Factors associated with health literacy and medication adherence in the elderly patients with chronic kidney disease

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Abstract

Context: One of the main factors related to health literacy in chronic kidney disease (CKD) is medication adherence.

Aims: The present study aimed to investigate the factors associated with health literacy and medication adherence in older adults with CKD referring to Imam Khomeini Amol Nephrology Clinic in 2018.

Setting and Design: This descriptive-analytical study was performed in 2018 in Imam Khomeini Amol Nephrology Clinic.

Materials and Methods: This study was performed on 150 elderly CKD patients aged above 60 years. Sampling was done using available sampling method and with the anticipation of confounders. Demographic information, elderly health literacy, and medication adherence were assessed using a questionnaire and interview.

Statistical Analysis Used: Data were described with mean, standard deviation, and frequency and analyzed using Chi-square tests.

Results: The results showed that the age of the participants was 64.3 ± 3.89 years, and 40% of the elderly had an inadequate health literacy, 39.3% had insufficient health literacy, 20.7% had insufficient health literacy, and excellent health literacy was observed in none of the patients. The results showed that there was a statistically significant relationship between health literacy and medication adherence ($P < 0.05$). Chi-square test showed that the higher the health literacy, the more the medication adherence.

Conclusion: According to the results of the study on the low level of health literacy and its direct relationship with medication adherence, it can be said that more attention of nurses is needed to promote and follow drug adherence by educating patients with low levels of health literacy to prevent the progression of the disease and convert drug therapy to dialysis.

Keywords: Chronic kidney disease, Elderly, Health literacy, Medication adherence

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INTRODUCTION

Elderly people are at increased risk of chronic kidney disease (CKD) due to chronic conditions such as blood pressure and diabetes.[1] The prevalence of CKD worldwide at the end 2015, in different countries, varied from less than 100 to more than 2000 people in one million estimated, At the end of 2015 in Iran, the population of patients with CKD has reached about 53,000 people.[2] CKD is an illness characterized by progressive loss of kidney function in maintaining normal levels of protein metabolism products (e.g., urea), blood pressure, hematocrits, as well as water, electrolytes, and acid–base.[3] Medication adherence is of great importance in patients with CKD. Nonadherence to medication implies noncompliance with physician and subsequent behaviors, which may mean overdosing on a medication or continuing it in spite of the physician's advice to stop.[4] In spite of the role of medication adherence in patients with CKD,[5] noncompliance is common among such patients so that approximately 25%–86% of the patients do not adhere to their medication regimen.[6] One of the influential factors in adherence to the medication regimen is health literacy.[7] Health literacy is defined as the potential of a person to acquire, interpret, and understand the basic information and health services required for making appropriate decisions.[8] It indicates the impact of such information on motivating the individual to accept or reject health practices.[9] According to researches, individuals with lower health literacy are more likely to be hospitalized and refer to physicians,[10] and pay lower attention to preventive care;[11] therefore, they incur higher medical expenditures.[12] Various studies also showed that poor health literacy in the elderly is associated with consequences such as increased mortality,[13] failure to take preventive measures such as screening tests,[14] and attempting some high-risk behaviors.[15] Various studies show a wide range of health literacy across countries. The findings of a study in Taiwan entitled "Health Literacy, Health Status, and Utilization of Care in Adults" showed that about 30% of the patients had low health literacy.[16] Another study in Brazil entitled "Health Literacy in People Treated with Warfarin" reported no significant relationship between health literacy and the Normal suffering treatment.[17] Because health literacy can affect medication adherence, it seemed necessary to investigate its relationship with medication adherence in patients with CKD. On the other hand, physiological changes associated with aging can affect the ability of the elderly to understand and interpret health information; hence, it is essential to pay more attention to health literacy in the elderly. Therefore, the current study was designed to assess the high prevalence of CKD in the elderly and the great burden of the disease on social health, health literacy problems, and noncompliance of such patients with medication. The current study aimed at evaluating the factors associated with health literacy and medication adherence in the elderly with CKD receiving medication and do not use alternative renal replacement therapies, such as hemodialysis and peritoneal dialysis.

MATERIALS AND METHODS

The study was performed on 150 elderly patients with CKD aged 60 years and above in the Nephrology Clinic of Imam Khomeini Hospital, Amol, Iran, from June to September 2019.

Sample size and sampling procedure

Samples were selected using the available sampling method based on the inclusion criteria and willingness of the patients to participate in the study. Inclusion criteria were aged 60 years and above; being able to read, write, and communicate verbally; not receiving alternative renal replacement therapies (including hemodialysis, peritoneal dialysis, and kidney transplant); receiving CKD diagnosis from a specialist at least 4 weeks prior to the study; and having no psychiatric disorders (such as schizophrenia and symptoms of severe depression based on the results of Geriatric Depression Scale) or cognitive impairments (using the Abbreviated Mental Test Score). Exclusion criterion was having progressive disease to the extent that the patient needed dialysis.

According to the following formula and the results of Kooshyar study, with 95% confidence level and 80% power,the minimum sample size calculated was 125 people:

$$125 = \left[\frac{Z_{1-\frac{0/95}{2}} + Z_{1-\beta}}{0.5 * \ln\left(\frac{1+0/25}{1-0/25}\right)} \right]^2 + 3$$

To enhance the accuracy and taking into account the possibility of loss of 10%, the sample size was 150 people.

Data collection tool and procedure

Data were collected by three questionnaires, namely a demographic questionnaire, adult Health Literacy for Iranian Adults (HELIA), and Morisky Medication Adherence Scale (MMAS-8). The demographic questionnaire included questions on age, gender, marital status, life status, education level, occupational status, average monthly income, number of daily medicine use, and disease duration. HELIA was used to assess health literacy in the patients. It is a

33-item scale developed by Montazeri *et al.* to measure the ability of individuals in health literacy based on five dimensions including accessibility (6 items), reading skills (4 items), understanding (7 items), evaluation (4 items), and decision-making and health information (12 items). The items are scored based on a 5-point Likert scale, but quite easy (5 scores), easy (4 scores), not easy/not difficult (3 scores), hard (2 scores), and quite hard (1 score) are the options allocated to the reading skills items. The options always (5 scores), most of the times (4 scores), sometimes (3 scores), rarely (2 scores), and never (1 score) were allocated to the items of other dimensions.

To calculate the total score, scores of all dimensions ranging from 0 to 100 are divided by 5. Finally, health literacy is categorized as four levels: scores 0–50 are considered as low, 50.1–66 as insufficient, 66.1–84 as sufficient, and 84.1–100 as excellent health literacy. The construct validity of the scale was evaluated by exploratory factor analysis and its reliability was assessed by the internal correlation coefficient, by Montazeri *et al.*; its validity and reliability were accepted.[18] Using the same method, the reliability of HELIA in the current study using Cronbach's alpha coefficient was estimated as 92%.

The MMAS-8 developed by Morisky in 2008 was used to assess compliance of patients with medication regimen in the current study. The first 7 items of this 8-item scale have yes/no answers. "Yes" answer scores 0 and "no" scores 1. The final question is scored based on a 5-point Likert scale (never, rarely, sometimes, often, and always). The total score of the MMAS-8 ranges from 0 to 8, and scores <6, 6–8, and 8, respectively, indicate low, medium, and high adherence. The validity of the scale was assessed in 2008 by Rashedi and its Cronbach's alpha was reported as 83%.[19] In the study by Kooshyar *et al.*, along with assessing the face and content validity of this scale by experts, its reliability was reported as 0.68% using Cronbach's alpha coefficient;[20] however, using the same method, the reliability of MMAS-8 in the current study was calculated as 75%.

Data analysis

The researcher explained the study objectives to the eligible participants after obtaining their consent to participate in the study. The participants were assured of the anonymity of the questionnaires and confidentiality of information; the participants were also asked to answer the items accurately. Incomplete or confounded questionnaires were excluded from the analysis. Data were analyzed by SPSS 21 (IBM SPSS Statistics for Windows, Armonk, NY: IBM Corp) using descriptive tests (mean and standard deviation (and inferential statistics (logistic regression

to analyze health literacy level and drug adherence with other variables and Pearson's correlation to analyze the relationship of health literacy and medication adherence with quantitative variables). $P < 0.05$ was considered statistically significant.

Ethical consideration

Ethical clearance for this study was obtained from Mazandaran University research ethics committee prior to the commencement of the study. Written and verbal informed consents were obtained from all the respondents, with confidentiality and anonymity of their responses assured and maintained. This study was approved by the Ethics Committee of the Mazandaran University of Medical Sciences with code IR.MAZUMS.REC.1398.645.

RESULTS

According to the obtained results, the mean age of the participants was 64.3 ± 3.89 years; 55.3% were female and 44.7% were male; 58% were married, of whom 32% lived with their spouse and children. Furthermore, the education level of 80% of the participants was incomplete high school diploma; 56.7% of the participants had income equivalent to the cost of living. Besides, 48% of the participants were homemakers and 90% reported taking more than five drugs per day. In addition, 37.3% of the patients had a history of hypertension, 21.3% diabetes, and 20.7% cardiac disease [Table 1]. The mean score of patients' health literacy was 57.32 in reading skills, 53.59 in accessibility, 65.93 in understanding, 41.85 in evaluation,

Table 1: Demographic characteristics of the elderly participants

Variable	*n* (%)
Sex	
Male	67 (44.7)
Female	83 (55.3)
Education	
High school	120 (80)
Diploma and higher	30 (20)
Employment status	
Employed	28 (18.7)
Retired	50 (33.3)
Homemaker	72 (48)
Marital status	
Married	134 (89.3)
Widow	16 (10.7)
Income status	
Less than the cost of living	51 (34)
Equal to the cost of living	85 (56.7)
More than the cost of living	14 (9.3)
The number of drugs	
<5 drugs	15 (10)
>5 drugs	135 (90)
Life companions	
Spouse	87 (58)
Children or lonely	15 (10)
Wife and children	48 (32)

and 54.05 in decision-making. Health literacy was low in 60 (40%) patients, insufficient in 59 (39.3%), sufficient in 31 (20.7%), and excellent in none [Table 2]. The results of the study showed that most of the elderly (71.3%) with CKD had poor and only 2% had high compliance with medication.

Chi-squared test showed that there was a statistically significant relationship between health literacy and medication adherence; therefore, medication adherence increased with increasing health literacy (*P* < 0.05). The results of statistical tests (Pearson's correlation tests) showed that health literacy was statistically significantly correlated with the variables of educational level, marital status, and occupational status (*P* < 0.05) [Table 2]; there was also a statistically significant relationship between compliance with medication and variables of life companions, educational level, income status, and marital status (*P* < 0.05) [Table 3]. The results of Pearson's correlation coefficient showed a statistically significant relationship between health literacy and medication adherence in the elderly with CKD (*P* < 0.05) (*R* = 0.16).

To measure the overall effect of confounding variables on health literacy, age, gender, educational level, number of daily medicines, number of children and life companions, income level, and occupational status were compared; multiple logistic regression results showed that age (*P* < 0.001, 95% confidence interval [CI] = 0.2–0.8, odds ratio [OR] = 0.49), income level (*P* < 0.001, 95% CI = 1.3–1.8, OR = 2.6), and occupational status (*P* < 0.001, 95% CI = 0.4–0.8, OR = 0.62) had effects on health literacy; as income went up, health literacy increased by 2.6 times. It was 0.49 in age, which indicated that health literacy was higher at younger ages. It was 0.628 in occupational status, which showed that health literacy was higher in employed participants. To measure the total effect of confounding variables on medication adherence, variable of age, gender, education level, number of daily medicines, number of children and life companions, income level, and occupational status were compared; the results of multiple logistic regression showed that the age and life companions (*P* < 0.001, 95% CI = 1.3–3.1, OR = 2.03) as well as number of children and number of daily medicines (*P* < 0.001, 95% CI = 1.3–3.1, OR = 4.8) had effects on compliance with medication.

Table 2: Relationship between health literacy and demographic variables of the elderly with chronic kidney disease

Variable	Mean±SD	n (%)				P
		Inadequate health literacy	Not enough health literacy	Adequate health literacy	Excellent health literacy	
Age						
65–60 years	1.82±62.2	34 (37.2)	43 (41.3)	27 (26)	-	0.36
70–65 years	0.90±67.07	18 (60)	9 (30)	3 (10)	-	
70 years and older	3.34±72.5	8 (50)	7 (43.8)	1 (3.6)	-	
Sex						
Male	56.85±12.06	21 (31.3)	16 (34.9)	64 (23.9)	-	0.151
Female	12.28±52.69	39 (47)	15 (44.8)	83 (18.1)	-	
Education						
High school	9.53±50.36	60 (50)	53 (44.2)	7 (5.8)	-	0.001
Diploma and higher	5.91±71.97	0	6 (20)	24 (80)	-	
Employment status						
Employed	56.93±12.43	7 (25)	15 (53.6)	6 (21.4)	-	0.05
Retired	12.06±59.05	15 (53.6)	18 (36)	17 (34)	-	
Homemaker	23.50±49.11	38 (52.8)	26 (36.1)	8 (11.1)	-	
Marital status						
Married	55.10±12.13	51 (38.1)	55 (41)	28 (20.9)	-	0.341
Widow	13.27±49.92	9 (56.2)	4 (25)	3 (18.8)	-	
Income status						
Less than the cost of living	47.45±7.98	30 (58.5)	20 (39.2)	2 (51)	-	0.001
Equal to the cost of living	12.36±57.53	28 (38.9)	25 (37.6)	85 (29.4)	-	
More than the cost of living	62.26±13.66	2 (14.3)	7 (50)	5 (35.7)	-	
The number of drugs						
<5 drugs	56.81±9.44	4 (26.7)	5 (33.3)	6 (40)	-	0.142
>5 medications	52.10±7.93	56 (41.5)	54 (40)	25 (18.5)	-	
Life companions						
Spouse	52.86±11.28	40 (46)	36 (41.4)	87 (12.6)	-	0.35
Children or single	52.04±17.09	7 (46.7)	4 (36)	15 (26.7)	-	
Wife and children	58.07±11.93	13 (27.1)	19 (39.6)	48 (33.3)	-	
Number of children						
Three children and fewer	52.08±11.93	14 (25.8)	23 (37.1)	23 (37.1)	-	0.001
Four children and more	58.04±14.93	44 (50)	36 (40.9)	8 (9.1)	-	

SD: Standard deviation

Table 3: Relationship between medication adherence and demographic variables of the elderly with chronic kidney disease

Variable	Mean±SD	n (%)		P
		Low drug adherence	**Medium and high drug compliance**	
Age				
65–60 years	62.2±1.82	77 (74)	27 (26)	0.05
70–65 years	67.07±0.90	24 (80)	6 (20)	
70 years and older	3.34±72.5	6 (37.5)	10 (62.5)	
Sex				
Male	1.51±5.17	50 (74.6)	17 (25.4)	0.342
Female	1.50±5.32	57 (67.7)	26 (31.3)	
Education				
High school	1.48±5.07	93 (77.5)	27 (22.5)	0.01
Diploma and higher	6.20±0.92	14 (46.7)	16 (53.3)	
Employment status				
Employed	5.07±1.66	23 (82.1)	5 (17.9)	0.23
Retired	5.35±1.47	32 (64)	18 (36)	
Homemaker	5.25±1.48	52 (72.2)	20 (27.8)	
Marital status				
Married	5.16±1.45	102 (76.1)	32 (23.9)	0.001
Widow	5.98±1.74	5 (31.3)	11 (68.8)	
Income status				
Less than the cost of living	6.66±1.55	41 (80.4)	10 (19.6)	0.014
Equal to the cost of living	5.60±1.425	53 (62.4)	32 (37.6)	
More than the cost of living	5.33±1.20	13 (92.9)	1 (7.1)	
The number of drugs				
<5 drugs	5.26±1.43	13 (86.7)	2 (13.3)	0.142
>5 medications	5.91±1.76	94 (69.6)	41 (30.4)	
Life companions				
Spouse	5.15±1.29	71 (18.6)	16 (18.4)	0.01
Children or single	5.20±1.19	6 (40)	9 (60)	
Wife and children	5.27±1.74	30 (62.5)	18 (37.5)	
Number of children				
Three children and fewer	6.07±1.42	39 (62.9)	68 (77.3)	0.055
Four children and more	5.20±0.92	23 (37.1)	20 (22.7)	

SD: Standard deviation

DISCUSSION

The results of the study showed that the level of health literacy was very low in the participants so that 79.3% of the elderly had low and insufficient health literacy. However, due to the high prevalence of chronic diseases and the subsequent need for self-care skills, health literacy is deemed to be of great importance in such patients. The results of various studies also show a wide range of low health literacy; for example, in the study by Kutner *et al.*, only 3% of the elderly had high health literacy.[21] In the study by von Wagner *et al.* in the Britain, 30% of the elderly aged 60 and above had insufficient health literacy.[22] The results of their study were consistent with those of Powell *et al.*[23] and Peterson *et al.*[24] In the study by Kim *et al.*, the level of health literacy of most elderly people was insufficient.[25] In the study by Banihashemi and Amirkhani on individuals aged 18 and above, 28.1% of the participants had adequate, 15.3% had borderline, and 56.6% had inadequate health literacy.[7] In the study by Reisi *et al.*, 79.7% of the studied elderly had inadequate, 11.6% had borderline, and 8.8% had adequate health literacy.[26] Results of the study by Kooshyar *et al.* showed that the studied elderly had inadequate health literacy; they also reported a statistically

significant relationship between educational level and health literacy (*P* < 0.05), that is, individuals with higher educational level had higher health literacy.[20] Similar results were reported in different studies;[27,28] however, Schillinger *et al.*[29] found no relationship in their studies between health literacy and educational level. No correlation was found also between health literacy and gender in the present study (*P* > 0.05) that was consistent with the results of other studies.[7,13,16] However, Reisi *et al.* reported in that the frequency of inadequate health literacy was higher among female patients than males.[26] The study by Banihashemi and Amirkhani[7] indicated lower health literacy in females; in contrast, the study by Ashari *et al.* reported higher health literacy among females.[30] The studies by von Wagner *et al.*[22] and Kooshyar *et al.*[20] also confirmed this correlation; contradictions among the findings of different studies could be attributed to sociocultural contexts of the studied populations in terms of health. Regardless of gender, the family, cultural, and social influences may be critical in shaping attitudes and beliefs, and the manner of interaction with the health system. There was also a significant correlation between health literacy and income, that is, the elderly with higher incomes had higher health literacy. Patients with higher socioeconomic

status, educational level, and access to relevant education may be more likely to be healthier. The results of studies by Reisi *et al*.[26] and Lee *et al*.[31] are consistent with those of the present study, but the results of the study by Mollakhalili *et al*.[32] showed no significant relationship between health literacy and income. The findings of the current study indicated no significant relationship between marital status and health literacy, which is in agreement with the results of the study by Mohseni *et al*.[33] The studies by Reisi *et al*.[26] and Mollakhalili *et al*. reported a significant relationship between health literacy and marital status.[32] The contradiction among findings can be related to differences in the studied populations and various sociocultural factors. The authors believed that inadequate health literacy of the elderly in Amol can be attributed to psychological, cognitive, physiological, and economic changes caused by aging. However, because of the high prevalence of chronic diseases among this group of the community, which emphasizes the need for screening, more attentions should be paid on health literacy. A high rate of inadequate health literacy in the elderly is a warning to health system administrators. One of the reasons for the low health literacy in the present study may be the type of the instrument employed, although proving that this requires comparative studies with similar conditions. For example, in the study by Bostock and Steptoe in the UK, which used the Short Form of the Adult Functional Literacy Questionnaire (S-TOFHLA), the findings showed that 67.2% of the adults had high, 20.3% had moderate, and 12.5% had low health literacy[34] Javadzade showed that 46.5% of the participants had adequate, 38% had borderline, and 15.5% had inadequate health literacy; there was also a significant relationship between participants' health literacy and educational level.[35]

Regarding medication adherence, the results of the present study showed that 71.3% of the elderly with CKD had poor adherence, which is in line with the findings of a study that reported lower adherence among patients with high blood pressure.[36] On the other hand, Gholamaliei *et al*. reported low adherence in the studied participants, which is consistent with the results of the present study[37] that led to their noncompliance.[38] Furthermore, the study by Kutner *et al*. indicated that more than half of the patients had problems with their dietary recommendations; elderly patients (56%) with diabetes had moderate medication adherence.[21] Roudsari *et al*. reported in their study that most patients had relatively high medication adherence, which is inconsistent with the results of the current study.[39] This contradiction may be related to sociocultural differences in the study populations. The study findings indicated that increasing

the health literacy increased medication adherence, which is consistent with the results of the studies by Kooshyar *et al*.,[20] Schillinger *et al*.,[29] and Lee *et al*.,[31] but inconsistent with the findings of the study by Mosher *et al*.[40] In the study by Zhang *et al*., the relationship between health literacy and adherence to therapeutic regimen was reported as significantly weak,[41] On the other hand, Wolf *et al*. stated that low health literacy in patients with AIDS is a risk factor for noncompliance with medication.[42] In the present study, health literacy was significantly correlated with age, which explains that health literacy reduces with increasing age, which is consistent with the results of the studies by Kooshyar *et al*.[20] and Ghanbari *et al*.[43] and inconsistent with the findings of the study by Zhang *et al*.; the reason for this contradiction can be the age of the participants such that in the study by Zhang *et al*., the age of the participants was above 18, whereas the current study was conducted on elderly patients aged 60 years and above.[41] There was also a significant difference between health literacy and educational level, which is in agreement with the results of the studies by Kooshyar *et al*.[20] and Ghanbari *et al*.[43] It seems that with increasing educational level, patient's knowledge of the disease and the consequences of noncompliance with medication regimen increase.

CONCLUSION

The findings of the study show that more than half of the elderly participants had low health literacy and poor medication adherence, which reflects the need of the community for more education in order to promote health literacy and improve medication adherence. Similarly, the medical team, especially nurses, should note that medication adherence, in addition to playing an important role in managing patients with CKD, affects different aspects of the lives of patients with CKD. The limitations of this study can be attributed to the lack of participation of older adults (90 and older) due to their old age. Furthermore, the mental and physical condition of the elderly can influence their response to the questionnaire.

Conflicts of interest
There are no conflicts of interest.

Authors' contributions
- Ms. Fatemeh lohrasbi and Dr. Ehteram Sadat Ilali contributed to the compilation of the article
- Seyed_nouraddin Mousavinasab contributed to the analysis of the article
- Tahereh Yaghobi contributed in the editing of the article.

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