while sex showed a dependent relationship with ESRD-AQ, as seen in Table 2.

Table 2. Multivariate analysis of ESRD-AQ score.

Variables	Standardized β	Partial r	p-value
Dialysis session per week	-0.429	-0.435	<0.001
Sex	0.173	0.191	0.110

R^2 (adj.) = 0.221.

Discussion

Compliance with therapy in hemodialysis patients is essential for the management of end-stage renal disease. However, it frequently presents considerable difficulty for patients. This research assessed the correlation between patients' characteristics, including health literacy, and non-adherence behavior in hemodialysis patients. According to this study's findings, being on a three-dialysis-sessions-per-week schedule and being male were identified as associating factors with lower adherence behavior. Previous work has shown several factors affecting hemodialysis patients' adherence to their complex therapeutic regimens, such as age, sex, health literacy, and duration of dialysis (McDonald et al. 2002; Chan et al. 2012; Ibrahim et al. 2015; Al-Radeef et al. 2019; Ozen et al. 2019).

This study found that patients undergoing three dialysis sessions weekly are more likely to show non-adherence behavior than those on two weekly dialysis sessions. This unexpected result may indicate the tendency of patients with more frequent dialysis sessions to think that their adherence is less important and that they can adhere less strictly to their treatment without significant consequences. To our

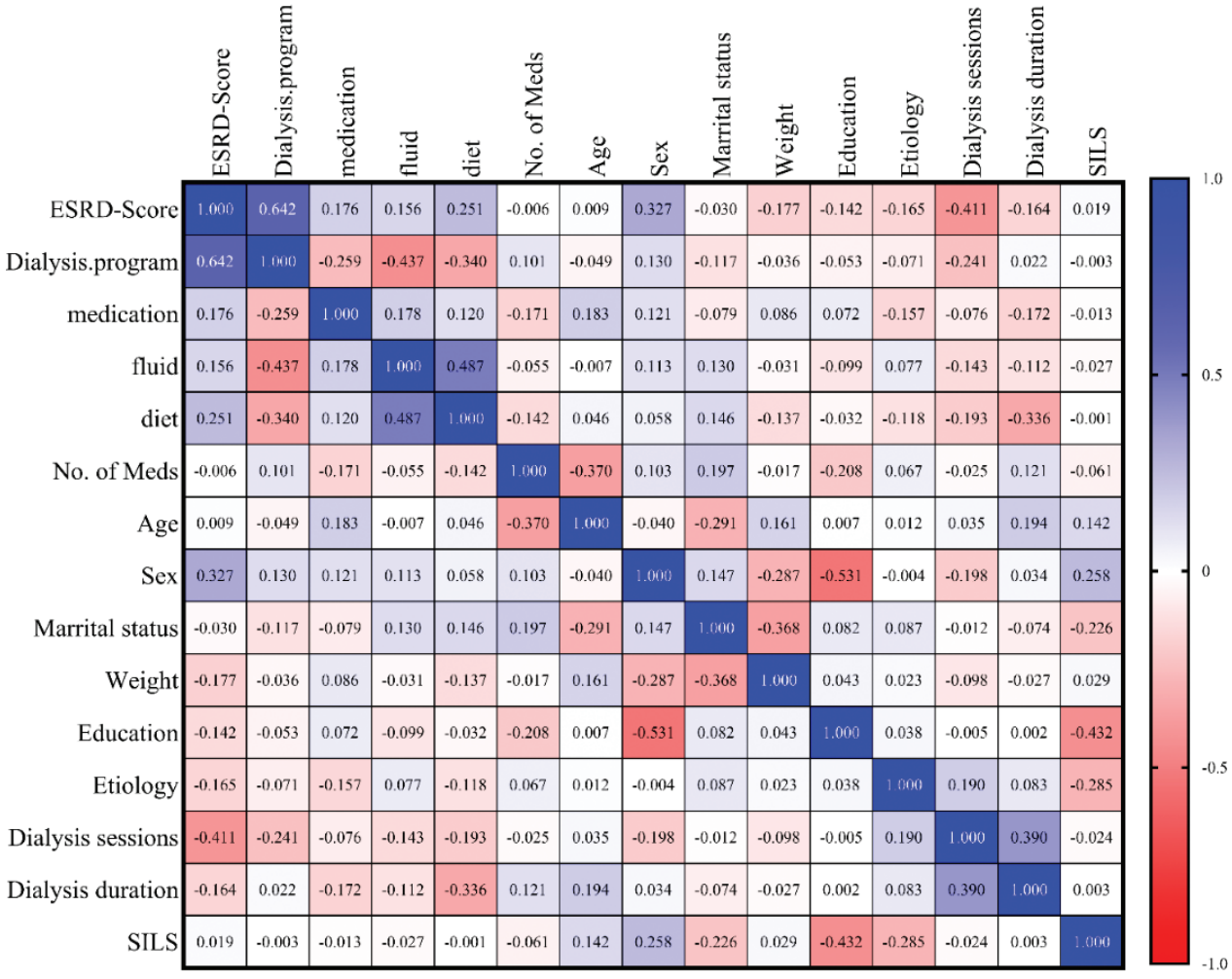

Figure 1. Correlation matrix of studied variables.

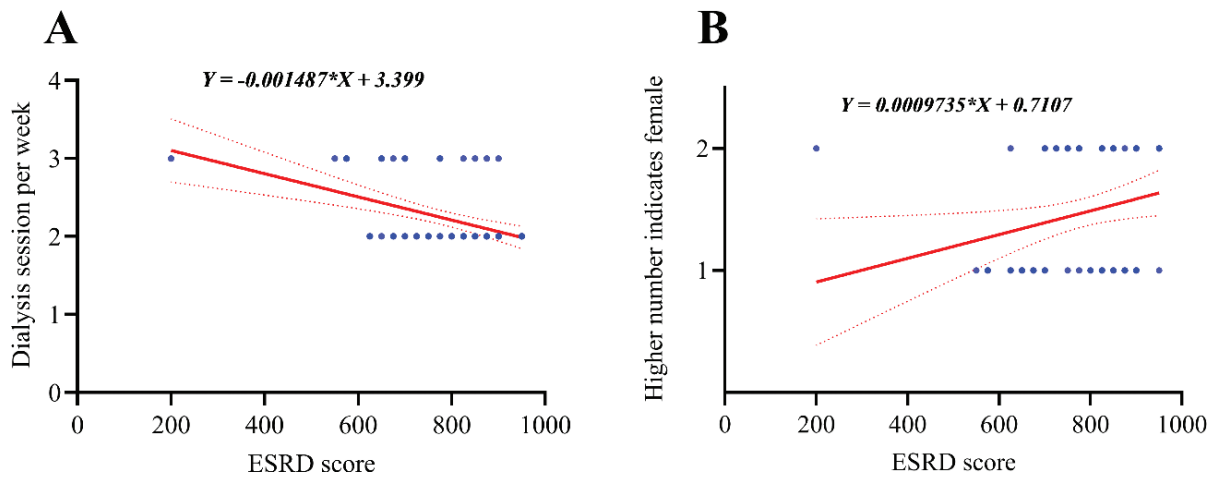

Figure 2. Linear correlation between ESRD-AQ score with (**A**) number of dialysis sessions per week and (**B**) sex (in which 2 indicates female, while 1 indicates male).

knowledge, no previous study has investigated this factor for potential association with hemodialysis patients' adherence.

This study found that being male is associated with non-adherence to hemodialysis treatment. Several studies reported higher rates of non-adherence to hemodialysis treatment in men (Saran et al. 2003; Ozen et al. 2019). This may be attributed to the fact that many men had the feeling of losing their role in the family because of their condition (Wells 2015). Therefore, it is important to understand the opinions of male patients about this issue so the healthcare staff can provide appropriate support. The tendency for lower adherence to treatment among Iraqi male hemodialysis patients compared to female patients may be cultural. Men may tend to think that they are unable to do their duties when they must adhere to a complex therapeutic regimen of hemodialysis treatment for four hours a day, twice or three times a week, many prescribed medications, and specific diet and fluid restrictions. However, several previous studies reported that males showed better or non-inferior adherence levels to dialysis treatment than females (Naalweh et al. 2017; Hermis and Abed 2022); this may be linked to various variables, including sociodemographic disparities, cultural influences, and regional healthcare accessibility.

This study reported no association between health literacy and hemodialysis patients' adherence behavior; these findings were contrary to previous studies, showing a positive relationship between adherence and health literacy among hemodialysis patients (Zhang et al. 2014; Chen et al. 2024). In contrast, a previous meta-analysis concluded that the relationship between health literacy and adherence in chronic disease patients is unclear, in which 14 reported a positive relationship, 1 study suggested a negative relationship, 3 found mixed results, and 9 reported not finding a relationship (Hyvert et al. 2023). This difference may stem from cultural and educational differences. Another explanation could be the different tools used to assess health literacy. Where SILS is focused on the readability component, other tools may reflect a more general assessment.

Another factor is the duration since starting hemodialysis treatment (McDonald et al. 2002; Chan et al. 2012; Abed et al. 2019). In the present study, patients' duration on dialysis showed a weak negative association with adherence behavior; this may be because patients with longer periods since starting hemodialysis treatment are potentially more vulnerable to mental health disorders and a more compromised quality of life (Ginieri-Coccossis et al. 2008), which may make patients unable to follow the recommended instructions tightly. Additionally, hemodialysis patients with longer disease duration were reported to have higher medication-related burden, which may affect their adherence (Hamid et al. 2018; Jumaah Jebur et al. 2018; Hameed et al. 2020; Kadhim Jwad et al. 2022). In contrast, another study found that longer hemodialysis duration was associated with a reduced risk of non-adherence to treatment (Ozen et al. 2019). Meanwhile, another study found no significant relationship between hemodialysis treatment adherence and duration (Ibrahim et al. 2015). Several studies reported that younger people are likelier to not adhere to treatment (Kutner 2001; Karamanidou et al. 2008). This study observed no association between age and patients' adherence. This observation was also reported in another study (Alhamad et al. 2023), possibly due to differences in patient characteristics and the place where the study was conducted.

Education has been reported as an important factor for adherence. Interestingly, this study reported a weak inverse association between education and hemodialysis treatment adherence. This result aligns with other studies, indicating that the patient's knowledge about the disease and its management is more critical to adherence behavior than the general education level (Alikari et al. 2019; Dsouza et al. 2023). Nevertheless, tailored educational interventions remain crucial, improving patients' knowledge of their disease and self-management skills regardless of their educational background (Mirzaei-Alavijeh et al. 2023). Only a few patients' characteristics appeared to affect hemodialysis patients' adherence.

Study limitations

The study possesses numerous limitations, notably a rather small sample size, which may restrict the generalizability of the findings. Data obtained via interviews may be susceptible to recollection bias. The study's cross-sectional design precludes the determination of causal links. The study's concentration on a singular center within a specific location may not accurately reflect the diversity of adherence patterns among all hemodialysis patients throughout Iraq.

Conclusion

Our research found several patient variables that affect adherence among hemodialysis patients in the Baghdad region of Iraq. Significantly, characteristics such as sex and the frequency of dialysis sessions per week affected adherence. These findings stress the necessity of customized therapies targeting these determinants to augment hemodialysis adherence and eventually increase patient outcomes in this demographic.

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Additional information

Conflict of interest

The authors have declared that no competing interests exist.

Ethical statements

The authors declared that no clinical trials were used in the present study.

The authors declared that no experiments on humans or human tissues were performed for the present study.

Informed consent from the humans, donors or donors' representatives: Ethical approval was received from the University of Baghdad, College of Pharmacy ethical committee (reference number RECAUCP872024G, date: 8th July 2023).

The authors declared that no experiments on animals were performed for the present study.

The authors declared that no commercially available immortalised human and animal cell lines were used in the present study.

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Author contributions

Conceptualization, investigation, Manuscript preparation, Al-Hamadani FY and Ansaf TS. Supervision, Al-Hamadani FY. Statistical analysis and review of final results, Ansaf TS. Manuscript review and editing, Al-Hamadani FY and Ansaf TS. All authors have read and agreed to the published version of the manuscript.

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Data availability

The data that support the findings of this study are openly available in Zenodo at https://zenodo.org/records/14543774, reference number 14543774.

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Supplementary material 1

The end stage renal disease adherence questionnaire

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