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Treatment Adherence and Associated Factors Among Patients Undergoing Hemodialysis in a Cross-Sectional Study

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Abstract

Background and aims:

Non-adherence to treatment remains a major challenge among patients undergoing hemodialysis and is closely linked to adverse clinical outcomes, reduced quality of life, and increased healthcare costs. Given the growing number of individuals with end-stage renal disease, identifying factors associated with non-adherence is essential for developing targeted interventions that enhance patients' commitment to prescribed therapeutic regimens

Methods

This analytical cross-sectional study was conducted on 200 hemodialysis patients. Data were collected using the End-Stage Renal Disease Adherence Questionnaire (ESRD-AQ), the Multidimensional Scale of Perceived Social Support (MSPSS), the Patient Health Questionnaire-9 (PHQ-9), the General Self-Efficacy Scale (GSE-10), and a demographic/clinical form. Statistical analyses were performed using descriptive statistics and inferential tests, including Mann–Whitney U, Kruskal–Wallis, Spearman correlation, and multiple linear regression in IBM SPSS v26.

Results

The study included 200 participants (mean age: 59.63 ± 13.04 years); 61% were male, 82.5% married, and 45.5% had below high-school education. The mean treatment adherence score was 1011.12 ± 138.81. Multivariate regression showed that treatment adherence was significantly associated with age ($B = 2.07$, $p = 0.033$), gender ($B = 57.13$, $p = 0.048$), perceived social support ($B = 4.22$, $p = 0.003$), and depression ($B = -20.13$, $p < 0.001$). No significant association was found between self-efficacy and adherence.

Conclusion

Overall, patients demonstrated relatively favorable levels of treatment adherence. Higher perceived social support and lower levels of depression were key predictors of improved adherence. These findings highlight the importance of psychosocial interventions and supportive care programs to enhance treatment adherence among hemodialysis patients.

Highlights

1. Greater social support and lower depression levels were significant independent predictors of improved treatment adherence in hemodialysis patients.

2. Age and gender were significantly associated with treatment adherence, while self-efficacy showed no statistically significant relationship in the multivariate analysis.

3. Despite the clinical complexity of hemodialysis, patients demonstrated overall favorable adherence, highlighting the importance of psychosocial interventions alongside medical care.

Introduction

Chronic kidney disease (CKD) is characterized by persistent kidney damage or a reduced glomerular filtration rate lasting at least three months, progressing from mild impairment to end-stage renal disease (ESRD), in which the kidneys lose their ability to excrete waste and maintain homeostasis[1, 2]. Without renal replacement therapy, ESRD is rapidly fatal[3]. Hemodialysis remains one of the most widely used and effective treatment modalities for ESRD worldwide[4]. The global burden of ESRD is substantial and growing, with millions dependent on hemodialysis worldwide. Consequently, patient adherence to this multifaceted regimen is a critical determinant of clinical outcomes and quality of life[5].

Despite its life-sustaining role, hemodialysis is often accompanied by significant psychological distress and lifestyle disruption. Non-adherence to the treatment regimen—encompassing session attendance, dietary and fluid restrictions, and medication intake—remains a pervasive challenge, with reported rates varying widely and reaching up to 57% for certain behavioral domains[6, 7]. Reported non-adherence rates vary considerably, ranging from 20–39% for medications, dialysis sessions, and dietary restrictions[8]. with systematic reviews indicating non-adherence to dietary and fluid restrictions in approximately 47–57% of patients[9]. Such non-adherence contributes to serious complications, including fluid overload, electrolyte disturbances, cardiovascular events, and increased mortality[10].

Understanding the drivers of (non-)adherence is therefore paramount. While determinants are multifaceted, spanning socioeconomic, treatment-related, and systemic factors[11, 12]. Among modifiable psychosocial factors, depression—highly prevalent in this population[13]—social support[14], and self-efficacy[5] have been highlighted as potentially influential. However, findings remain inconsistent, with some studies reporting no significant association between these factors and adherence[15]. This discrepancy underscores the need for further investigation within specific cultural and clinical contexts. Therefore, this study aimed to assess the level of treatment adherence and to critically examine the specific associations between depression, perceived social support, self-efficacy, and treatment adherence in a cohort of hemodialysis patients. By clarifying these relationships, the findings aim to inform more targeted and effective psychosocial interventions to support adherence and improve patient outcomes.

Materials and Methods

Study Design and Setting

This cross-sectional analytical study was conducted between April and May 2024 at two hemodialysis centers in Rasht, Iran: the Razi Educational and Medical Center and the Caspian Dialysis Center. The study protocol received approval from the Research Ethics Committee of Guilan University of Medical Sciences (IR.GUMS.REC.1402.582). All participants provided written informed consent after receiving a full explanation of the study aims. Participation was voluntary, and confidentiality of personal and clinical data was strictly maintained.

Participants and Sampling

Eligible participants were adult hemodialysis patients (age ≥ 18 years) who had been on hemodialysis for more than three months, received dialysis for 3–4 hours per session at least twice weekly, were independent in self-care activities, and were willing and cognitively able to participate. Patients were enrolled during hemodynamically stable dialysis sessions.

The sample size was determined based on the rule of thumb for linear regression, which recommends 10–20 participants per predictor variable. With 10 independent variables planned for analysis, a minimum of 200 patients were recruited[16].

Data Collection Instruments

1. **Treatment Adherence** – Assessed using the **End-Stage Renal Disease Adherence Questionnaire (ESRD-AQ)**, a 46-item tool covering session attendance, medication use, fluid restriction, and dietary adherence. Total scores range from 0 to 1200, with higher scores indicating better adherence[17].
2. **Perceived Social Support** – Measured with the **Multidimensional Scale of Perceived Social Support (MSPSS)**, which includes 12 items evaluating support from family, friends, and significant others. Scores range from 12 to 84, categorized as low (12–35), moderate (36–60), or high (≥ 61) support[18].
3. **Self-Efficacy** – Evaluated using the **Generalized Self-Efficacy Scale (GSE-10)**, a 10-item instrument scored from 10 to 40, with higher scores reflecting greater self-efficacy[19].
4. **Depressive Symptoms** – Assessed with the **Patient Health Questionnaire-9 (PHQ-9)**, a 9-item scale scored 0–27; a score ≥ 10 indicates clinically significant depression[20, 21].
5. **Demographic and Clinical Information** – A structured form collected data on age, sex, marital status, education, occupation, socioeconomic status, duration of dialysis, comorbidities, and laboratory values.

Statistical Analysis

Continuous variables are presented as mean ± standard deviation, and categorical variables as frequency (percentage). The normality of distribution was examined using the Kolmogorov–Smirnov test. Univariate analyses included the Mann–Whitney U test, Kruskal–Wallis test, and Spearman's correlation coefficient to evaluate associations between treatment adherence and demographic/clinical

factors. The relationships of adherence with social support, self-efficacy, and depression were also assessed via Spearman's correlation. A multiple linear regression model was fitted to identify independent predictors of treatment adherence while adjusting for potential confounders. All analyses were performed using IBM SPSS Statistics (version 26), with a significance level set at $p < 0.05$.

Results

The study included 200 hemodialysis patients with a mean age of 59.63 ± 13.04 years. The majority of participants were male (61.0%) and married (82.5%). In terms of socioeconomic characteristics, 45.5% had an education level below high school, 43.5% were unemployed, and 44% reported good socioeconomic status (Table 1).

Treatment adherence was generally favorable, with a mean total adherence score of 1011.12 ± 138.81. Across adherence subscales, patients scored highest in attendance at dialysis sessions (541.62 ± 101.81) and medication adherence (187.25 ± 26.04). Comparatively, adherence was lower for fluid restriction (130.50 ± 53.23) and dietary recommendations (146.50 ± 49.49) (Table 2).

A statistically significant correlation was observed between the total score of perceived social support and treatment adherence (adherence behaviors) in the hemodialysis patients studied. The scatter plot density further confirms the significant relationship between perceived social support and treatment adherence in this clinical population (Fig1).

Multivariable linear regression identified several significant predictors of treatment adherence. Older age ($\beta = 2.07$, $p = 0.033$), male gender ($\beta = 57.13$, $p = 0.048$), and higher perceived social support ($\beta = 4.22$, $p = 0.003$) were positively associated with adherence. In contrast, higher levels of depressive symptoms were significantly associated with lower adherence ($\beta = –20.13$, $p < 0.001$). Although self-efficacy showed a positive relationship with adherence, this association was not statistically significant in the adjusted model (Table 3).

Discussion

This study aimed to examine adherence to treatment and the related factors in hemodialysis patients. The findings indicated that the mean total adherence score among these patients was favorable, recorded at1011.12 ± 138.81, aligning with the results from Al-Atawi's study[22]. In contrast, Medeiros et al. reported a low mean adherence score in hemodialysis patients[23], while Khalili et al. identified it as moderate[15]. This study's findings differ from those previously mentioned, which could be attributed to medical staff training, cultural differences, diverse methods for assessing adherence, and differences in sample sizes. Additionally, the patients evaluated demonstrated better adherence in the subscales concerning participation in dialysis sessions and medication adherence compared to those related to fluid restriction and dietary compliance, consistent with Azizi et al.'s findings[11].

In terms of demographic variables, the findings of this study indicated that only age and gender were significantly linked to treatment adherence. Specifically, older hemodialysis patients tended to adhere better to their treatment regimens. This trend aligns with the conclusions drawn in the study by Borji et al[24]. older individuals may have heightened concerns about mortality, motivating them to stick to their treatment to avert adverse outcomes. Conversely, the research conducted by Rafiei Vardanjani et al. found no significant association between age, gender, and treatment adherence[25]. The discrepancies in these findings may be attributed to the differing age ranges of participants, the varied challenges and family responsibilities that each age group faces, and cultural factors.

The present study indicated a significant relationship between treatment adherence scores and perceived social support among the hemodialysis patients examined. Family members emerge as one of the most crucial sources of social support for these patients. Similar results were observed in the study conducted by Alatawi et al.[22] which also demonstrated a significant correlation between these two variables. Additionally, research by Belguzar Kara et al.[26] and Ahrari et al.[27] reinforced the idea that family is the primary source of support for patients. Furthermore, Rahimi's study found a notable relationship between perceived social support and adherence to dietary restrictions, fluid management, and medication guidelines, again highlighting family members as vital sources of support. The findings of the present study align with these earlier research outcomes[28]. Social support is recognized as a social psychological factor that can enhance health behaviors, enabling patients to adhere to self-care practices and mitigate negative effects and psychological stress.

The findings revealed a significant negative correlation between the total score of depressive symptoms and treatment adherence among the hemodialysis patients examined. Similar results were reported by Elif Ok et al.[29] and Zoi-Maria Fotaraki et al.[30], indicated that the relationship between depression and self-care is statistically significant; specifically, as depressive symptoms intensify, self-care diminishe. Our study's findings align with those of the studies mentioned above. This phenomenon may be explained by the fact that one of the inclusion criteria for participants was undergoing hemodialysis for more than three months. This duration may have allowed patients to accept their condition and adjust to their treatment circumstances, leading to a gradual reduction in depressive symptoms and, consequently, improved treatment adherence.

In this study, a significant relationship was observed between self-efficacy and treatment adherence; however, it did not reach statistical significance. Research by Martos-Méndez et al.[31] indicated a substantial and direct correlation between treatment adherence and self-efficacy. Similarly, the findings from Kazemi et al.[32] demonstrated a significant and direct relationship between self-efficacy and adherence to dietary and fluid intake. Our study's results, however, do not align with those of the studies mentioned above. This discrepancy may be attributed to variations in measurement tools, the average age of participants, cultural differences, and the availability of support resources. Enhancing self-efficacy could potentially improve adherence to treatment regimens and foster healthy behaviors, subsequently alleviating both physical and psychological symptoms. Self-efficacy is pivotal in driving motivational processes and individual performance.

Based on multivariate regression analysis, age, gender, social support, and depressive symptoms were identified as predictors of treatment adherence among the patients studied. The findings from the research conducted by Asadi Zaker et al.[5], Hashemi et al.[12], indicated that higher levels of social support and lower levels of depression are associated with improved treatment adherence in hemodialysis patients. Our study's results align with those of these previous studies. In contrast, Khalili et al.[15] did not find a significant relationship between treatment adherence and the psychosocial factors investigated, such as depression, perceived social support, and self-efficacy. Potential reasons for the discrepancies in results may include differences in sample size, varying sampling tools, data collection methods, and the patient's hemodynamic and mental conditions.

limitation:

Despite the strengths of this study, it also has limitations, one of which is the large number of questions and questionnaires used, as well as the possibility of patient non-cooperation. Efforts were made to reduce this limitation by collaborating with research units or through multi-stage sampling using various instruments. Additionally, given that the data collection method involved interviews and questionnaires, and despite the fact that the sampling process began after creating appropriate conditions (hemodynamic stability) for the patient during the dialysis session, there remains a possibility that some patients were in unfavorable hemodynamic conditions, which were beyond the researcher's control.

Conclusion

The results indicated that patients undergoing hemodialysis favorably adhere to their treatment regimen. Notably, as social support increased, both depression levels decreased, and treatment adherence improved among these patients. However, this study suggests that the role of self-efficacy in enhancing adherence to treatment protocols warrants further exploration. Overall, ensuring treatment adherence is a multifaceted process that requires comprehensive involvement from nursing professionals across various dimensions, including assessment, identification of influencing factors, education, support, and ongoing monitoring. Implementing these strategies can effectively promote patient adherence and enhance treatment outcomes. Given the importance of awareness and understanding among patients and care teams regarding treatment adherence, it is recommended that future research focus on assessing the knowledge and awareness of patients, caregivers, and healthcare teams concerning treatment adherence and its associated factors.

Declarations

Data availability statement

The datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request.

Consent to Publish

Written informed consent to participate and consent for publication were obtained from all participants prior to their inclusion in the study

Author contributions

All authors have critically reviewed and approved the final draft and are responsible for the content and similarity index of the manuscript.

Ethical approval

This study was approved by the Research Ethics Committee of Guilan University of Medical Sciences (IR.GUMS.REC.1402.582). All patients provided written informed consents, and All procedures were in accordance with the tenets of the Declaration of Helsinki and its later amendments [33].

Informed consent statement

Informed consent was obtained from all subjects involved in the study. The confidentiality of personal data was guaranteed, and all results were processed anonymously. Participants are assured that the information of the individuals will not be disclosed and the results will be announced only for scientific principles without the names of individuals

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Conflicts of interest

There are no conflicts of interest.

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Tables

Table 1. Sociodemographic characteristic of hemodialysis patients (*n* = 200)

Characteristic		Mean ± SD or Frequency (%)
Age (years)		59.63 (13.04)
Gender	Male	122 (61.0%)
	Female	78 (39.0%)
Marital status	Single	18 (9.0%)
	Married	165 (82.5%)
	Divorced	4 (2.0%)
	Widowed	13 (6.5%)
Education	Basic literacy	63 (31.5%)
	High school	91 (45.5%)
	Diploma	16 (8.0%)
	Higher education	30 (15.0%)
Occupation	Unemployed	87 (43.5%)
	Employed	34 (17.0%)
	Retired	79 (39.5%)
Socio-economic status	Low	48 (24.0%)
	Moderate	88 (44.0%)
	High	64 (32.0%)

SD: Standard deviation

Table 2. Descriptive statistics of the primary outcome and key variables (N = 200)

Variable	Mean ± SD	Median (IQR)
Treatment adherence	1011.12±138.81	1050 (925-1100)
Session attendance	541.62 ± 101.81	600 (500-600)
Medication compliance	187.25 ± 26.04	200 (100-200)
Fluid restriction	130.50 ± 533.23	150 (100-150)
Dietary adherence	146.50 ± 49.49	150 (150-200)
Perceived Social Support	75.86 ± 6.40	78 (72-80)
Family support	26.86 ± 2.05	28 (26-28)
Friends support	26.63 ± 2.47	28 (25.25-28)
Significant others	22.36 ± 3.86	24 (20-24)
Depression (PHQ-9)	2.56± 2.36	2 (1-3)
Self-efficacy (GSE-10 (	26.36± 8.31	26 (20-33)

IQR: Interquartile Range.

Table 3. Predictors of treatment adherence in hemodialysis patients (*n* = 200)

Predictor	B (SE)	P
Block 1: Demographic variables		
Age (years)	2.07 (0.96)	0.033*
Gender (Female vs Male)	57.13 (28.66)	0.048*
Marital Status		
Married vs Single	-25.61 (37.57)	0.496
Divorced vs Single	28.91 (80.16)	0.719
Widowed vs Single	-51.28 (53.97)	0.343
Education		
High school vs Basic literacy	-23.26 (24.80)	0.350
Diploma vs Basic literacy	22.85 (40.55)	0.574
Higher education vs Basic literacy	-2.06 (36.59)	0.955
Occupation		
Employed vs Unemployed	21.01 (32.99)	0.525
Retired vs Unemployed	49.24 (31.37)	0.118
Socio-economic status		
Moderate vs Low	20.05 (26.43)	0.449
High vs Low	-28.43 (28.34)	0.317
Model characteristics	$R^2 = 0.136$, $F_{(12,187)} = 2.46$, $p = 0.005$	
Block 2: Independent variables		
Perceived social support	4.22 (1.41)	0.003*
Depression symptoms	-20.13 (3.82)	< 0.001*
Self-efficacy	2.01 (1.11)	0.072
Model characteristics	F change $_{(3, 184)} = 20.21$, $p < 0.001$, $R^2 = 0.350$, R^2 change = 0.214	

B: Regression coefficient SE: Standard error R^2: Coefficient of Determination

Figures

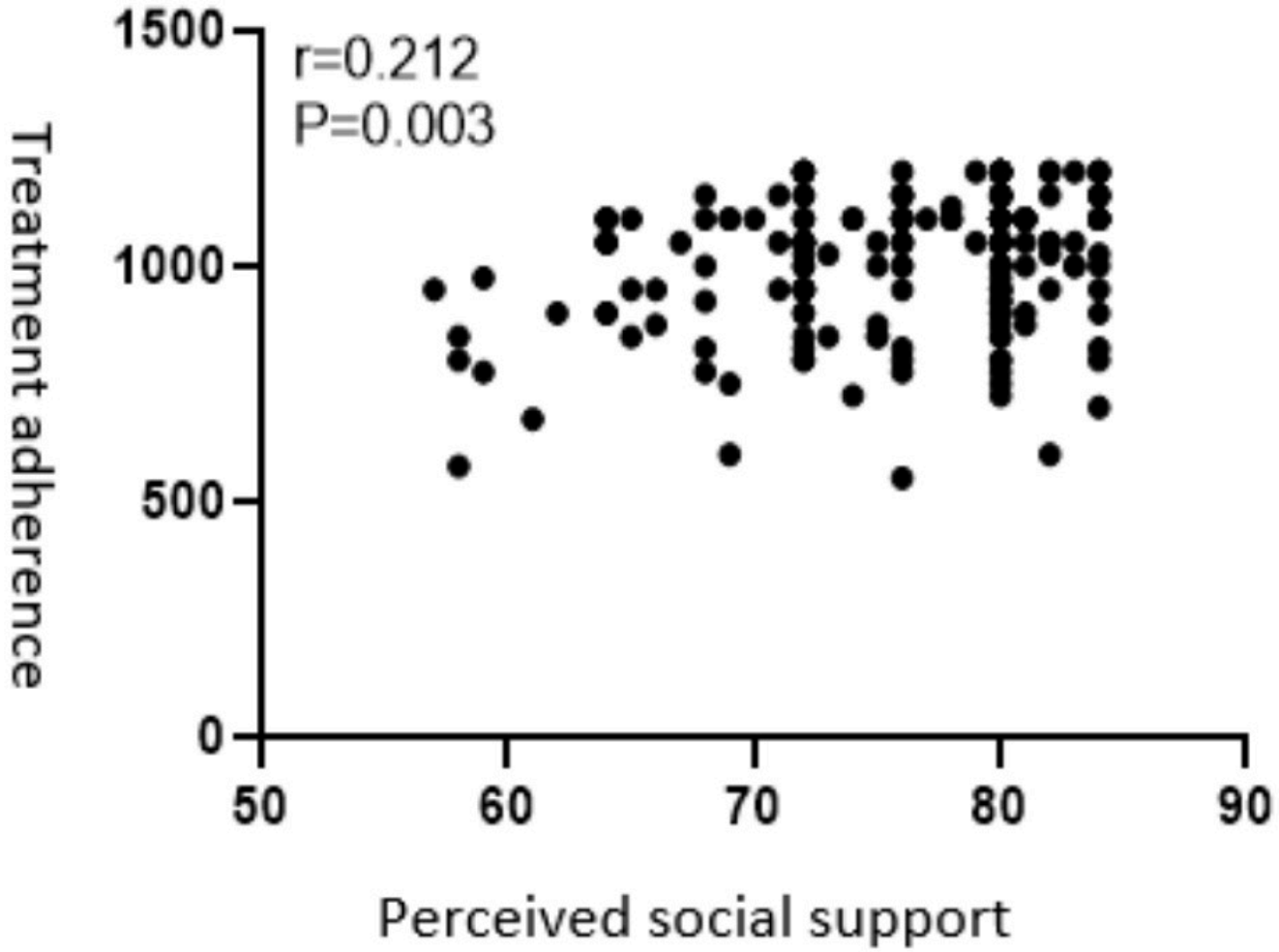


Figure 1

Correlation between Perceived Social Support and Treatment Adherence in Hemodialysis Patients

Supplementary Files

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- GraphicalAbstract.png