Medication Adherence among Adult Patients on Hemodialysis

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ABSTRACT. Medication adherence was assessed in 89 patients on hemodialysis (HD) at the King Abdul Aziz Medical City using an Arabic version of the Morisky Medication Adherence Scale (MASS-8). The results of the study revealed that 31.46% and 40.45% of the participants showed low and medium adherence, respectively, while 28.09% showed high medication adherence. Accordingly, 71.91% of the patients visiting the dialysis unit were considered medication non-adherent. While being of older age ($P = 0.012$), being married ($P = 0.012$) increased the level of adherence, being of medium level of education ($P = 0.024$) decreased adherence levels. On the other hand, gender, presence of a care-giver, number of members in the household and employment status seems to have no effect on the level of medication adherence. These results call upon the practitioners in HD units to develop intervention programs that can increase the level of medication adherence.

Introduction

Adherence, as an alternative term to compliance, is becoming popular because it enhances the role of patients in the doctor–patient relationship.1 The World Health Organization Adherence meeting in June 2001 defined adherence as “the extent to which the patient follows medical instructions.” According to The American Society on Aging and the American Society of Consultant Pharmacists Foundation joint Adult Medication document, medication non-adherence includes the following acts: Either intentionally or inadvertently failing to fill or refill a prescription, omitting one or more doses, taking more of a medication than prescribed, discontinuing a medication, taking a dose at the wrong time, taking medication of other(s), taking a dose concurrently with the
wrong foods and medications, taking expired and/or damaged medications, taking improperly stored medications and, finally, improperly using medicated devices such as inhalers.\(^5\)

Fischer et al in 2010 analyzed more than 195,000 electronic prescriptions and found that less than 78\% of all the e-prescriptions were filled, with even a lesser percentage for new e-prescriptions (72\%). It was also interesting to find that patients with new prescriptions for chronic medications were the least adherent (hypertension, 28.4\%; hyperlipidemia, 28.2\%; and diabetes, 31.4\%).\(^4\) Patient medication non-adherence can be very costly. A report in 2009 by The New England Healthcare Institute (NEHI), a non-profit organization, estimated that poor adherence to medication costs the US health-care system $289 billion annually.\(^5\) In addition to visits to doctors followed by diagnostic tests and treatment, it was estimated that 23\% of admissions to nursing homes and 10\% of hospital admissions are caused by non-adherence to medications.\(^6\) The cost of these avoidable events can be staggering if it is taken into consideration that as of 2009, the estimated average expenditure on nursing homes per resident was $13,761 and that the average cost of each hospital admission was $17,271.\(^5\)

Another negative effect of patient non-adherence to medication is the false impression that the doctor (or other health-care providers) might get about the effectiveness of the medication regimen that was prescribed. In such cases, the doctor might prescribe a new regimen that might result in aggravation of the patients’ disease.\(^7\) In general, for many chronic conditions, poor medication adherence to prescribed medications and other aspects of the treatment regimen can adversely affect the treatment outcome leading to additional and unnecessary tests, dosage adjustments, changes in the treatment plan, visits to the emergency department or hospitalization, which ultimately results in increased cost of medical care.

Dialysis is a life-saving procedure, but at best it replaces only about 10\% of the normal renal function. The average dialysis patient takes 6–10 medicines a day in addition to many dietary restrictions. These complex therapeutic regimens place a significant burden on the patients and usually make them dependent on health-care providers for many aspects of their treatment.

A critical review of the literature by Schmid et al concerning adherence of adult patients undergoing chronic hemodialysis (HD) to prescribed oral medications showed that more than half of the study patients included in their review reported a mean medication non-adherence of 67\%.\(^8\) Furthermore, it was found that 80.4\% of chronic HD patients were non-adherent to diet, while 75.3\% of them were non-adherent to fluid restriction.\(^9\)

There are several factors that have been associated with medication non-adherence in chronic patients such as those undergoing HD.\(^10\) These factors were categorized by Jin et al into patient-centered factors, therapy-related factors, social and economic factors, health-care system factors and disease factors. Patient-centered factors include demographic factors (age, ethnicity, gender, education, and marital status), psychosocial factors (beliefs, motivation and attitude), patient–prescriber relationship, health literacy, patient knowledge, physical difficulties, tobacco smoking or alcohol intake, forgetfulness and history of good compliance. The therapy-related factors include route of administration, treatment complexity, duration of the treatment, medication side-effects, degree of behavioral change required, taste of the medication and requirements for drug storage. The health-care system factors include lack of accessibility, long waiting time, difficulty in getting prescriptions filled and unhappy clinic visits. The social and economic factors include inability to take time off work, cost and income and social support. Finally, the disease factors include disease symptoms and severity of the disease.\(^11\)

The aim of this study is to assess the patient medication adherence in patients on HD and to understand the factors that affect this adherence, negatively or positively.

**Materials and Methods**

This study was conducted in the HD unit at the King Abdulaziz Medical City (KAMC),
Riyadh. The work load at this unit is divided into four shifts per day (morning, afternoon, evening and night), serving two groups of patients; Group A (Saturday, Monday and Wednesday) and Group B (Sunday, Tuesday and Thursday). Each HD patient is scheduled to come three times per week as part of Group A or B. Each group includes around 120 patients.

Adult patients (15–65 years) who visited the HD section regularly and were willing to communicate were recruited into this study. The study was approved by the Institutional Review Board of the King Abdullah International Medical Research Center, National Guard Health Affairs, Riyadh, Saudi Arabia. A verbal approval to participate in the study was obtained from all the participating patients. One hundred patients agreed to complete the questionnaire.

The study design is a cross-sectional survey study. An Arabic version of the Morisky 8-item Medication Adherence Scale (MMAS-8) questionnaire was chosen for this study. In addition, demographic data such as age, gender, level of education, marital status and employment status and relevant information such as period on dialysis, presence of a care-giver and number of people in the household were also collected. The original English version of the MMAS-8 was initially translated into Arabic by two bilingual professionals following which the two translations were amalgamated into one Arabic version. This Arabic version was back translated into English by two different bilingual professionals and the back translations were compared and matched with the original MMAS-8 for wording, similarity in meaning and relevance.

The score of the MMAS-8 ranged from 0 to 8, and each item in the questionnaire carried one point. The first seven items required a yes (1) or no (0) answer, while the eighth was answered on a 5-point Likert scale that was dichotomized into “always,” “usually,” “sometimes” or “every now and then” (0) or “never/rarely” (1). The final score described the adherence levels; a perfect eight meant high adherence, a score from seven to six meant medium adherence and, finally, a score less than six meant low adherence. Furthermore, only patients with high adherence scores were considered adherent and those with low and medium adherence scores were considered non-adherent. The data were analyzed using SPSS version 18 by obtaining Pearson correlation for continuous variables and by one-way ANOVA for non-continuous variables.

Results

Of the 100 participants, only 90 completed the questionnaire. One of these respondents was found to be a temporary patient and, hence, his responses were discarded. Accordingly, responses from 89 participants were included in the descriptive statistics and analysis, with a response rate of 89%. The average age of the participants was 55.79 ± 17.69 years. The mean duration on dialysis was 37.27 ± 48.91 months. There were 47 male participants (52.8%) and 42 female participants (47.2%).

On the basis of the MMAS-8 score, 31.46% (N = 28) showed low adherence, 40.45% (N = 36) showed medium adherence and 28.09% (N = 25) showed high adherence (Figure 1). This meant that 71.91% of the patients visiting the dialysis unit were non-adherent.

There was no correlation between age in general and the adherence score (P = 0.083, r = 0.185), nor was there a correlation between the duration on dialysis and the adherence score (P = 0.653, r = 0.048). Age was also categorized into three groups (15–35, 36–55 and more than 55 years old) or two groups (≤45 and >45 years). Both categorizations were analyzed by one-way ANOVA to determine whether there are differences in the means of the adherence scores. Indeed, and in both cases, there were significant differences in adherence between the age categories (P = 0.012), in which higher adherence was associated with older age (Table 1).

With regard to the other variables, there was a significant difference in adherence (P = 0.012) between married and single participants (6.40 ± 1.50 and 5.13 ± 2.33, respectively). Also, there was a significant difference in adherence (P = 0.024) between participants who...
had no or less than high school education, participants who have high school education and those with a BSc degree (6.34 ± 1.62, 4.92 ± 2.30 and 6.50 ± 1.31, respectively). On the other hand, there was no difference in adherence ($P = 0.471$) between males and females (6.30 ± 1.67 and 6.02 ± 1.88, respectively), nor was there a difference in adherence ($P = 0.061$) between those participants who had care-givers and those who did not (6.55 ± 1.41 and 5.84 ± 1.95, respectively). Also, no difference in adherence ($P = 0.415$) was found between patients who live in households of less than three members and those who live in households of three or more members (5.67 ± 1.80 and 6.18 ± 1.77, respectively). Finally, there was no difference in adherence ($P = 0.198$) between participants who were employed and those who were not employed (7.00 ± 1.41 and 6.20 ± 1.76, respectively).

### Discussion

Measuring and assessing medication adherence in patients on HD is complex and requires certain criteria to obtain accurate results. Beside tablet counting that is used to assist patient compliance, there are several methods that could be used to assess compliance, including laboratory measurement, patient self-report and dialysis staff-report. There are several factors that have been associated with medication non-adherence in chronic patients such as those undergoing HD. These factors were categorized by Jin et al into patient-centered factors, therapy-related factors, social and economic factors, health-care system factors and disease factors. Among these categories, this work studied the demographics from the patient-centered factors (age, gender, education, employment, presence of care-giver,

<table>
<thead>
<tr>
<th>Age</th>
<th>N</th>
<th>Mean (adherence score)</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Three categories</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 to 35 years</td>
<td>18</td>
<td>5.06 ± 2.04</td>
<td></td>
</tr>
<tr>
<td>36 to 55 years</td>
<td>18</td>
<td>6.33 ± 1.61</td>
<td></td>
</tr>
<tr>
<td>Above 55 years</td>
<td>53</td>
<td>6.45 ± 1.60</td>
<td>0.012</td>
</tr>
<tr>
<td>Total</td>
<td>89</td>
<td>6.15 ± 1.77</td>
<td></td>
</tr>
<tr>
<td>Two categories</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤45 years old</td>
<td>24</td>
<td>5.3750 ± 2.06</td>
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</tr>
<tr>
<td>&gt;45 years old</td>
<td>65</td>
<td>6.4308 ± 1.57</td>
<td>0.012</td>
</tr>
<tr>
<td>Total</td>
<td>89</td>
<td>6.1461 ± 1.77</td>
<td></td>
</tr>
</tbody>
</table>
number of persons in the household and marital status) and the duration on dialysis from the therapy-related factors.

In this study, we tested for the effect of age as a continuous variable and as discrete age-groups. Although there was no correlation between age (as a continuous variable) and adherence score, the results of this study showed that older age is associated with better adherence. These results are contrary to the results of Kutner and Cardenas who reported that patients aged 25–34 years were found to have the best overall adjustment to chronic dialysis therapy.\textsuperscript{12} On the other hand, our results agree with overwhelming evidence that medication adherence in dialysis patients improves with older age.\textsuperscript{13–18} Furthermore, it has also been reported that dietary adherence of dialysis patients improves with older age,\textsuperscript{19,20} and the odds of missing at least one dialysis session in a month were higher in patients aged <55 years.\textsuperscript{21}

With regard to marital status, being married was shown to enhance medication adherence, which is in agreement with a very recent report that found that adherence score was higher in Greek married women than single ones.\textsuperscript{22} Being married might be associated with better family support, which was found to also enhance adherence to fluid regimens in HD patients.\textsuperscript{23}

This study has found that patients with the highest (BSc) and the lowest levels of education (lower than high school) were the most adherent, while those with high school education were least adherent. Schmid et al, in a review of available reports on medication adherence by HD patients, have concluded that higher adherence is associated with higher level of education.\textsuperscript{8} It seems that patients with a higher level of education have more confidence in the benefits of their medication regimen.\textsuperscript{24} Another study showed that lower level of education was associated with better dietary adherence in HD patients.\textsuperscript{25} Acceptance of the disease state seems to be associated with higher levels of medication adherence.\textsuperscript{25} In this context, older and less-educated patients may have the highest acceptance of their disease states and, hence, show better adherence. It is worth mentioning that level of adherence of patients with high school degree has been previously found to be different from those with lower or higher education levels.\textsuperscript{26}

We found a lack of correlation between duration on dialysis and medication adherence in this study. Similarly, it has been previously reported that the duration of end-stage renal disease (ESRD) and duration on dialysis does not significantly affect medication adherence.\textsuperscript{27} In our study, the lack of correlation might be due to the extreme heterogeneity in the data as the standard deviation was actually larger than the mean.

Other demographic characteristics including gender, number of people living in the household and employment status had no effect on the medication adherence in this current sample. A review by Karamanidou about determinants of non-adherence to phosphate binding medication in patients with ESRD concluded that gender is commonly associated with medication adherence, but not employment status.\textsuperscript{28} The number of members in the household was reported to negatively correlate with medication adherence in patients on cardiovascular medications,\textsuperscript{29} because it might affect the timing of doses.\textsuperscript{30} The lack of adherence in this current work might be attributed to the fact that 79 participants (88.76\%) reported living in household of three members or more. Finally, the presence of a care-giver was found to positively affect medication adherence, but can be overshadowed by the overall environment that the patient lives in.\textsuperscript{30}

Conclusions

This work assessed medication adherence among HD patients. Less than one-third of the study sample showed high adherence. Medication adherence was found to be positively associated with older age and being married and negatively associated with having medium level of education. One the other hand, the duration on dialysis, gender, the presence of a care-giver, employment status and number of household members were not found to be
associated with medication adherence. The results of this study call on the practitioners in HD units to develop intervention and educational programs to increase the level of medication adherence.

Conflict of interest: None

References


