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Evaluation of Adherence to Treatment Regimen and Related Factors in Hemodialysis Patients

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ABSTRACT

Non-adherence to treatment regimens is a prevalent issue among patients undergoing hemodialysis and is recognized as a contributing factor to disease progression, increased hospitalization rates, and suboptimal responses to hemodialysis. Given the multitude of factors influencing treatment non-adherence and the critical role of adherence in enhancing the quality of life for hemodialysis patients, this study was conducted to assess adherence to treatment regimens and associated factors among hemodialysis patients at Taleghani Hospital, Urmia. In this descriptive-correlational study, 66 hemodialysis patients were selected through convenience sampling. Demographic data were collected using a questionnaire, and treatment adherence was evaluated using the End-Stage Renal Disease Adherence Scale. Data analysis revealed a mean total treatment adherence score of 551.38 ± 181.71. The subdimensions included adherence to hemodialysis treatment (238.37 ± 67.78), medication regimen adherence (85.33 ± 39.45), dietary regimen adherence (99.93 ± 45.22), and fluid restriction adherence (127.75 ± 29.26). Total treatment adherence scores demonstrated a significant inverse relationship with urban versus rural residence and a direct correlation with the mean age of the patients. In conclusion, the study results indicate that patients' treatment adherence was moderate, likely attributable to the chronic nature of the disease, economic and livelihood challenges, and a lack of patient awareness. Enhanced attention to the causes of non-adherence in hemodialysis patients is imperative.

Keywords: End stage renal disease; Hemodialysis; Adherence to treatment

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Introduction

End-stage renal disease (ESRD) is a progressive, irreversible disorder characterized by kidney failure to remove metabolic waste and maintain fluid and electrolyte balance [1]. The Centers for Disease Control and Prevention (CDC) identified kidney disease as the ninth leading cause of death in America [2]. Based on the National Health and Morbidity Survey reports, the prevalence of CKD has increased from 9.1% in 2011 to 15.5% in 2018. The incidence and prevalence of ESRD have also increased notably over the last 25 years, and the number of ESRD patients is estimated to reach 51,000 in 2020 and

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106,000 in 2040 [3]. A systematic review by Pouryan et al. reported a prevalence of chronic kidney disease of 18.80% in women and 10.83% in men, exceeding global averages [4]. In chronic kidney failure, kidneys cannot maintain metabolic functions or fluid/electrolyte balance, ultimately leading to life-threatening uremia. Patients initially receive conservative management but eventually require dialysis [5]. Hemodialysis is the most common treatment for chronic kidney disease, with approximately 80% of patients with acute kidney disease in the United States receiving hemodialysis [6]. Iran has over 13,000 dialysis patients, with approximately 150,000 dialysis sessions performed each month, indicating a 15% annual increase [7].

Hemodialysis remains the most prevalent treatment for chronic kidney disease [8]. Patients face significant lifestyle changes post-hemodialysis initiation, requiring complex regimens including 3–4 weekly 4-hour sessions, strict dietary control, fluid restrictions, and medication adherence [9,10]. Adherence to these regimens significantly improves health status and well-being in patients undergoing hemodialysis [11].

Successful hemodialysis depends on four key factors: dietary adherence, medication compliance, fluid restriction, and attendance at dialysis sessions [12]. Treatment adherence in ESRD patients is critical for achieving optimal outcomes, reducing mortality/morbidity, and preventing complications such as nutritional deficiencies, muscle cramps, and sepsis [13]. However, non-adherence to treatment remains a major challenge in hemodialysis patients. Treatment adherence encompasses appropriate dietary intake, prescribed fluid consumption, and medication use [14].

Patient compliance with treatment regimens is influenced by cultural and social factors, as well as personal beliefs. While adherence improves health outcomes, compliance rates remain low [15]. Non-adherence to treatment is one of the primary concerns for healthcare teams [16].

Non-adherence leads to severe complications, including cardiac arrest from potassium-rich diets, interdialytic weight gain causing respiratory distress, muscle cramps, anxiety, pulmonary edema, hypertension, and heart failure [17-19]. Medication non-adherence hinders therapeutic goals [20]. Despite the importance of adherence behaviors, many hemodialysis patients fail to comply with prescribed regimens, leading to reduced quality of life, increased morbidity, and mortality [10].

Numerous studies have identified factors influencing treatment adherence among hemodialysis patients, including advanced age, male gender, education level, communication with healthcare providers, smoking status, treatment duration, and complexity, and psychosocial factors such as depression and low perceived social support [21–24].

Cultural context also plays a significant role; for instance, in many Asian countries, family involvement often supports dietary adherence through shared meal planning, while participation in religious or cultural events may hinder compliance with fluid restrictions [25]. Recent studies further illustrate this duality: Alshogran et al. highlighted how family dynamics can both promote and challenge medication adherence due to conflicts between traditional beliefs and medical advice [26]. Peng & Li showed that community-based support systems in East Asia enhance adherence through peer modeling and shared experiences [27]. Alobaidi found that religious fasting practices in South Asia frequently lead to unintentional non-adherence to fluid and dietary guidelines [28]. However, many prior investigations have been conducted in Western populations, used non-standardized tools, or focused on limited domains of adherence, which limits their applicability to Iranian or Middle Eastern settings. Some local studies also lacked methodological rigor or comprehensive assessment across multiple adherence dimensions.

This study addresses these gaps by applying a validated multidimensional tool (ESRD-AQ) to assess adherence across four key domains — hemodialysis attendance, medication use, dietary restrictions, and fluid intake — within a specific regional context (Urmia, Iran). These enhancements provide a more nuanced understanding of adherence patterns and contribute to the literature by addressing the lack of region-specific evidence in Middle Eastern dialysis populations.

Materials and Methods

This analytical cross-sectional study enrolled 305 This descriptive-correlational study was conducted in 2023 at the Dialysis Unit of Taleghani Teaching Hospital, Urmia University of Medical Sciences.

The statistical population of this study was patients with ESRD in the dialysis department of Taleghani Hospital who met the inclusion criteria for the study.

The inclusion criteria for the study included a definitive diagnosis of chronic renal failure and being on hemodialysis by a nephrologist; having a file in the hemodialysis ward and performing hemodialysis three times a week for 3 to 4 hours each time; age 18-65 years; willingness to participate in the study; ability to hear and speak; acceptable alertness to answer questions; being literate; and exclusion criteria included: unwillingness to continue cooperating in the study; use of psychotropic substances; death or transfer of the patient to another medical center.

After ethical approval, data were collected through demographic questionnaires and the End-Stage Renal Disease Adherence Questionnaire (ESRD-AQ). Convenience sampling was conducted across three shifts. The sample size (n = 66) was calculated using the formula for estimating proportions (p = 0.85, d = 5%, α = 0.95), based on Zamanzadeh et al. [29].

The ESRD-AQ contains 46 items across five domains: the first section gathers general information through 5 questions, the second assesses acceptance of hemodialysis treatment with 14 questions, the third evaluates adherence to pharmacological therapies via nine questions, the fourth focuses on compliance with fluid restrictions through 10 questions, and the fifth examines adherence to recommended dietary guidelines for chronic kidney disease using eight questions. The total treatment adherence score is derived by summing the scores of all five sections, with a minimum possible score of 0 and a maximum achievable score of 1200. Higher scores indicate better adherence to the prescribed treatment regimen. Responses use a 5-point Likert scale (1 = non-adherence, 5 = complete adherence). Mean ± 1 SD was defined as moderate adherence, and scores above or below indicated good or poor adherence [30].

The ESRD-AQ had been previously culturally adapted, validated, and its reliability assessed by Rafiei et al. to evaluate the impact of individualized multi-stage care on treatment adherence in hemodialysis patients. Its reliability was determined via Cronbach's alpha (0.98) and test-retest analysis (0.85) [31].

Additionally, in Ghanbari et al.'s study, which aimed to investigate the effect of feedback-oriented education on treatment regimen adherence in dialysis patients with end-stage renal disease, content validity was established using the Content Validity Index (CVI). The overall CVI score was calculated as 0.98, comprising subscores for simplicity (0.98), clarity (0.97), and relevance (0.99) [32].

The researcher administered the questionnaires to eligible participants until the target sample size was reached. The collected data were analyzed using the statistical software SPSS version 25, employing both descriptive statistics (mean, standard deviation, frequency, and percentage) and analytical statistics (Pearson correlation test).

Results

The mean patient age was 47.23 ± 11.16 years. Most were male (56.1%), married (92.4%), employed (39.4%), and with a university education (33.4%). 62.1% had moderate income, 63.6% were nonsmokers, and 70% resided in urban areas.

The findings obtained from the data on dietary adherence scores among hemodialysis patients across four dimensions showed that the total adherence score was 551.38 ± 181.71.

Total adherence scores showed a significant inverse correlation with urban residence (r = -0.451, p = 0.002) and a direct correlation with age (r = 0.105, p = 0.041).

No significant associations were found between adherence scores and occupation, education, marital status, smoking, or income level. (Table 2)

Pearson correlation analysis revealed a statistically significant negative correlation between the total score of dietary adherence in hemodialysis patients and their residential status (r = -0.451, P = 0.002).

In addition, a statistically significant positive correlation was observed between dietary adherence scores and mean age (r = 0.105, P = 0.041).

However, no statistically significant associations were found between dietary adherence scores and other demographic variables, including occupational status, educational level, marital status, smoking history, and income level (Table 1).

Table. 1. Adherence scores to treatment regimen in patients undergoing hemodialysis

Adherence Domain	Mean	SD
Hemodialysis Treatment Adherence	238.37	67.78
Medication Regimen Adherence	85.33	39.45
Dietary Regimen Adherence	99.93	45.22
Fluid Restriction Adherence	127.75	29.26
Total Treatment Adherence Score	551.38	181.71

Table 2. Demographic characteristics of patients and correlation with overall adherence score to treatment regimen

Variable	Category	Frequency	Sig and r
Gender	Female	29(43.9)	P=0.298 , r=-0.075
	Male	37(56.1)	P=0.298 , r=-0.075
Occupational Status	Employed	2639.4 ()	P=0.232 , r=-0.231
	Unemployed	18(27.3)	P=0.232 , r=-0.231
	Self-Employed	22(33.3)	P=0.232 , r=-0.231
Education	Elementary	12(18.2)	P=0.846, r=-0.032
	Guidance School	10(15.1)	P=0.846, r=-0.032
	High School	12(18.2)	P=0.846 , r=-0.032
	Diploma	10(15.1)	P=0.846, r=-0.032
	Bachelor	22(33.4)	P=0.846, r=-0.032
Marital Status	Single	5(7.6)	P=0.062, r=+0.001
	Married	61(92.4)	P=0.062, r=+0.001
Residence Type	Urban	46(70)	P=0.002, r=-0.451
	Rural	20(30)	P=0.002, r=-0.451
Smoking Status	Yes	24(36.4)	P=0.763, r=-0.034
	No	42(63.6)	P=0.763, r=-0.034
Income Level	Low	16(24.2)	P=0.132, r=-0.078
	Moderate	41	P=0.132, r=-0.078
	High	9	P=0.132, r=-0.078
Age	—	47.23(Mean)	P=0.041, r=+0.105

Discussion

This descriptive-correlational study was conducted to assess the level of adherence to therapeutic regimens and associated factors among hemodialysis patients with end-stage renal disease at Taleghani Hospital in Urmia, Iran, in 2023. Treatment adherence was evaluated across four domains—hemodialysis, pharmacological therapy, fluid intake restrictions, and dietary regimens—as well as related influencing factors. The majority of patients demonstrated moderate adherence levels across these four domains, aligning with the findings of Tavakoli et al. [33]. One of the notable findings of this study was the statistically significant inverse correlation between urban residents and overall treatment adherence, indicating that rural residents demonstrated higher adherence to prescribed hemodialysis regimens compared to their urban counterparts. This finding aligns with previous reports suggesting that rural populations may benefit from stronger family support systems, closer community ties, and more structured daily routines, which facilitate better adherence to complex treatment plans. Alshogran OY et al., [26]. In contrast, urban patients often face greater lifestyle disruptions, increased occupational stress, and easier access to non-recommended foods and beverages, which may contribute to lower adherence levels Hammad SS et al., [25]. Additionally, urbanization may be associated with reduced social cohesion and weaker informal monitoring of health behaviors, making it more challenging for patients to adhere to strict dietary and fluid restrictions. These results emphasize the importance of tailoring adherence improvement strategies according to patients' sociocultural and environmental contexts. Future interventions should consider geographic differences when designing educational programs or support systems for hemodialysis patients, as age has been shown to have a direct correlation. A cross-sectional study by Chan et al. involving 188 hemodialysis patients in Malaysia similarly reported a positive association between age and adherence to dietary and pharmacological regimens [34]. Melon Reagan and Curtis emphasized age as the most critical demographic factor, noting that older patients exhibited stricter dietary compliance, consistent with the present study [35]. Analysis of adherence scores revealed the highest mean adherence to hemodialysis treatment and the lowest to pharmacological regimens. This aligns with an Italian study observing poor medication adherence and high hemodialysis compliance [36]. Schneider et

al. reported non-adherence to pharmacological regimens in 67% of the studies [37], while Sokhak et al. identified common reasons for non-adherence, including forgetfulness, deviation from prescribed dosages and skepticism about the efficacy of medication [38]. Regarding fluid intake adherence, most patients demonstrated moderate adherence, which corroborates the findings of Rafiei Vardajani et al. [31]. Studies by Ramboond et al., Barnett et al., Kugler et al., and Li & Molassiotis reported non-adherence rates ranging from 47% to 59.7% [36–39]. Variations in findings across studies (30–74%) [40,41] may reflect socioeconomic disparities, logistical burdens (e.g., transportation for dialysis), comorbidities, or differing assessment methodologies.

In contrast to Li and Molassiotis [39] and Davoodi [42], this study found low dietary adherence among most patients, which is potentially attributable to regional economic hardship, indirect costs (e.g., travel), employment barriers, and concurrent illnesses. For instance, another study reported non-adherence rates of 18.4% for dietary regimens and 25.1% for fluid restrictions [41]. Limitations of this study include uncontrolled environmental, emotional, and psychological factors that may have influenced patients' responses to the questionnaire. These findings underscore the need for tailored interventions addressing demographic and contextual barriers to improve adherence in hemodialysis populations.

Conclusion

Treatment adherence in hemodialysis patients at Taleghani Hospital was moderate, likely influenced by disease chronicity, economic challenges, and knowledge gaps. Future studies should expand sample sizes and adopt comparative or multicenter designs. Interventional studies involving interdisciplinary specialists addressing adherence determinants are recommended.

Clinical Implications

With the growing ESRD population requiring lifelong hemodialysis, identifying adherence barriers can improve patient's quality of life and mental health.

Authorship contribution statement

MA and NI: conceptualization. MKN: Data analysis. MA, NI, and MKN: manuscript revision. All authors contributed to the article and approved the submitted version.

Ethical Consideration

The research obtained approval from the Ethics Committee of Lorestan University of Medical Sciences (IR.UMSU.REC.1397.490).

Declaration of Competing Interest

The authors have no conflict of interests related to this article

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Data Availability

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

Declaration of Generative AI

The authors declare that they have not used any type of generative artificial intelligence for the writing of this manuscript, nor for the creation of tables, or their corresponding captions.

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