



The impact of teach-back training method (TBTM) on treatment adherence in hemodialysis patients: a randomized controlled trial

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Introduction: Ensuring adherence to treatment is vital for individuals undergoing haemodialysis. The demanding treatment frequency and duration often present challenges for patients in maintaining a consistent routine. Non-adherence can result in adverse health effects and an increased risk of hospitalization. This study aimed to evaluate the impact of teach-back training on treatment adherence among haemodialysis patients.

Method: A randomized controlled trial involved 60 end-stage kidney disease patients undergoing haemodialysis. Participants were randomly assigned to either the control or intervention group. Data were collected using the End-Stage Renal Disease Adherence Questionnaire (ESRD-AQ), assessing adherence in four dimensions: HD incidence, medication use, fluid restriction, and diet recommendations. The intervention group received feedback-based training on diet and fluid restriction during four 45–60-min sessions, while the control group received regular indoor training.

Result: Following the intervention, significant differences in mean scores for HD frequency, medication use, and fluid restriction were observed between the two groups ($P < 0.001$). However, there was no significant difference in the mean score for food recommendations ($P = 0.108$).

Conclusion: The teach-back training method (TBTM) is an effective communication strategy that enhances treatment adherence in haemodialysis patients. This intervention has the potential to improve patient outcomes and overall quality of life by simplifying medical information and encouraging patient engagement.

Keywords: adherence, education, haemodialysis, nurse, teach-back training

Introduction

Haemodialysis plays a crucial role in the treatment of patients with end-stage renal disease^[1]. However, adherence to the haemodialysis regimen can be challenging due to its complexity and the presence of comorbidities among patients^[2]. Non-adherence to haemodialysis treatment has serious consequences, including increased morbidity, mortality, and hospitalizations^[3].

Recognizing the significance of treatment adherence in haemodialysis patients^[2], it becomes imperative to identify interventions that can enhance adherence and ultimately improve patient outcomes^[4,5]. Effective strategies may involve patient

HIGHLIGHTS

- Haemodialysis plays a crucial role in the treatment of patients with end-stage renal disease.
- Non-adherence to the prescribed regimen can lead to adverse health effects and an increased risk of hospitalization.
- One promising intervention is the teach-back method.

education on the benefits and risks of treatment, setting realistic goals, and providing supportive resources such as counselling and peer support groups^[6]. Building strong patient-provider relationships and involving patients in their care also contribute to adherence promotion^[7].

One promising intervention is the teach-back method^[8], which is a communication strategy involving the explanation of medical information to patients using simple language, followed by patients explaining the information back in their own words. This approach ensures patient comprehension and helps identify areas of confusion, leading to improved patient education and treatment adherence^[9].

The importance of family participation in improving treatment adherence among haemodialysis patients is increasingly recognized^[10]. Family members can offer emotional, practical, and informational support to patients, thereby enhancing their motivation to adhere to the treatment regimen^[11]. The use of the teach-back method, with family involvement, proves to be an effective intervention^[9]. Family members assist in facilitating patient understanding by rephrasing or clarifying complex

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information^[12]. Moreover, they provide emotional support, fostering a sense of accountability and motivation for treatment adherence^[10]. Additionally, family participation in the teach-back process promotes shared decision-making among patients, family members, and healthcare providers, enhancing patient autonomy and engagement in the treatment process^[12].

This study aims to investigate the impact of the teach-back training method (TBTM) on adherence to treatment in haemodialysis patients.

Methods

Research design

Study design

To achieve the research goals, a parallel, randomized controlled trial was carried out, with a single-blinded approach. The study followed the CONSORT checklist, which guarantees the thorough and comprehensive reporting of this randomized controlled trial^[13] (see Additional file).

Participants

The research was approved by the Faculty Research Committee and the Ethics Committee of Urmia University of Medical Sciences (ethics number: IR.UMSU.REC.1398.420). Initially, the researcher received permission from relevant authorities to conduct the study at temporary accommodations for COVID-19 patients in Urmia. The inclusion criteria for participants were a diagnosis of ESKD, a minimum haemodialysis duration of three and a half hours, receiving haemodialysis treatment, being between 18 and 65 years old, willing to participate, not having certain chronic conditions, not using psychoactive substances, and having no significant cognitive impairment. The exclusion criteria included severe illness requiring intensive care, patient instability, discharge with personal consent or death, and undergoing non-routine procedures.

The sample size was determined based on Ghanbari *et al.*'s^[14] study, with a 99% confidence level and 95% statistical power. Through targeted sampling, 60 eligible participants were recruited and randomly allocated to the control group (30 participants) and the intervention group (30 participants). The sample size of 25 participants per group was initially calculated using the relevant formula for comparing means between two groups, with an extra 20% allowance for potential sample loss, leading to a total of 30 participants in each group.

$$n = \frac{(z_{\alpha/2} + z_{\beta})^2 \times (s_1^2 + s_2^2)}{(\bar{x}_1 - \bar{x}_2)^2} = \frac{(2/575 + 1/96)^2 \times (77/13^2 + 197/95^2)}{(1123/33 - 931/66)^2} = 25$$

The sampling took place between September 11th and 21 November 2022. Among 70 eligible patients, seven declined to participate, two did not meet the inclusion criteria, and one was transferred to another health facility due to underlying health conditions. The flow diagram illustrating the enrolment of subjects into the study groups can be found in Figure 1.

Data collection

The data collection instruments used in this study included a demographic survey and the End-Stage Renal Disease Adherence Questionnaire (ESRD-AQ). The demographic survey gathered

information on age, gender, education, marital status, occupation, income, and duration of haemodialysis.

The ESRD-AQ comprises 46 self-assessment items divided into four sections, evaluating medication adherence across four dimensions: haemodialysis attendance, medication use, fluid restriction, and dietary recommendations. The initial part captures patient data on ESRD and renal replacement therapy (RRT) history (5 items), while the subsequent sections assess adherence to HD treatment (14 items), medications (9 items), fluid restrictions (10 items), and dietary recommendations (8 items). The final sections directly evaluate adherence behaviours and patients' understanding and perspectives on treatment. Responses in the ESRD-AQ include Likert scales, multiple-choice, and "yes/no" formats. The total score ranges from 0 to 1200, with a higher score indicating greater adherence^[15]. The instrument's reliability was confirmed by Raffie *et al.*^[16] using the Cronbach alpha coefficient ($\alpha=0.91$), and the test-retest reliability coefficient was calculated as 0.85.

Intervention

After gaining approval from the Faculty of Nursing and Midwifery and obtaining necessary clearances from the Vice-Rector for Science and the University's Ethics Committee (Code of Ethics IR.UMSU.REC.1398.420), the researcher informed the scientific community. Patients were randomly allocated to either the intervention group or the control group using a sealed envelope system, where 60 cards were prepared, half labelled A (intervention group) and the other half labelled B (control group). After shuffling the cards, each patient randomly selected one, determining their group assignment. Ahead of the intervention, the researcher explained the study's aims, procedures, and confidentiality to the patients in clear and understandable language. All patients in both the intervention and control groups provided informed consent to take part in the study.

In the intervention group, patients participated in in-person educational sessions alongside a family member who played a vital role in the patient's haemodialysis care. They were provided with a clear and easily understandable interpretation of a structured educational package, ensuring a more precise representation of the intervention approach, as opposed to a generic approach. Each patient in the intervention group attended a total of four sessions, lasting 45–60 min each, with two sessions held weekly between their haemodialysis sessions. If a patient did not fully grasp the content within a 60-min session, additional training was provided to ensure their understanding. The intervention adhered to the principles of the 5-step method, using simple and understandable language without complex medical terminology. After each session, the patient was asked to recap the information in their own words to ensure understanding. Any misunderstandings or incorrect responses were identified and corrected, and the patient was further questioned to confirm their understanding of the material taught. The educational sessions covered the following topics: the initial session focused on haemodialysis, its application, and associated side effects; the second session discussed medication treatments during haemodialysis; the third session addressed fluid intake restriction; and the fourth session provided dietary training. In the control group, patients received routine interventions provided by the department, mainly educational pamphlets and related training provided by haemodialysis department nurses due to limited personnel and

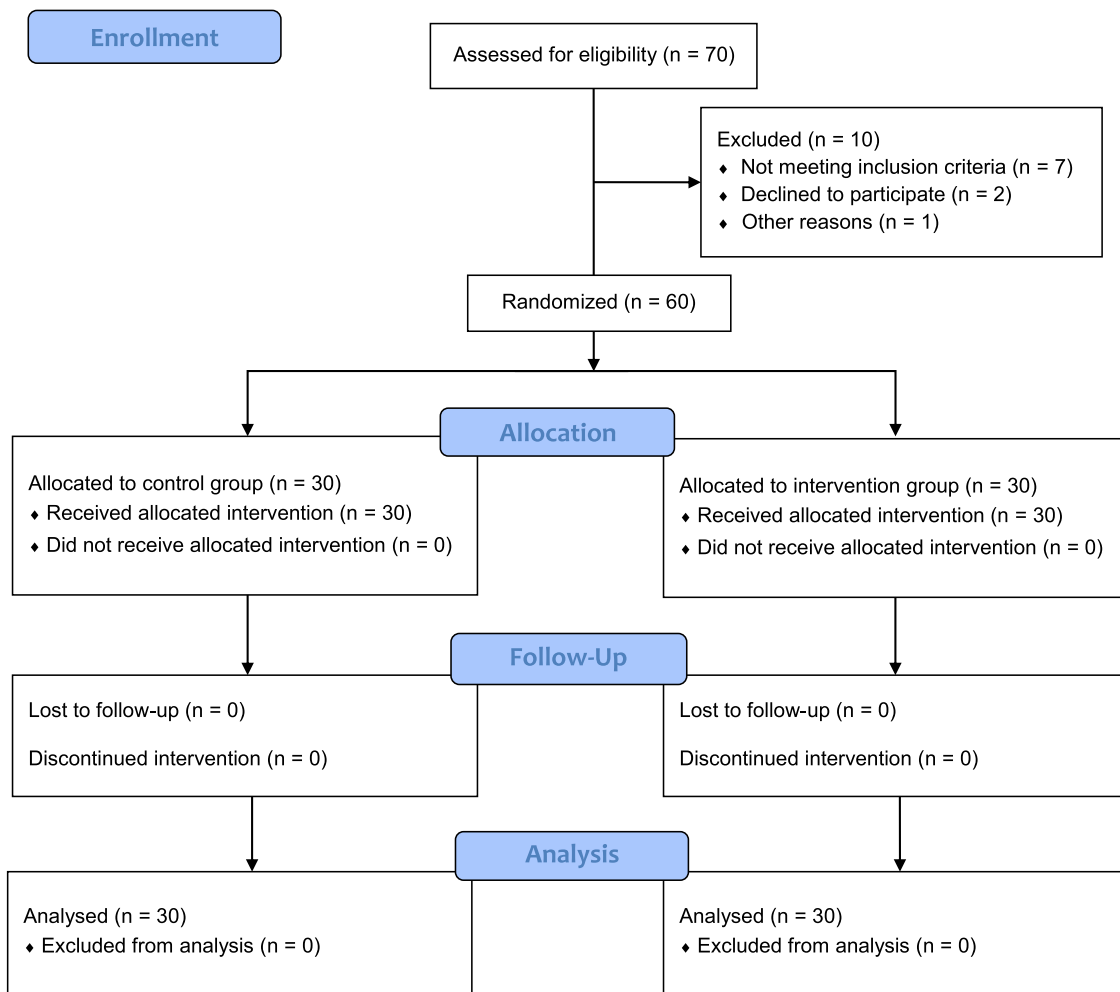


Figure 1. CONSORT flow diagram of study.

time. One month after the intervention, both the control and intervention groups completed the ESRD-AQ questionnaire.

Statistical analysis

The study aimed to compare the treatment adherence rates of patients who received TBTM with those who did not. To analyze the data, both the Kolmogorov–Smirnov test and independent-samples *t*-test were used in SPSS 26. The Kolmogorov–Smirnov test was used to assess the normality of the data distribution, determining if parametric or non-parametric tests were appropriate. Subsequently, the independent-samples *t*-test was implemented to compare the means of the two groups in terms of treatment adherence, while paired *t*-tests were used for within-group comparisons of normally distributed parameters. All of these analyses were performed by a researcher who was not aware of the data.

Results

Demographic characteristics

The findings indicated that in the control group, the average age of the patients was 43.90 ± 11.32 years, with a standard deviation. Among them, 14 individuals (46.7%) were female, and

16 individuals (53.3%) were male. In the intervention group, the mean age of the patients was 45.10 ± 12.39 years, with a standard deviation. In this group, (46.7%) were female, and 16 individuals (53.3%) were male. Regarding education level, in the control group, 14 patients (46.7%) had an elementary level of education, 14 patients (46.7%) had a high school level of education, and 2 individuals (6.7%) had a university education. In the intervention group, 12 patients (40%) had an elementary level of education, 15 patients (50%) had a high school level of education, and three patients (10%) had a university education. In both the control and intervention groups, 21 patients (70%) were employed, while 9 patients (30%) were unemployed. In terms of marital status, the majority in the control group (26 patients, 86.7%) were married, and the remaining (4 patients, 13.3%) were single. Similarly, in the intervention group, the majority (25 patients, 83.3%) were married, and the rest (5 patients, 16.7%) were single. Among the patients in the control group, 18 patients (60%) had an income equal to their expenses, 10 patients (33.3%) had an income lower than their expenses, and 2 patients (6.7%) had an income higher than their expenses. In the intervention group, 23 patients (76%) had an income equal to their expenses, 6 patients (20%) had an income lower than their expenses, and 1 patient (3.3%) had an income higher than their expenses. The mean duration of

Table 1
Comparison of demographic characteristics of the patients in the study groups

Variables	Groups		Result
	Control, n (%)	Intervention, n (%)	
Sex			
Male	16 (53.3)	16 (53.3)	<i>P</i> = 0.100
Female	14 (46.7)	14 (46.7)	
Education level			
Elementary	14 (46.7)	12 (40)	<i>P</i> = 0.658
High school	14 (46.7)	15 (50)	
University	2 (6.6)	3 (10)	
Marital status			
Single	4 (13.3)	5 (16.7)	<i>P</i> = 0.307
Married	26 (86.7)	25 (70)	
Occupation			
Unemployed	9 (30)	9 (30)	<i>P</i> = 0.100
Employed	21 (70)	21 (70)	
Income			
Less than the expenses	10 (33.3)	6 (20)	<i>P</i> = 0.799
Equal to the expenses	18 (60)	23 (76.7)	
More than the expenses	2 (6.7)	1 (3.3)	
	Mean ± SD	Mean ± SD	
Age	43.90 ± 11.32	45.10 ± 12.39	<i>P</i> = 0.511
Haemodialysis history	6.03 ± 4.38	6.09 ± 4.64	<i>P</i> = 0.298

haemodialysis in the control and intervention groups was 6.03 ± 4.38 and 6.09 ± 4.64 years, respectively. The results revealed no statistically significant differences between the two groups in terms of age, sex, education, marital status, occupation, income, and duration of haemodialysis (Table 1) (*P* > 0.05).

Treatment adherence and its dimensions

The independent *t*-test analysis demonstrated no statistically significant differences in the mean score of overall treatment adherence and its dimensions (HD attendance, medication use, fluid restrictions, and diet recommendations) between the two groups (*P* > 0.05) (Table 2). However, after the intervention, there was a statistically significant difference in the mean scores for overall treatment adherence and its dimensions, except for diet recommendations, between the two groups (*P* < 0.001) (Table 3). We believe that, this non-satisfactory between the

Table 2
Comparison of the treatment adherence mean scores in the study groups before the intervention

Variable	Group	N	Mean ± SD	Result
HD attendance	Intervention	30	456.4 ± 69.6	<i>*P</i> = 0.532
	Control	30	455.2 ± 75.4	
Medication use	Intervention	30	125.6 ± 31.3	<i>*P</i> = 0.719
	Control	30	124.8 ± 21.6	
Fluid restrictions	Intervention	30	120.5 ± 22.9	<i>*P</i> = 0.778
	Control	30	119.7 ± 25.53	
Diet recommendations	Intervention	30	105.6 ± 19.2	<i>*P</i> = 0.458
	Control	30	104.8 ± 28.8	
Total score	Intervention	30	812.7 ± 88.9	<i>*P</i> = 0.119
	Control	30	791.5 ± 70.4	

**Independent-samples t-test.*

Table 3
Comparison of the treatment adherence mean scores in the study groups after the intervention

Variable	Group	N	Mean ± SD	Result
HD attendance	Intervention	30	524.3 ± 40.3	<i>*P</i> < 0.001
	Control	30	449.7 ± 91.7	
Medication use	Intervention	30	151.4 ± 28.4	<i>*P</i> < 0.001
	Control	30	128.3 ± 21.4	
Fluid restrictions	Intervention	30	143.9 ± 22.1	<i>*P</i> < 0.001
	Control	30	105.5 ± 25.6	
Diet recommendations	Intervention	30	110.7 ± 14.9	<i>*P</i> = 0.119
	Control	30	106.6 ± 21.6	
Total score	Intervention	30	929.7 ± 41.4	<i>*P</i> < 0.001
	Control	30	789.2 ± 90.6	

**Independent-samples t-test.*

two groups after intervention probably was due to a lack of affordability. Additionally, factors such as personal motivation, taste preferences, and external temptations might have influenced the participants' ability to adhere to the recommended diet.

The results of the paired-samples *t*-test indicated that in the intervention group, the mean scores of overall treatment adherence and its dimensions (HD attendance, medication use, fluid restrictions, and diet recommendations) significantly differed after the intervention compared to before the intervention (*P* < 0.001). On the other hand, no significant differences were observed in the mean scores of overall treatment adherence and its dimensions in the control group after the intervention compared to before the intervention (*P* > 0.05) (Table 4).

Discussion

This study aimed to assess the impact of TBTM on treatment adherence among haemodialysis patients. The results revealed a significant difference in the mean scores of HD attendance, medication use, and fluid restrictions between the intervention and control groups following TBTM training. It was observed that TBTM training contributed to enhanced treatment adherence and improved dimensions such as HD attendance, medication use, and fluid restrictions in haemodialysis patients. However, no significant difference was found in the mean score of

Table 4
Comparison of the treatment adherence mean scores of the patients within the study groups before and after the intervention

Variable	Group	Before the intervention	After the intervention	Result
		mean ± SD	mean ± SD	
HD attendance	Intervention	456.4 ± 69.6	524.3 ± 40.3	<i>*P</i> < 0.001
	Control	455.2 ± 75.4	449.7 ± 91.7	
Medication use	Intervention	125.6 ± 31.3	151.4 ± 28.4	<i>*P</i> < 0.001
	Control	124.8 ± 21.6	128.3 ± 21.4	
Fluid restrictions	Intervention	120.5 ± 22.9	143.9 ± 22.1	<i>*P</i> < 0.001
	Control	119.7 ± 25.53	105.5 ± 25.6	
Diet recommendations	Intervention	105.6 ± 19.2	110.7 ± 14.9	<i>*P</i> < 0.001
	Control	104.8 ± 28.8	106.6 ± 21.6	
Total score	Intervention	812.7 ± 88.9	929.7 ± 41.4	<i>*P</i> < 0.001
	Control	791.5 ± 70.4	789.2 ± 90.6	

**Paired-samples t-test.*

diet recommendations between the two groups. The absence of significant differences in demographic characteristics between the groups suggests that the observed improvement in adherence in the intervention group, before and after the intervention, can be attributed to the positive effect of TBTM.

The TBTM is widely used to promote patient understanding and adherence to medical instructions. However, its effectiveness may vary depending on the patient population. In the case of haemodialysis patients who are relatively young, they may respond more positively to this method compared to older patients. Younger patients typically possess a higher level of cognitive function and are more likely to actively engage in the learning process. They may be more inclined to ask questions, seek clarification, and effectively utilize the TBTM to reinforce their understanding of the treatment. However, it is important to remember that individual patient characteristics and preferences should always be taken into consideration to ensure the best possible outcomes with TBTM (*).

In support of these findings, Zabolypour and colleagues demonstrated in their study that TBTM can enhance therapy adherence in hypertensive patients. Given that adherence to the treatment regimen is crucial for hypertension control, the utilization of TBTM may foster patient compliance and strengthen the patient-caregiver relationship^[9]. Another study conducted by Nasiri and colleagues investigated the impact of an apprenticeship program on self-care deficits in haemodialysis patients. The findings indicated that teacher-based self-care training can alleviate self-care gaps in the physical and psychological aspects among haemodialysis patients^[17]. Reyhani and colleagues conducted a clinical study to explore the effects of feedback training on self-efficacy and self-care in heart failure patients. The results demonstrated a significant increase in the mean self-efficacy scores of patients in the intervention group following the intervention, compared to those who received traditional group training^[18].

Ganbari *et al.*^[14] explored the effect of TBTM on adherence in dialysis patients with end-stage renal disease (ESRD) and found that TBTM can enhance adherence in the domains of haemodialysis, medication use, fluid restriction, and diet, with the exception of dietary advice. Similarly, Oshvandi and colleagues examined the impact of TBTM on self-care behaviours in patients with type 2 diabetes and reported that feedback-based self-care training can improve patient engagement and adherence to self-care activities. This intervention can enhance patients' knowledge, self-esteem, and performance in areas such as nutritional needs, physical activity, foot care, medication use, glycemic control, and smoking cessation, one month post-intervention^[18]. These findings align with the present study. Additionally, Mahmoudi Rad *et al.*^[19] investigated the effect of TBTM on foot care in patients with type 2 diabetes and found that the mean foot care score was significantly higher in the study group than in the control group at one and three months post-intervention, further supporting the current study's results.

However, it is important to acknowledge that some studies have reported results that contradict the findings of the present study. For instance, Kandula *et al.*^[20] examined the impact of TBTM on information retention in diabetic patients and found no significant effect on information retention. These discrepancies in results may be attributed to variations in the training methods employed, such as a combination of multimedia instruction and

apprenticeship training, as well as differences in the study populations.

Several limitations were identified in this study. Firstly, the short follow-up period was due to funding constraints, which may have limited the ability to assess long-term adherence. Secondly, the small sample size, with only one dialysis centre in the city of Urmia, could have influenced the results. Future research with larger sample sizes is recommended. Moreover, the use of convenience sampling in this study introduced a significant risk of selection bias, and alternative sampling techniques should be considered in future studies. Since this study was not conducted across multiple centres, the generalizability of the findings may be limited. Additionally, some patients' adherence may have been affected by missed scheduled HD sessions due to financial difficulties. Furthermore, variances in participants' mental and spiritual attributes, motivations, and personality traits may have influenced their perceptions, knowledge, and adherence to therapy. These limitations were beyond the control of the researchers.

Conclusion

In conclusion, the management of haemodialysis patients necessitates a family-centred approach that addresses the unique challenges to treatment adherence in this population. Healthcare providers should collaborate closely with patients and their families to comprehend their individual circumstances and develop tailored strategies to enhance adherence. TBTM represents a communication strategy that can enhance treatment adherence among haemodialysis patients. By simplifying medical information and promoting patient engagement, this intervention holds promise for improving patient outcomes and quality of life.

Ethical approval

Ethical approval for this study (Ethical Committee IR.UMSU. REC.1398.420) was provided by the Ethical Committee of Urmia University of medical sciences, Iran on 10 November 2021.

Consent

Written informed consent was obtained from the patient for publication of this study. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

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Author contribution

S.P. and J.R.: study concept, data collection, writing the paper and making the revision of the manuscript following the reviewer's instructions. L.A. and H.H.: study concept, reviewing and validating the manuscript's credibility.

Conflicts of interest disclosure

NA.

Research registration unique identifying number (UIN)

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Guarantor

Sonia Pazirfteh.

Data availability statement

The datasets generated during and/or analyzed during the current study are available upon reasonable request.

Provenance and peer review

Not commissioned, externally peer-reviewed.

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