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ORIGINAL RESEARCH

Adherence to Treatment Regimens Among End-Stage Renal Disease Patients: A Cross-Sectional Study

Fatima Sameer Belhmer[1], Mohammed Abdullah Al Amad[1], Mogahed H Albitahi[2], Fatma K Babattah[3]

[1]Yemen-Field Epidemiology Training Program, Ministry of Public Health and Population, Sana'a City, Yemen; [2]Nephrology and Dialysis Center, Thawra Tertiary Hospital, Sana'a City, Yemen; [3]Family Medicine Center, Hadramout University, Hadramout, Yemen

Correspondence: Fatima Sameer Belhmer, Email fatimabelhmer202@gmail.com

Purpose: Adherence to treatment regimens is crucial to enhance the clinical outcomes of patients with End-Stage Renal Disease (ESRD). In Yemen, there is a gap in information about this issue. Hence, this study aimed to assess the adherence and associated factors of ESRD patients to the four adherence domains, including HD session attendance, medication, dietary modification, and fluid management.

Patients and Methods: A descriptive cross-sectional study of ESRD patients was conducted. End-Stage Renal Disease Adherence Questionnaire (ESRD-AQ) was used to collect data through face-to-face interviews. The scoring system was used. The mean of the gained scores was calculated and divided by expected maximum scores and the resulting percentage was used to rank the level of adherence as good ≥ 83%, moderate ≥58- <83% and poor <58%). Non-parametric tests to assess the mean differences with selected variables at p-value <0.005.

Results: The overall (mean ±SD) scores of 393 patients for the four adherence domains (HD, medication, fluid restrictions, and dietary recommendations) were 933.5+210 indicating an overall moderate level of adherence. Good adherence to HD and moderate adherence to medication, diet and fluids were observed (88.5%, 76.7%, 61.9%, and 61.6%, respectively). Significantly higher mean scores among patients with urban residency (941.8 vs 869.4, p=0.03), HD duration < 5 years (949.2 vs 908.0, p=0.02), the overall perception of treatment (956.7 vs 653.3, p=<0.001), patients who had a perception of medication (942.0 vs 734.3, p=0.002), fluid restriction (958.9 vs 727.3, p=<0.001), and diet recommendations (969.8 vs 715.2, p=<0.001). Significantly lower mean scores were observed among patients who had not received counseling regarding the importance of dietary and fluid restriction (962.8 vs 920.5, p=0.02) and (965.6 vs 919.0, p=0.02, respectively).

Discussion: This study is the first in our country to provide baseline information on adherence toward different treatment domains and their associated factors among patients with ESRD. The adherence level among patients with ESRD was moderate in general and good for HD. There was a significant association between adherence and residency, HD duration, overall perception of treatment, perception of medication, fluid and dietary restrictions, and poor counseling. Regular counseling should be provided to enhance adherence levels. A multicenter study is recommended to assess the causal relationship between adherence and the factors affecting adherence.

Keywords: adherence, end stage renal disease, ESRD-AQ, hemodialysis, Yemen

Introduction

Chronic renal disease (CRD) is a progressive loss of kidney function that, if left untreated, may lead to kidney failure or end-stage renal disease (ESRD), which eventually leads to the need for renal replacement therapy (RRT), hemodialysis (HD) or transplantation.[1,2] CRD is a global public health concern, affecting more than 800 million people, or 10% of the total population affected.[3,4] Patients with ESRD who require RRT are estimated to be between 4.902 and 9.701 million, the majority of whom reside in countries with low-to-middle income (LMICs).[5]

ESRD can have unfavorable consequences for patients, their families, and society, including reduced quality of life, financial strain, and major life changes due to the chronic nature of the disease and its potentially fatal complications.[6] In addition, treatment requires a comprehensive regimen, including HD, appropriate medication, dietary modification and fluid restriction.[7]

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The effectiveness of treatment depends heavily on adherence or compliance to the treatment regimen according to the recommendations of the treating physician.[8,9] Adherence to therapeutic recommendations is defined as "the extent to which a person's attitude matches the agreed recommendations of a healthcare giver in terms of taking medications, following a recommended diet regimen, and/or carrying out lifestyle changes".[10] It can lead to improved clinical outcomes, while non-adherence may hurt the quality of life, increase the risk of hospitalization by 16%, and increase the risk of mortality by 20–25%.[11–13] Several studies have indicated that patients' general perception of the importance of adhering to treatment domains is related to adherence level enhancement, demonstrating the importance of counseling and educating HD patients about their treatment domains to improve therapeutic outcomes.[14]

CRD and ESRD prevalence data in the Eastern Mediterranean region (EMR) are scarce, which affects health planning for effective preventive and therapeutic measures, as are data on adherence to treatment regimens and associated factors with adherence. The incidence of ESRD in EMR is estimated to be 110–140 cases per million population.[15]

In Yemen, the World Health Organization estimated the total number of patients with ESRD undergoing dialysis to be 5200 in 2018, while the prevalence in 2019 was estimated to be 9.5/10,000 population.[16,17] However, no data regarding the adherence of these patients to their treatment regimens are available in Yemen. This study aimed to assess the level of adherence to treatment domains and its associated factors among patients with ESRD admitted to the Al Thawra Modern General Hospital.

Materials and Methods

Study Design and Setting

A facility-based study was conducted between September 12 and October 31, 2023, at the Urology and Nephrology Center of a tertiary public hospital (Al Thawra Hospital) in Sana'a City. All patients who underwent HD during the study period were eligible after providing verbal consent to participate in the study.

Study Population

Inclusion criteria: Patients with a confirmed diagnosis of ESRD who have underwent maintenance HD for at least 6 months and received dialysis at least twice two weekly.

Exclusion criteria: Patients undergoing HD for less than 6 months, those with advanced malignancy, those who had a psychiatric disease, those who were intellectually unable to answer questionnaires, and those who refused to participate were excluded.

Data Collection Tools and Procedures

Data were collected through face-to-face interviews using a semi-structured questionnaire adopted from the End-Stage Renal Disease Adherence Questionnaire (ESRD-AQ).[18] (Supplementary Figure 1). The questionnaire consists of four parts:

The first part includes patients' socio-demographic and clinical history. The second part includes five questions that cover RRT-related history. The third part includes six questions on adherence to treatment; three related to HD session attendance, and the others related to medications, fluid restriction, and diet recommendations. The fourth part includes eight questions on information for each perception and counseling items.[14,19]

Study Variables

Primary Outcome

Adherence to treatment reflects the behavior of patients toward compliance with different treatment domains included (HD, Medication, dietary recommendations, and fluid restriction).

Secondary Outcomes

Patients' perceptions toward the importance of following the recommended dialysis sessions, medication, fluid, and food, as well as the received counseling sessions.

Independent Variables

Socio-Demographic

Age, sex, marital status, place of residence, occupation, educational level, and family living status.

Clinical Variables

Comorbidity status, duration of HD treatment, kidney transplant, and history of peritoneal dialysis.

Measurements

Scoring subscales to assess adherence for each domain, overall adherence, perception, and counseling were based on previous studies[14,19.] The 5-point Likert scale was used to measure adherence to treatment, with a maximum score of 1200 (Supplementary Figure 2). Scores were then converted to percentages by dividing them by the maximum scores for each category and total adherence scores. The level of adherence was categorized as poor if the overall scores were <700 (<58%), moderate if they were between 700–999 (58–82%), and good if they were > 1000 (≥ 83%).

For the perception questions, the answers were categorized on Likert 5-point scale as (very important=5, important= 4, moderately important=3, little important = 2, and not important =1). Perception was then re-categorized as "good" for the answers 4 and 5 and "poor" for answers 1, 2, and 3. Similarly, for counseling questions, (the answers: every dialysis session, every week, every month, every 2 to 3 months, every 4 to 6 months) were categorized as "received counseling", while (never, rarely, irregularly, only once) were categorized as not-received.

Data Entry, Management and Analysis

Data were entered and analyzed using Epi Info version 7.2.4.0. Variables were categorized and coded as appropriate, and the mean ± standard deviation was used to summarize the continuous variables after checking for normality. Categorical variables were described as frequencies and percentages (%). Adherence levels were plotted against demographic and clinical variables to identify groups with less adherence to treatment regimens using the Mann–Whitney *U*-test with a confidence level of 95% and $p < 0.05$.

Ethical Consideration

Approval was obtained from the National Committee of Health and Medical Research at Ministry of Public Health and Population (MoPH&P) in the Republic of Yemen (Registration number: 6216–10/09/2023). Further permission to conduct the study was sought from the director of the Hospital. Methods were performed by the Declaration of Helsinki. Verbal consent was obtained from all participants along with the research committee's approval and confidentiality was maintained throughout the study.

Results

Of 480 patients, 393 (81.9%) responded to the questionnaire. The patient mean age was 45.0 + 17.4, and 62.9% were males, 81.9% were married, and 88.6% lived in urban areas. Most participants (92.1%) were unemployed or retired and 43.0% were illiterate. A total of (88.0%) were living with their families. Of them, 61.8% were under HD for <5 years and 80% were hypertensives while 16% had both hypertension and Diabetes mellitus (Table 1).

The overall (mean ± SD) adherence scores for the four items were 933.5 ± 210 or 77.8%, indicating a moderate level of adherence. The level of adherence to HD sessions was good (88.5%) and moderate for compliance with medication, diet, and fluid restriction (percentage scores=76.7, 61.9%, and 61.6%, respectively) (Table 2).

Most participants had a good perception toward the treatment domains, with the highest percentage for the dialysis schedule (98.7%). 95.9% had a good perception of following the medicine as schedule. Perception toward diet restriction was the lowest, with 85.8% of studied patients believing that important to watch the type of food taken daily. The perception of importance of fluid restriction was comparatively fair with 89.1% of the studied patients believing that it is important to adhere to restricted fluid intake (Table 3). For further details (Supplementary Table 1)

Table 1 Sociodemographic and Clinical Characteristics of ESRD patients at Al Thawra Modern General Hospital, Sana'a City, Yemen, 2023

Characteristics	Category	Number	Percentage
Age in years	Mean ±SD	45.0± 17.4	
Sex	Male	247	62.9
	Female	146	37.2
Living place	Urban	348	88.6
	Rural	45	11.5
Marital Status	Married	322	81.9
	Unmarried	71	18.0
Education	Educated	224	57.0
	Illiterate	169	43.0
Occupation	Employed	31	7.9
	Unemployed/retired	362	92.1
Living status	With family	364	88.0
	Alone	47	12.0
Transportation to the centre	Public transportation	330	88.6
	Private/others	45	11.4
Duration of HD	Mean ± SD	4.1±4.5	
Comorbidities	Hypertension	346	80.0
	Diabetes	64	16.3
	Hypertension and diabetes	61	16.0
Case management	Kidney transplant	37	9.4
	Peritoneal dialysis	8	2.0

Abbreviation: ESRD, end stage renal disease; HD, hemodialysis.

Table 2 Adherence Score for Various Treatment Domains Among ESRD patients at Al Thawra Modern General Hospital, Sana'a City, Yemen

Domine	Mean score ± SD	Maximum scores	Percent score	Level
Attending Hemodialysis sessions	531.9±111.8	600	88.5	Good
Compliance to Medication	153.4±61.1	200	76.7	Moderate
Diet	123.7±70.7	200	61.9	Moderate
Fluid restriction	123.3±71.0	200	61.6	Moderate
Overall adherence to treatment	933.5±210.0	1200	77.8	Moderate

Abbreviation: ESRD, end stage renal disease; SD, standard deviation.

Table 3 Perception on Importance of Adherence to Various Treatment Domains Among ESRD patients at Al Thawra Hospital, Sana'a City, Yemen (n=393)

Perception Regarding Treatment Domains	Number with Good Perception	Percentage
Overall perception level	363	92.3
Follow dialysis schedule	388	98.7
Compliance to medication schedule	377	95.9
Watch diet daily	337	85.8
Limit fluid intake	350	89.1

Abbreviation: ESRD, end stage renal disease

The percentage of patients who received counseling by a healthcare provider was 99.0%, those who received counseling about the importance of HD attendance were only (17.6%), compliance with medication schedule (34.6%), diet recommendations (30.8%) and fluid restriction (31.0%) (Table 4). For further details (Supplementary Table 2)

Table 4 Counselling Received by Patients for Different Treatment Domains Among Hemodialysis Patients at Al Thawra Hospital, Sana'a City, Yemen (n=393)

Domains	Received Counseling	
	N	%
Any counselling	389	99.0
Attending HD sessions	69	17.6
Compliance to Medication	136	34.6
Diet	122	31.0
Fluid restriction	121	30.8

Abbreviation: ESRD, end stage renal disease;HD, hemodialysis.

Table 5 Predictors for Adherence to Treatment Among ESRD Patients Attending Al Thawra Hospital, Sana'a City, Yemen n=393)

Characteristics		No.	Adherence Mean Score± SD	*P. value
Area of residence	Urban	348	941.8± 207.7	<0.05
	Rural	45	869.4± 219.2	
Dialysis Duration (years)	<5 Years	211	955.4± 206.8	<0.05
	≥5 Years	150	908.1± 211.4	
Level of perception				
Overall perception	High	363	956.7±193.8	<0.001
of treatment	Low	30	653.3± 203.3	
Medication	High	377	942.0± 203.0	<0.002
	Low	16	734.3± 274.3	
Diet recommendations	High	337	969.8±184.3	<0.001
	Low	56	715.2± 224.9	
Fluid restriction	High	350	958.9±144.5	<0.001
	Low	43	727.3± 220.0	
Counselling				
Fluid restriction	Received	122	965.6±209.3	0.02
	Non received	271	919.0±209.1	
Food Recommendations	Received	121	962.8±207.4	0.04
	Non received	272	920.5±210.2	

Note: **P-value obtained from t-test.*
Abbreviation: ESRD, end stage renal disease; SD, standard deviation.

Table 5 shows significantly higher mean scores among patients with a shorter duration of HD, urban residency, patients with a high perception level for medication, fluid restriction, and diet recommendations. Significantly lower mean scores were found among patients who had not received counseling regarding the importance of diet and fluid restriction.

Discussion

Adherence to a treatment regimen is essential for obtaining desirable outcomes and preventing complications among patients with ESRD. However, it remains challenging for patients to achieve this because of many reasons, including the complexity of treatment regimens, psychological factors, physical symptoms and fatigue, lack of awareness and education, financial constraints, cultural and social factors and health literacy.[20]

Most study participants were males, and studies have shown that more women than men develop CRD; however, men were more likely to progress to ESRD than women for unexplained reasons.[21,22] Most study participants were

unemployed, which could be attributed to difficulty in sustaining employment with dialysis. It was also noticed that lower educational levels were predominant, which, given that dialysis is a life-changing event at numerous levels, may discourage patients from completing their education.

The majority of patients were hypertensive and a lower percentage had diabetes. This has also been reported in other studies.[14,23] Hypertension and CRD are inextricably linked, as hypertension is a major risk factor for CRD development, progression to ESRD, and renal function decline, exacerbating hypertension. The high prevalence of hypertension across CRD stages provides strong evidence of this bidirectional link. However, the relationship between prolonged exposure to elevated blood pressure (BP) and ESRD has not been well established.[24,25]

The findings of our study revealed that more than half of the ESRD patients exhibited overall good adherence to the treatment regimen, in accordance with another study,[9] while it was higher than the findings of two studies performed in Palestine and Iraq[14,19.] The higher adherence rate in this study might be related to patients accepting the illness and fear of complications, encouraging each other, and continuous family and social support, especially since Yemeni society is interconnected.

During HD sessions, patients are usually tired from a long session duration; therefore, continued observation and enhancement by health providers could help. Adherence to HD sessions in this study was similar to that reported in other countries[9,26,27] and higher than the rates reported in Saudi Arabia and Indonesia.[28,29] This finding could be explained by the health insurance coverage of the cost of HD sessions and the patient's belief that poor adherence to HD sessions is directly linked to mortality.

Compliance with the HD domain in this study was the highest compared to other domains, in line with other studies.[9,14,19] However, a study conducted in Saudi Arabia[28] showed the highest adherence rate was for diet and the lowest was for HD. The differences in the study design and measurements may also play pivotal roles.

Adherence to prescribed medicine, fluids, and dietary recommendations was moderate, in agreement with other studies.[14,23] This could be related to the lower perception of the importance of fluid restriction and diet, enhanced by the lack of counseling in this regard. This highlights the importance of providing patient counseling and education regarding fluid and diet recommendations. Since the nurse plays a crucial role in the patient's well-being, the relational skills must be of a high standard. These skills can be enhanced through extensive training courses to improve patient care. Also, mobile health applications (apps) evaluated by a multidisciplinary team of health professionals can serve as a support tool for nutritional self-care.[30,31]

Several studies from different world regions have reported significant associations between adherence and socio-demographic and clinical characteristics.[23,32,33] This study found a significant association between adherence and urban residency, which may have resulted from better access to health care in urban areas than in rural areas. Improving access to healthcare in rural areas and facilitating transportation to HD centers are recommended to improve the adherence of patients with ESRD to treatment.

Our study revealed that a shorter duration of HD was associated with better adherence to treatment, in accordance with other studies.[34,35] Researchers have suggested that when HD duration increases, patients' self-confidence in their ability to improve may decline, which could reduce their adherence to treatment.[34] Psychological support to patients with a long duration of HD could improve their adherence to treatment.

In our study, there was a significant association between adherence and the perception toward the importance of compliance with medication schedules, fluids, and dietary recommendations. The same finding was reported in a study conducted in Egypt, which found that the perception score is one of the main predictors of non-adherence.[36] Improving the perception of the importance of adherence to various treatment domains is recommended to increase treatment adherence.

Studies have highlighted the Patients' need to clearly and appropriately understand health information related to specific illnesses to help enhance perception and improve adherence to treatment.[33] Our findings showed that lack of counseling was significantly associated with poor adherence to treatment. Consistent with other studies, continuous education and counseling were crucial for enhancing patients' adherence levels.[23]

Study limitations: This study was conducted at only one center, which could affect the generalizability of the results. However, the hospital where the study was conducted is the largest referral tertiary hospital in Sana'a.

Conclusions

This study is the first to provide information on adherence toward different treatment domains and its associated factors among patients with ESRD. The adherence level among patients with ESRD was moderate in general and good for HD. Most participants had a good perception toward the treatment domains, with the highest percentage for the dialysis schedule and lowest percentage for diet restriction. The risk of non-adherence to the treatment regimen was higher among rural residents, non-educated, and those with a lower perception of the importance of treatment adherence due to lack of counseling. We recommend improving healthcare in rural areas, improving transportation to HD centers, offering regular counseling sessions to boost adherence levels, concentrating on excessive training sessions for healthcare providers to enhance patient care and further multicenter studies are necessary to determine the predictors of treatment regimen adherence in patients with ESRD in Yemen.

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Disclosure

The authors report no conflicts of interest in this work.

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