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The Effectiveness of Cognitive Behavioral Therapy on Adherence to Treatment and Quality of Life in Hemodialysis Patients

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A B S T R A C T

The present study aimed to investigate the effectiveness of cognitive-behavioral therapy (CBT) on treatment adherence and quality of life in hemodialysis patients. This research employed a quasi-experimental design with pre-test–post-test and a control group. The statistical population consisted of all hemodialysis patients who attended the dialysis center, from whom 30 individuals were selected through convenience sampling and randomly assigned to experimental and control groups. Research instruments included standardized questionnaires assessing treatment adherence and quality of life. The experimental group received CBT in multiple sessions, while the control group did not receive any intervention. Data were analyzed using appropriate statistical tests, and the results indicated that CBT significantly improved treatment adherence and enhanced quality of life among hemodialysis patients. These findings suggest that CBT can serve as an effective psychological intervention for improving both medical and psychosocial outcomes in this population.

Keywords: *Cognitive-behavioral therapy, treatment adherence, hemodialysis, quality of life*

1. Introduction

Chronic kidney disease (CKD) is one of the most common and significant non-communicable diseases, characterized by a gradual and irreversible decline in kidney function that seriously affects patients' quality of life. According to global estimates, approximately 2–3% of the world's population is affected by this condition, and the prevalence is increasing in Iran as well. The most common treatment for advanced kidney failure is hemodialysis, which, although it prolongs patients' survival, does not fully replace kidney function and cannot assume all its physiological responsibilities (Shayanfar, 2023). When

hemodialysis treatment begins, several changes occur in patients' lives, the most common being increased fatigue, caused by both physical weakness and psychological complications. Physical issues such as fatigue and impaired functional capacity, alongside the psychological burden of the disease and its treatment, may persist for years (McCall et al., 2025).

Treatment adherence is one of the key concerns in chronic diseases and plays a vital role in disease management (Yarns et al., 2024). Adherence to treatment refers to patients' compliance with dietary regimens, medications, fluid restrictions, and lifestyle modifications recommended by healthcare providers (Salimi et al., 2017). Many patients with chronic conditions fail to adhere to prescribed treatments, and adherence rates in Iranian populations have been reported to range from 12.7% to 86.3% (Farahani, 2024). In fact, most patients with end-stage CKD show poor treatment adherence. Insufficient knowledge, awareness, and follow-up regarding therapeutic regimens often lead to irreversible consequences.

One of the major challenges for these patients is strictly following dietary and fluid restrictions and taking prescribed medications. Non-adherence, such as not using phosphate binders, can result in elevated serum phosphate, secondary hyperparathyroidism, and vascular calcification. Similarly, non-compliance with dietary recommendations, excessive weight gain between dialysis sessions, and irregular attendance or shortened dialysis duration significantly affect prognosis (Salimi et al., 2017). Non-adherence is further complicated by polypharmacy, as patients undergoing hemodialysis are typically prescribed 6–10 medications daily (Azargoon, 2022). The main themes of non-adherence include patient-related factors (e.g., psychological aspects, lack of engagement, poor awareness of drug benefits and restrictions, financial difficulties), medication-related factors (e.g., challenges in administration), and healthcare system-related factors (e.g., shortage of nurses, rigid regulations, insufficient social support) (Naeimi, 2024).

The challenges of hemodialysis also create profound changes in patients' quality of life, including decreased efficiency, reduced physical activity, fatigue, weakness, and frequent muscle cramps, which may ultimately lead to hopelessness about the future, immobility, diminished self-confidence, and social isolation. Studies confirm that CKD strongly impacts the quality of life of affected individuals. Potential complications such as hypotension, painful muscle cramps, bleeding, air embolism, chest pain, and decreased consciousness contribute to poor quality of life in these patients. Moreover, CKD disrupts physical, social, and economic domains, altering patients' perceptions of their health and quality of life (Dehghani, 2016).

Among psychological interventions studied in relation to treatment adherence and quality of life, cognitive-behavioral therapy (CBT) has gained attention. CBT focuses on modifying patients' cognitions and behaviors, promoting lifestyle changes, and reshaping maladaptive thought patterns to improve both physical and psychological well-being (Nasirzadeh, 2024). Psychological interventions based on CBT models may help adjust maladaptive beliefs and enhance treatment participation, as numerous studies have demonstrated that CBT fosters effective coping strategies and reduces maladaptive ones. Given the emotional burden of dialysis and the associated mood disturbances, techniques aimed at releasing mental rumination, managing emotions, and reducing distress can play a crucial role in mental health and quality of life improvement (Ghaemi, 2018).

Overall, few studies have investigated the application of CBT in the psychotherapy of hemodialysis patients, and to date, no study has specifically examined the effectiveness of CBT on both treatment adherence and quality of life simultaneously. Therefore, the present study was conducted to evaluate the effectiveness of cognitive-behavioral therapy on treatment adherence and quality of life among patients undergoing hemodialysis.

2. Methods and Materials

2.1. Study Design and Participants

This study employed a quasi-experimental design with a pre-test–post-test and one-month follow-up, including a control group. The statistical population comprised all hemodialysis patients referred to the dialysis unit of Shahid Labbafinejad Hospital, Tehran, in 2024. Based on Cohen's table and considering a test power of 0.80, an effect size of 0.35, and a significance level of 0.05, the sample size was estimated at 30 participants. Samples were selected through purposive sampling and randomly assigned into two groups (one experimental group and one control group). The experimental group received cognitive-behavioral therapy (CBT), while the control group received no intervention. Research instruments were administered in three stages: pre-test, post-test, and one-month follow-up for both groups.

Inclusion criteria consisted of being diagnosed with kidney failure under hemodialysis, age between 25 and 65 years, having at least a middle-school education, providing informed consent, and absence of severe psychiatric

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disorders or substance abuse. Exclusion criteria included absence from more than two sessions, unwillingness to continue participation, and loss of eligibility criteria.

2.2. Measures

Self-Report Treatment Adherence Questionnaire for End-Stage Renal Disease Patients: The treatment adherence questionnaire developed by Kim (2010) consists of 46 items across five main sections: (1) general information (5 items), (2) attendance at hemodialysis sessions (14 items), (3) medication adherence (9 items), (4) fluid restriction (10 items), and (5) dietary restriction (8 items). The total treatment adherence score is obtained from the sum of these five sections, ranging between 0 and 1200. Responses are rated on a five-point Likert scale from 1 (non-adherence) to 5 (complete adherence). Higher scores indicate greater adherence to treatment. According to the developer's instructions, one standard deviation above and below the mean is considered moderate adherence; scores below are classified as poor adherence, and scores above as high adherence. The validity and reliability of this questionnaire were confirmed in an Iranian sample by Rafi'i Vardanjani and Shafiei (2017), reporting a content validity index of 0.98, which indicates strong psychometric quality (Rafiei Vardanjani & Shafiei, 2017).

Kidney Disease Quality of Life Questionnaire (KDQOL): The Kidney Disease Quality of Life (KDQOL) questionnaire was developed by Hayes et al. in 1994 and consists of 79 items designed to measure quality of life in patients with kidney disease. It includes two subscales: disease-specific health measures (symptoms and problems, effects of kidney disease, burden of kidney disease, work status, cognitive function, quality of social interactions, sexual function, sleep, social support, encouragement by dialysis staff, patient satisfaction, and overall health rating), and general health measures (physical functioning, role limitations due to physical problems, bodily pain, general health, vitality, social functioning, role limitations due to emotional problems, and mental health). Scoring follows a standardized procedure, with scores for each dimension ranging from 0 to 100, where higher scores indicate better quality of life. For example, the physical functioning subscale includes 10 questions on daily activities, with three response options: severely limited (0), somewhat limited (50), and not limited at all (100). The instrument was first translated into Persian by Fardinmehr, with face and content validity confirmed. Its psychometric properties have been validated in Iranian samples (Norouzi et al., 2021); Rahimi et al., 2016), reporting internal consistency reliability coefficients ranging from 0.61 to 0.90 and split-half reliability of r = 0.90.

2.3. Intervention

The cognitive behavioral therapy (CBT) intervention was adapted from Young (2003) and delivered across eight structured sessions, each lasting 90 minutes, aimed at helping participants recognize and modify maladaptive thought patterns and behaviors. The first session introduced the study, explained the CBT model and program objectives, reviewed confidentiality and informed consent, and conducted pre-test assessments. The second session trained participants to distinguish and link thoughts, emotions, and behaviors, recognize automatic negative thoughts, and practice role-playing with attention to verbal and nonverbal cues, supported by a thought–emotion–behavior worksheet as homework. Session three focused on identifying cognitive distortions, developing positive self-talk, improving assertive communication, and practicing problem-solving for interpersonal conflicts. In session four, participants engaged in cognitive restructuring through identifying, evaluating, modifying, and assessing the effects of maladaptive thoughts, complemented by imagery techniques, cognitive reappraisal, and thought-stopping practice. Session five emphasized stress management, coping strategies, and relaxation training, particularly progressive muscle relaxation. In session six, participants worked on enhancing self-esteem, evaluating self-concept, and learning anger management strategies. Session seven targeted assertiveness training by differentiating passive, aggressive, and assertive behaviors, while reinforcing self-talk to increase assertiveness. The final session consolidated learned CBT techniques, promoted coping skill generalization to real-life challenges, reviewed emotional awareness, and concluded with a post-test to evaluate progress.

2.4. Data Analysis

Data were analyzed using mixed-design ANOVA with SPSS version 26.

3. Findings and Results

The mean age of participants in the CBT group and the control group was 36.8 ± 7.01 years, with no statistically

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significant difference between the two groups. Therefore, the two groups were homogeneous in terms of age.

Table 1

Comparison of Means and Standard Deviations of Variables

Variable	Group	Pre-test (Mean ± SD)	Post-test (Mean ± SD)	Follow-up (Mean ± SD)
Treatment adherence	CBT group	77.6 ± 6.63	99.7 ± 4.69	69.2 ± 5.03
	Control group	63.0 ± 4.59	62.9 ± 4.46	62.6 ± 4.71
Quality of life	CBT group	37.9 ± 6.85	39.3 ± 7.32	52.4 ± 6.12
	Control group	39.3 ± 7.32	39.9 ± 7.72	39.4 ± 7.46

As shown in Table 1, the mean scores of treatment adherence and quality of life did not differ significantly between groups at baseline. However, after the intervention, the experimental group showed significant improvement compared with the control group, and these differences were sustained at follow-up. Normality of variables was confirmed using the Shapiro–Wilk test, with significance levels above 0.05 for most subscales.

Box's test of equality of covariance matrices yielded a significant result (Box's M = 39.1, F = 5.76, df1 = 6, df2 = 5680.3, p = 0.001), indicating a violation of the homogeneity of covariance matrices assumption; however, because the group sizes were equal, this violation was considered acceptable. In contrast, Levene's test of equality of variances showed no significant differences in variance for the pre-test (F = 1.39, df1 = 1, df2 = 28, p = 0.247), post-test (F = 0.015, df1 = 1, df2 = 28, p = 0.903), and follow-up (F = 0.016, df1 = 1, df2 = 28, p = 0.901) measures, indicating homogeneity of variances across all variables.

Table 2

Multivariate Analysis of Variance (MANOVA)

Test statistic	Value	F	df1	df2	Sig.	Partial η^2
Pillai's Trace	0.860	82.6	2	27	0.001	0.860
Wilks' Lambda	0.140	82.6	2	27	0.001	0.860
Hotelling's Trace	6.12	82.6	2	27	0.001	0.860
Roy's Largest Root	6.12	82.6	2	27	0.001	0.860

With pre-test scores controlled, Wilks' Lambda was significant ($\Lambda = 0.140$, F = 82.6, p = 0.001, $\eta^2 = 0.860$). This indicates a significant difference between the experimental and control groups on the dependent variables, with 86% of the variance explained by group membership.

Table 3

Univariate ANOVA Results

Source	SS	df	MS	F	p	η^2
Treatment adherence						
Group (between)	372.1	1	372.1	6.06	0.020	0.178
Error	1717.06	28	61.3	–	–	–
Time (within)	2304.2	1.07	2284.2	180.9	0.001	0.866
Time × Group	247.06	1.07	256.07	163.1	0.001	0.853
Error (within)	47.06	29.9	1.57	–	–	–
Quality of life						
Group (between)	1292.01	1	1292.01	11.04	0.002	0.283
Error	3274.9	28	116.9	–	–	–
Time (within)	793.4	1.08	734.4	34.6	0.001	0.553
Time × Group	728.02	1.08	673.8	31.7	0.001	0.532
Error (within)	641.1	30.2	21.1	–	–	–

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The repeated-measures ANOVA (Greenhouse–Geisser correction) showed a significant main effect of time for both treatment adherence ($F = 180.9$, $p = 0.001$, $\eta^2 = 0.866$) and quality of life ($F = 34.6$, $p = 0.001$, $\eta^2 = 0.553$). Significant interaction effects were also found between group and time for both outcomes, indicating that changes across time differed significantly between groups.

Table 4

Pairwise Comparisons (Within-Subjects Contrasts)

Variable	Comparison	SS	df	MS	F	p	η^2
Treatment adherence	Pre-test vs Post-test	228.1	1	228.1	174.8	0.001	0.862
	Post-test vs Follow-up	76.05	1	76.05	202.1	0.001	0.878
Group × Time	Pre-test vs Post-test	212.8	1	212.8	163.1	0.001	0.853
	Post-test vs Follow-up	61.2	1	61.2	162.8	0.001	0.853
Quality of life	Pre-test vs Post-test	152.2	1	152.2	131.6	0.001	0.542
	Post-test vs Follow-up	271.3	1	271.3	242.0	0.001	0.601
Group × Time	Pre-test vs Post-test	546.01	1	546.01	133.1	0.001	0.542
	Post-test vs Follow-up	182.01	1	182.01	328.0	0.001	0.503

Pairwise comparisons revealed significant improvements in treatment adherence and quality of life from pre-test to post-test, with effects maintained at follow-up in the experimental group. No significant changes were observed in the control group.

The findings demonstrate that CBT significantly improved treatment adherence and quality of life among hemodialysis patients. Post-test scores in the CBT group increased sharply compared to baseline, and these improvements were sustained at follow-up. In contrast, the control group showed no significant changes across time.

4. Discussion and Conclusion

The present study aimed to evaluate the effectiveness of cognitive–behavioral therapy (CBT) on treatment adherence and quality of life in hemodialysis patients. Findings revealed that CBT significantly improved both treatment adherence and quality of life compared to the control group, and these effects were sustained at follow-up.

A review of previous research, both domestic and international, supports these findings. Farahani et al. (2023) reported that CBT enhanced coping strategies and self-efficacy, ultimately facilitating adherence to prescribed regimens (Farahani, 2024). Similarly, Amini-Sadr (2023) demonstrated that CBT interventions, by modifying patients' attitudes toward treatment and increasing perceived control, improved self-care behaviors in individuals with chronic pain (Amini Sadr et al., 2022). In international studies, Sarneholm et al. (2025) confirmed CBT's effectiveness in improving adherence among patients with atrial fibrillation, attributing the results to reduced negative automatic thoughts and shifts in illness perception (Särnholm et al., 2023). Garke et al. (2025) also emphasized the role of CBT in stress management and restructuring dysfunctional cognitions, thereby increasing motivation for treatment continuation (Garke et al., 2025). This convergence of findings highlights the potential of CBT to strengthen adherence through cognitive, emotional, and behavioral processes.

The effectiveness of CBT in enhancing treatment adherence can be explained through cognitive restructuring. By identifying and challenging maladaptive beliefs (e.g., "treatment is useless" or "I cannot comply with this regimen"), CBT facilitates the development of more adaptive and empowering cognitions (Farahani, 2024). These changes promote patients' recognition of the necessity and value of treatment, while fostering self-efficacy. Sarneholm et al. (2025) similarly showed that cognitive reappraisal is a strong predictor of long-term treatment adherence in cardiac patients (Särnholm et al., 2023). Furthermore, CBT provides patients with problem-solving skills to overcome practical barriers such as time management for dialysis sessions or dietary restrictions, which helps sustain adherence (Amini Sadr et al., 2022).

Chronic illnesses often lead to physical and emotional fatigue, contributing to decreased adherence. CBT addresses this by reducing perceived stress, teaching relaxation techniques, and promoting cognitive restructuring (Farahani, 2024). Garke et al. (2025) found that reductions in stress not only improved mental health but also increased willingness to follow treatment regimens (Garke et al., 2025). The present findings align with this model, as patients in the CBT group demonstrated greater adherence over time.

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Beyond adherence, CBT significantly improved patients' quality of life. Consistent with previous research, CBT has been shown to enhance psychological and social well-being among chronic illness populations (Amini Sadr et al., 2022; Nouri-Saeid et al., 2022). In international studies, Garke et al. (2023) and Sarneholm et al. (2022) confirmed that CBT reduces psychological distress, strengthens adaptive coping, and improves physical, social, and emotional domains of quality of life in patients with chronic kidney disease (Garke et al., 2025; Särnholm et al., 2023).

These effects may be attributed to CBT's capacity to restructure maladaptive cognitions, thereby fostering more positive illness perceptions and future outlooks (Amini Sadr et al., 2022). Moreover, CBT's focus on addressing anxiety and depression—two of the strongest predictors of poor quality of life in dialysis patients—further enhances its utility (Nouri-Saeid et al., 2022). By replacing avoidance or denial with active coping, CBT empowers patients with a stronger sense of control, which is a central determinant of quality of life. Importantly, CBT also emphasizes interpersonal skills, such as assertiveness and conflict resolution, which facilitate stronger social relationships, further contributing to enhanced well-being (Särnholm et al., 2023).

Finally, CBT interventions equip patients with enduring cognitive and behavioral skills that are transferable to new situations, ensuring long-term sustainability of treatment effects (Garke et al., 2025). For hemodialysis patients, who face ongoing and intensive treatment, this durability is particularly valuable.

Despite its strengths, the study had several limitations. The sample was limited to patients from a single hospital in a specific timeframe, which restricts generalizability. The relatively small sample size (n = 45) may have reduced statistical power for subgroup analyses. The quasi-experimental design, along with incomplete control of potential confounders (e.g., medication effects, social support), may limit causal inferences. Furthermore, the use of pre-test measures could have influenced post-test responses. The one-month follow-up period restricted evaluation of long-term outcomes, and variability in patients' clinical conditions may also have influenced adherence and quality of life.

Overall, this study provides evidence that CBT is an effective intervention for improving treatment adherence and quality of life in hemodialysis patients. By targeting cognitive distortions, reducing stress, and enhancing coping strategies, CBT offers a comprehensive framework to address the psychological and behavioral challenges associated with chronic kidney disease. Integration of CBT into routine care for hemodialysis patients is recommended, alongside larger-scale studies with longer follow-up periods to further establish its long-term efficacy and generalizability.

Authors' Contributions

Authors contributed equally to this article.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

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Declaration of Interest

The authors report no conflict of interest.

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Ethical Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants.

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