Nonadherence to Dialysis among Saudi Patients – Its Prevalence, Causes, and Consequences

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ABSTRACT. Dialysis nonadherence among Saudi hemodialysis (HD) patients has not been studied previously. We study its prevalence, causes, and consequences. All chronic HD patients at our center were enrolled. Their demographics as well as levels of hemoglobin (Hb), Kt/v, potassium, and phosphate; dialysis type; dialysis vintage; duration; and shift were recorded. Nonadherence, defined as missed dialysis session or patient–derived shortening of the dialysis session by >10 min at least once over a month’s period, was recorded. We analyzed the relationship of nonadherence to emergency room visits, hospitalizations, interdialytic weight gain (IDWG), intradialytic symptoms, home-to-hospital distance, and smoking habits. Two hundred and sixty-five patients were included; their mean age was 61.8 ± 18.2 years, 47.3% were male, dialysis vintage was 3.8 ± 3.3 years, 5.9% were on HD, and 34.1% were on hemodiafiltration. During the study period, the nonadherence rate was 25% for missed dialysis sessions and 72% for shortened dialysis on at least one occasion. Nonadherence was more likely to occur in males than females (75% and 66%, respectively, P = 0.05), in smokers (57.1% vs. 21.7%, P = 0.0003), and in night shifts rather than day shifts (33.6% vs. 20.6%, P = 0.042). Nonadherent patients had lower Kt/V than adherent patients (1.22 ± 0.2 and 1.31 ± 0.2, respectively P = 0.01), had higher mean IDWG (2.7 ± 1.0 and 2.4 ± 1.0 kg, respectively, P = 0.02), and are more likely to be hospitalized (50% vs. 32%, P = 0.01). On the other hand, no differences were observed in serum phosphate, potassium, or Hb levels; intradialytic symptoms; education; employment; the distance between the dialysis unit and home; type of dialysis; Charlson Comorbidity Index; or the dialysis vintage. The prevalence of nonadherence in our group was comparable to that of other reports and is more likely to occur in male patients, smokers, and those in night shifts. It is associated with lower dialysis adequacy, higher mean IDWG, and higher hospitalization rate.
Introduction

Chronic kidney disease is a condition characterized by an irreversible loss of renal function that may progress into end-stage renal disease (ESRD) requiring renal replacement therapy. ESRD, being a long-term and demanding therapy, is associated with a high prevalence of nonadherence. According to the World Health Organization, the adherence to long-term therapy is defined as “the extent to which a person’s behavior – taking medication, following a diet, and/or executing lifestyle changes – corresponds with agreed recommendations from a health-care provider.” The adherence of the dialysis patients can be assessed subjectively by the nursing staff and objectively by measuring serum potassium and phosphate levels, interdialytic weight gain (IDWG), and skipping dialysis sessions.

Several small studies have linked different factors to nonadherence to dialysis regimen including demographics, lack of motivation, depression, and unreliable transportation. Nevertheless, a comprehensive study on adherence barriers and their consequences remains elusive. Both smoking and young age are important predictors of poor adherence among dialysis patients. Smoking might reflect a low priority of smokers on the value of promoting self-health. Young patients are more likely to perceive that they are not susceptible to negative health outcomes. Patients using public transportation have reduced adherence as do patients with pain and discomfort during dialysis therapy. Gender, working status, inadequate knowledge, and financial constraints are other barriers to adherence to hemodialysis (HD) regimen. Mukakarangwa et al in a study from Rwanda concluded that religiosity and age were significantly associated with compliance to HD.

Chronic HD patients are predisposed to physiological and psychological challenges more than other chronic diseases, and this might impact their adherence. Nonadherence has been shown to increase health-care expenses, risk of hospitalization, morbidity, and mortality. Despite the existence of ongoing research worldwide concerning this topic, there is limited data about nonadherence in Saudi Arabia. Hence, the aim of this study is to estimate the prevalence and to identify the causes and consequences of nonadherence to HD.

Methods

This is a retrospective case–control study of HD patients, conducted at a tertiary care center in Riyadh, Saudi Arabia, during March 2018. The objective was to determine the prevalence of nonadherence to HD, it causes, and its associated consequences.

All the adult stable chronic HD patients who have been on HD for at least 12 months and who have complete data were included in the study.

Interviews were conducted for the patients by the research participants at the dialysis center using a questionnaire which was a modified version of the ESRD Adherence Questionnaire. We used only the part of the questionnaire that assesses the self-reported HD attendance, perceptions related to adherence behaviors, and the reasons for nonadherence. The patients were informed about the aim of the study, and informed consents were obtained prior to starting the interviews.

The survey collected data on sociodemographic data, the self-perceived reasons of noncompliance, and the importance of HD from the patient’s perspective. Documented diagnosis of clinical depression was collected through the hospital database and also by directly asking the patient. The medical records of all HD patients studied were reviewed for hemoglobin (Hb), Kt/v, potassium, phosphate, dialysis vintage, IDWG, interdialytic hypotension episodes, duration of the dialysis session, and dialysis shift.

Nonadherence was defined as a missed dialysis session and by >10 min patient-derived shortening of the HD session at least one during one-month period. We analyzed the relationship of nonadherence to emergency room (ER) visits, hospitalizations, IDWG, intradialytic symptoms, home-to-hospital travel
distance, and smoking habits. Inferential statistics with Chi-square test were used to test categorical data, and t-test was used to test continuous data.

**Results**

A total of 265 HD patients were enrolled in the study: 66% were on HD and 34% were on hemodiafiltration. The mean age of the whole group was 61 ± 18.2 years (age of nonadherent patients was 62.0 ± 18 years and that of adherent was 61.8 ± 18 years). Males made up 47.3% of the total number; 8.8% were smokers. The mean distance from the patient’s location to the hospital was 18.9 ± 21.9 km.

The overall nonadherence, defined as missing at least one entire session per month, was 25% and as defined by reducing the dialysis time by at least 10 min on at least one occasion per month was 72%. Nonadherence was documented in 77% of males and in only 66% of females \((P = 0.05)\).

The frequency of smoking among the non-adherent and adherent groups was 22.7%, 57/1%, respectively \((P = 0.003)\).

Income, education, employment status, and mode of transportation showed no significant relationship to the rate of nonadherence (Table 1).

The prevalence of nonadherence was impacted neither by the diagnosis of clinical depres-

| Table 1. General characteristics of all hemodialysis patients at King Abdulaziz Medical City \((n=265)\). |
|---------------------------|---------------------|
| **Age mean** | 61±18.2 years |
| **Gender** | Male=47.3% |
| **Smoking status** | 8.8% |
| **Distance from hospital** | 18.9±21.9 |
| **Income** | \(P=0.7\) |
| 1 ≤5000 SAR | |
| 2 = 5000–10,000 SAR | |
| 3 ≥10,000 SAR | |
| **“Weight”** | Weight |
| **Education** | \(P=0.6\) |
| **Employment** | \(P=0.9\) |
| **Transport** | \(P=0.7\) |
| 1 = Personal car | |
| 2 = Bus | |
| 3 = Taxi | |
| 4 = Ambulance | |
| **Depression** | Depression recorded in the BestCare |
| 0 = No | \(P=0.6\) |
| 1 = Yes | |
| **Depressed patients** | \(P=0.5\) |
| 0 = No | |
| 1 = Yes | |
| **HTN, DM** | DM: \(P=0.1\) |
| 0 = No | HT: \(P=0.3\) |
| 1 = Yes | |
| **Hb** | Mean serum hemoglobin of all our subjects |
| **Dialysis vintage** | 3.8±3.3 years |
| **Hours per week** | 11.1±1.2 |
| **Serum phosphate** | 1.48±0.5 |
| **Serum potassium** | 4.9±0.7 |
| **Kt/v** | 1.25±0.24 |
| **Mean weight gain** | 2.63±1.07 kg |

HTN: Hypertension, DM: Diabetes mellitus, Hb: Hemoglobin.
sion whether collected through the hospital database or by directly asking the patient nor by the presence of hypertension or diabetes.

The dialysis vintage was 3.8 ± 3.3 years, and the average weekly time on dialysis was 11.1 ± 1.2 h. The mean serum phosphate was 1.48 ± 0.5 mmol/L, serum potassium was 4.9 ± 0.7 mmol, the Kt/V was 1.25 ± 0.24, and the mean IDGW was 2.63 ± 1.07 kg (Table 1).

The respondents were asked five questions related to how they perceive the importance of dialysis treatment adherence and reasons for nonadherence. Their responses are shown in Table 2.

The intradialytic symptoms observed were cramps in 13.6% of the patients, vomiting in 5.3%, and hypotension requiring fluid resuscitation in 45.8%.

The mean IDWG was statistically significantly lower in the adherent group (2.4 ± 1.0 kg vs. 2.7 ± 1.0 kg, \( P = 0.02 \)).

The mean serum levels of phosphate and potassium levels and Hb level were not significantly different between the adherent and nonadherent groups (Table 3). On the other hand, the Kt/V in the adherent group (1.31 ± 0.2) was statistically significantly higher than that in nonadherent group (1.22 ±

| Table 2. Patients’ responses to questions about the importance of dialysis treatment adherence and reasons for nonadherence. |
|--------------------------------------------------------------------------------------------------------------------------|
| **1. How important do you think it is to follow your dialysis schedule?**                                               |
| Very important                                                                                                               | 87.5% |
| Moderately important                                                          | 6.9%  |
| Not important                                                                                                                | 5.6%  |
| **2. Why do you think it is important to adhere your dialysis schedule?**                                                      |
| My kidney condition required dialysis as scheduled                                                                         | 70.3% |
| Following the schedule keeps my body healthy                                                                                  | 69.0% |
| My medical professional told me to do so                                                                                     | 21.1% |
| I had an experience where I was sick after I missed dialysis.                                                                 | 17.2% |
| I don’t think following the schedule is important                                                                           | 3.9%  |
| **3. How much difficulty do you have staying for your entire dialysis treatment as prescribed?**                            |
| No difficulty                                                                                                                | 44.1% |
| Moderate difficulty                                                           | 33.0% |
| Extreme difficulty                                                            | 22.9% |
| **4. What was the main reason you shortened your dialysis treatment last month?**                                            |
| Not applicable, I have not shortened my dialysis time                                                                         | 43.1% |
| Cramping                                                                      | 6.7%  |
| Bathroom use                                                                  | 1.2%  |
| Impatience                                                                     | 1.9%  |
| Access (graft, fistula, or catheter) clotted                                                                                  | 1.6%  |
| Physician (medical or surgical) appointment                                  | 1.2%  |
| Personal business or emergency                                                 | 4.6%  |
| Work schedule                                                                  | 1.2%  |
| Transportation problems                                                        | 3.3%  |
| You experienced symptoms of nausea, vomiting, lightheadedness, fainting, tingling, or numbness in feet/leg, etc.        | 2.1%  |

**What was the main reason you missed your dialysis treatment last month?**

| Reason                                                                 | Percentage |
|------------------------------------------------------------------------|------------|
| Not applicable (I did not miss any treatment)                           | 80%        |
| Transportation problems                                                 | 4.6%       |
| I was hospitalized                                                      | 1.3%       |
| Didn’t want to go or couldn’t go (answer the reason in the next question)| 10.0%      |
| Forgot the reason                                                       | 0.8%       |
| Other (please specify)                                                  | 3.3%       |
0.2) (P = 0.01) (Table 3).

The ER visits in 12-month duration prior to the study period was noted in 65% of patients in the adherent group compared to 77% in the nonadherent group (P = 0.07). The rate of hospitalization over the same period was 73.6% in the adherent group and 81.8% in the nonadherent group (P = 0.08) (Figure 1).

### Discussion

Estimating the prevalence of nonadherence and assessing its causes is crucial to quantify and understand the impact of the dialysis treatment on a patient’s lifestyle. Our study showed that full-session nonadherence to HD session was observed in 25% and shortened session nonadherence (for at least one occasion over the month of the study period) was observed in 72% of the patients. Leggat et al reported that at least 50% of HD patients were nonadherent to some part of the dialysis regimen. A study from Egypt concluded that 36% of their patients were nonadherent to the dialysis prescription. Furthermore, a prospective international study between the USA, Sweden, and Japan showed that nonadherence rate (based on missed dialysis session) was 35.4% in the USA and 0% in Japan and Sweden.

Our study shows a strong association between nonadherence and smoking. Smokers cannot resist the urge and desire to smoke during their dialysis session; therefore, they tend to shorten their sessions. This result is in agreement with other studies. Our study is the first study which looked at the relation between patient adherence to HD and the dialysis shift time. We have noticed that nonadherence is significantly higher among patients dialyzed in the night shift (starting after midnight) groups. This may be because night shift group usually finish at 6:00 am and the patient or caregiver shortens the session to leave early for other tasks (e.g., job and dropping children to school). Age is not linked with patient adherence to dialysis session in our study. However, other studies showed that younger

| Compare consequences | Control (adherent) group | Nonadherent group | P  |
|----------------------|--------------------------|-------------------|----|
| Mean IDWG            | 2.4 ±1.0 kg              | 2.7 ±1.0 kg       | 0.02* |
| Mean PO4 level       | 1.5 mmol/L               | 1.5 mmol/L        | 0.9 |
| Mean K+ level        | 4.8 mmol/L               | 4.97 mmol/L       | 0.15 |
| Kt/V                 | 1.31 ±0.2                | 1.22 ± 0.2        | 0.01* |
| Hemoglobin level     | 115.3 g/L                | 115.7115.3 g/L    | 0.9 |

IDWG: Interdialytic weight gain.

Figure 1.
patients tend to miss dialysis treatment.\textsuperscript{7,8}

Our study found that there is no link between patient adherence to HD sessions and the type of transportation (taxi, personal car, and ambulance) or distance between the dialysis unit and home. However, others reported that those who use private transportation (e.g., by a family member or self-driven) has better attendance than those who use public transportation.\textsuperscript{6}

We found that the education level, employment status, and income are not related to patient adherence to HD session.\textsuperscript{18,19} We have also found that gender is not an independent factor after multiregression analysis and is not related to HD adherence.

Our study showed that IDWG is statistically higher among nonadherent group, which is comparable to findings by another study.\textsuperscript{17}

Our study showed no difference in the mean serum phosphate, potassium, and Hb levels between the adherent and nonadherent groups. On the other hand, other studies have shown that serum phosphate level was significantly higher in the noncompliant group. This maybe related to the aggressive dietary advice given to our patient, which offsets the effect of nonadherence on the phosphate level.

Our study reports a positive relationship between patient nonadherence to HD and the rate of hospitalization/admission. Kimmel et al demonstrated that patients with shortened dialysis session have 24\% increased risk of mortality.\textsuperscript{20} In addition, a study done using US Renal Data System showed 14\% increased risk of mortality when skipping at least one session per month and 25\%–69\% increased risk of mortality in other studies.\textsuperscript{16,21,22}

\textbf{Strengths and Limitations}

This is the first study of its kind in our population. The limitation lies on the fact that it is a single-center study and, therefore, may not generalizable.

\textbf{Conclusion and Implication}

Nonadherence in our group is comparable to that of other reports. It is more likely to occur in male patients, smokers, and night shift groups. It is associated with lower dialysis adequacy, higher mean IDWG, and higher hospitalization rate. Smokers and night shift groups need a continuous interventional effort to promote adherence to dialysis by various strategies suggested in previous studies.\textsuperscript{4,23-32}

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