Original Article

Health Literacy and its Related Factors in Dialysis Patients: A Cross-sectional Study in Iran

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Abstract
Background: Inadequate health literacy (HL) in dialysis patients increases the risk of poor self-care and decreases severe self-care and severe negative health outcomes in these patients. This study aimed to investigate HL and its related factors in dialysis patients in Kerman, Iran, in 2021.
Methods: This cross-sectional study was performed on 280 dialysis patients who referred to Kerman (Iran) dialysis centres. The participants were selected through multi-stage sampling method. The study was conducted using the Iranian Health Literacy Questionnaire (IHLQ). The higher score shows a better HL.
Results: The mean age of the subjects was 57.75 ± 13.87 years. The mean score of HL was 9.12 ± 4.54 out of 20 points. During multivariate regression, there was a significant relationship between HL and age ($\beta = -0.08$, $P = 0.02$) and level of education (elementary/literacy ($\beta = 4.607$, $P < 0.001$), middle school ($\beta = 6.38$, $P < 0.001$), high school ($\beta = 8.573$, $P < 0.001$) and academic education ($\beta = 9.410$, $P < 0.001$), and there was a significant relationship between HL and eye disease ($\beta = -0.903$, $P = 0.001$).
Conclusion: Most participants did not have adequate HL, while HL as the most important determinant of self-care can improve patients' quality of life and reduce their health care costs. Therefore, in order to increase self-care, planning and necessary interventions, the HL of these patients seems to be necessary.
Keywords: Health literacy, Dialysis, Chronic kidney disease, End Stage Renal Disease

Introduction

Chronic kidney disease (CKD) is a disease in which the normal structure or function of the kidney is damaged for at least 3 months. The final stage of CKD is a chronic renal failure or end-stage renal disease (ESRD) in which glomerular filtration rate (GFR) is < 15 mL/min per 1.73 m² (1,2) , which requires replacement of permanently lost kidney function such as kidney transplantation and dialysis for patients to survive (3).

In 2017, the global prevalence of CKD was 9.1% (4) and its prevalence in Iran was 15.14% (5). It is predicted that due to changes in age and sex distribution and the increased prevalence of diabetes and obesity during 2015 to 2030, the incidence of kidney failure and the population of patients undergoing dialysis will increase (6).

Economic problems, deprivations and difficult living conditions, patient costs for dialysis, disability and having diseases other than kidney problems are all factors that cause many psychological, social and economical problems in addition to enduring the pain and suffering of the disease for dialysis patients and their families (7).

The treatment plan for dialysis patients is a combination of multi-drug regimens diet and fluid management. To optimize treatment adherence, dialysis patients must have sufficient health literacy (HL) to understand medical guidelines and interpret medication and food labels correctly (8). HL means achieving a level of knowledge, personal skills and self-confidence in order to take action to improve personal and social health by changing personal lifestyle and living conditions (9).

The prevalence of low HL in ESRD patients in various studies has been estimated 14% to 32% (10). Inadequate

HL in people with CKD is associated with poorer disease management and more severe complications in a way that low HL among dialysis patients compared to dialysis patients with adequate HL, is associated with increased risk of mortality (3), decreased access to kidney transplantation (11), decreased mental and physical health (12), and poorer self-management and self-care (13).

In contrast, higher HL in dialysis patients increases mental health and makes better quality of life (14), as well as more adherence in hemodialysis patients to medication, fluids and special diet recommendations (15). Numerous socio-economic factors such as low socio-economic level (11), level of education (16) play an important role in increasing or decreasing HL.

Therefore, identifying factors related to HL can help plan and intervene to improve the HL of these patients. Therefore, the present study has dealt with HL and its related factors in dialysis patients in Kerman, Iran.

Materials and Methods

Sampling and data collection

This cross-sectional study was performed from April to June 2021 on 280 patients undergoing various types of dialysis in Kerman, the capital of the largest province in southeast of Iran. Inclusion criteria were being 18-year-old and above, receiving dialysis for more than 2 months, and the ability to communicate verbally in Persian.

The sampling method was multi-stage sampling and convenience sampling in each centre. The questionnaire was completed by a trained questioner in day and night shifts in all public dialysis centers of Kerman (three centers) with the informed oral consent of the subjects. In the case of illiterate participants, the questionnaires were completed by the interviewer and in the case of literate people, the questionnaires were completed by the participants themselves. Response rate was 93.3% and the average response time was 20 minutes (Range: 10-30 minutes). Data collection tool was a questionnaire that has two parts. The first part is related to Socio-demographics and clinical information of dialysis patients obtained from similar studies and the second part is the questions of Iranian Health Literacy Questionnaire (IHLQ), which has been validated in previous studies (17,18).

Data analysis

According to the instructions of the questionnaire, scores less than 10 presenting inadequate HL, scores between 10 and 14 presenting border HL, and scores equal to or above 14 presenting considered desirable HL (17,18). Multivariate regression test was used to investigate the relationship between the studied variables with HL. The dependent variable was HL score and the independent variables were age, gender, education level, occupation, GFR, age at the time of the first dialysis, history of kidney transplantation, hypertension, diabetes, polycystic kidney disease, proteinuria, and eye disease. Data were analyzed using SPSS version 22 and statistical significant level was considered at $P = 0.05$. Firstly, to determine the candidate variables in the model, univariate linear regression was used for each independent variable with dependent variable (health literacy). Variables with $P < 0.2$ were entered into multivariate linear regression. Then, using Backward's method, the best model with effective variables was selected.

Ethical considerations

After explaining the objectives of the study to the participants and ensuring their confidentiality, informed oral consent was obtained from the participants. The questionnaires were also designed anonymously. This study was approved by the Ethics Committee of Kerman University of Medical Sciences (Ethical code: IR.KMU. REC.1400.101).

Results

Demographic features

The mean age of participants was 57.75 ± 13.87 years (59.35 ± 11.98 years for women and 56.68 ± 14.94 years for men). Also, 60% (168 people) were male participants. About one-third of the participants (31.2%) were illiterate. Most participants were housewives (36.1%), 23.2% were retired, and 21.2% were unemployed. More than two-thirds of the participants (69%) were living with their spouses and family members (Table 1).

Clinical features

The mean GFR was 10.48 ± 4.44 (9.47 ± 3.53 for women and 11.15 ± 4.86 for men). The mean age of the first dialysis in participants was 52.88 ± 14.80 years (55.10 ± 13.20 years for women and 51.41 ± 15.63 years for men) (Table 1). Among the participants, 5.2% had a history of kidney transplantation, out of which 71.42% were male (Table 2). More than half of the participants (59.5%) had hypertension, out of which 53.01% were men and 51.3% had diabetes, out of which 55.24% were men. About one-third of the participants had diabetes and hypertension concurrently (32.7%), out of which 51.13% were women (Table 2).

Health literacy status

The mean level of HL of the subjects was 9.12 ± 4.54 out of 20. More than half of the participants had inadequate HL score (53.2%) and only 14.3% had adequate HL score. Among people with inadequate HL (149 people), 58.38% were illiterate and among people with adequate HL (40 people), 42.5% had university education. In the constructs of HL, the highest score for inadequate HL was 272 (97.5%) for "social empowerment" and 119 (52%) for adequate HL for "reading skills" (Figure 1).

Table 1. Demographic characteristics of the participants

Characteristic	Female participants (n=112) No. (%)	Male participants (n=168) No. (%)	Total (n=280) No. (%)	P value
Age (y)	53.9±11.9	56.6±14.9	57.7±13.8	0.23
GFR	9.4±3.5	11.1±4.8	10.4±4.4	<0.001
Age at the time of the first dialysis	55±13.2	51.1±14.6	52.8±14.8	0.09
Education (n=279)				<0.001
Illiterate	50 (45)	37 (22)	87 (31.2)	
Elementary	21 (18.9)	26 (15.5)	47 (16.8)	
Secondary	14 (12.6)	30 (17.9)	44 (15.8)	
High school	14 (12.6)	43 (25.6)	57 (20.4)	
College/University	12 (10.8)	32 (19)	44 (15.8)	
Occupation (n=241)				<0.001
Student	0 (0)	1 (0.7)	1 (0.4)	
Housewife	84 (87.5)	3 (2.1)	87 (36.1)	
Retired	5 (5.2)	51 (35.2)	56 (23.2)	
Jobless	2 (2.1)	49 (33.8)	51 (21.2)	
Permanent employee	5 (5.2)	15 (10.3)	20 (8.3)	
Temporary employment	0 (0)	4 (2.8)	4 (1.7)	
Type of life (n=274)				<0.001
Living alone	9 (8.3)	7 (4.2)	16 (5.8)	
Living alone with their spouse	11 (10.1)	10 (6.1)	21 (7.7)	
Living only with family members	29 (26.6)	19 (11.5)	48 (17.5)	
Living with their spouse and family members	60 (55)	129 (78.2)	189 (69)	

Abbreviation: GFR, glomerular filtration rate.

Table 2. Clinical characteristics of the participants

Characteristic	Female Participants (n=112) No. (%)	Male Participants (n=168) No. (%)	Total (n=280) No. (%)	P value
History of kidney transplantation (n=14)	4(3.8)	10(6.2)	14(5.2)	0.38
Underlying cases (n=269)				
Hypertension	78(70.3)	88(52.4)	166(59.5)	0.09
Diabetes	64(57.7)	79(47)	143(51.3)	
Kidney stone	1(0.9)	0(0)	1(0.4)	
Polycystic kidney disease	4(3.6)	8(4.8)	12(4.3)	
Urinary reflux	1(0.9)	0(0)	1(0.4)	
Proteinuria	2(1.8)	8(4.8)	10(3.6)	

Relationship between health literacy and independent variables

Among the independent variables, age, education and eye disease had a significant effect on HL. In a way, the average HL score of people for each year of age will be 0.08 less. Also, the average HL score of people with elementary education is 4.60 points higher than that of illiterate people, and also, the average HL score of people with secondary education is 6.38 points higher than that of illiterate people. People with a high school/diploma or university level have an average HL score of 8.57 and 9.41 points, respectively, compared to illiterate people. People with eye disease have an average HL score of 0.90 points lower than people without eye disease (Table 3).

Discussion

In this study, using a multidimensional tool, HL and its related factors in the dialysis population of Kerman in Iran, were studied. The scores of the subjects in the constructs of health information access, social empowerment, knowledge, health information use, and individual empowerment were lower than those of other constructs. Also in this study, like similar studies (19-21), the most important variables determining HL were reported age and level of education, which improves with increasing education level. Increasing age and having eye
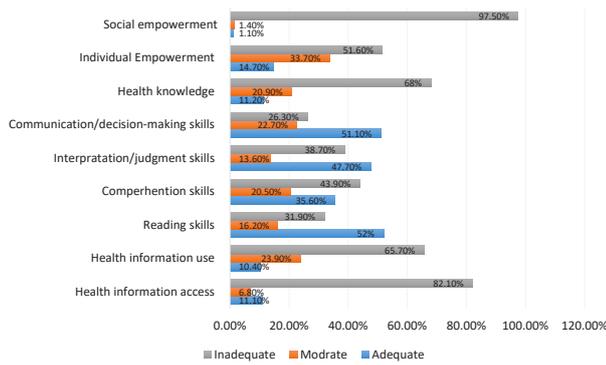
Figure 1. Distribution of scores of health literacy domains among dialysis patients under study.

disease is associated with decreasing HL score in dialysis patients. In the present study, the HL scores in the IHLQ constructs were similar to those reported in China (22)

and Egypt (23), but compared to a study in the Czech Republic (24), the scores of HL constructs were lower.

In general, patients with inadequate HL had low scores on all IHLQ scales, and patients in the low-level HL group were characterized by low education and the presence of comorbidities. In addition, multidimensional HL measurements in patients with comorbidities may help health care providers identify and respond to HL needs in each patient. From a long-term perspective, creating HL-responsive organizations by integrating how to meet the different needs of HL in the training of health care professionals may improve HL for each patient (25).

According to a study by Friis et al, education level is a strong predictor of HL (26). In the present study, college/university education was associated with a better ability to find good health information and understand health information. In fact, people with a college/university

Table 3. Univariate and multivariate linear regression to examine the effect of independent variables on the participants' health literacy score

Variable	Levels Variable	Univariate linear regression				Multivariate linear regression			
		B	SE	P value	95% CI	B	SE	P value	95% CI
Age		-0.15	0.01	<0.001	(-0.18 to -0.11)				
Gender	Female*	0							
	Male	2.59	0.55	<0.001	(1.50 to 3.68)				
Education	Illiterate*	0				0			
	Elementary/reading and writing	-4.28	0.45	<0.001	(-5.17 to -3.68)	4.60	0.37	<0.001	(3.86 to 5.34)
	Middle school/cycle	-1.28	0.55	0.02	(-2.38 to -0.18)	6.38	0.40	<0.001	(5.58 to 7.18)
	High school/diploma	1.85	0.50	<0.001	(0.87 to 2.84)	8.57	0.40	<0.001	(7.78 to 9.36)
	University	3.57	0.50	<0.001	(2.58 to 4.55)	9.41	0.47	<0.001	(8.46 to 10.35)
Occupation	Unemployed*	0							
	Student	5.37	4.71	0.25	(-3.90 to 14.64)				
	Housewife	-3.20	0.57	<0.001	(-4.34 to -2.06)				
	Retired	3.00	0.68	<0.001	(1.66 to 4.34)				
	Permanent employee	4.60	1.05	<0.001	(2.52 to 6.68)				
	Temporary employment	-1.14	2.37	0.63	(-5.81 to 3.52)				
GFR		0.05	0.06	0.37	(-0.07 to 0.18)				
Age on the first dialysis		-0.14	0.01	<0.001	(-0.17 to -0.11)				
Kidney transplant history	No*	0							
	Yes	2.23	1.28	0.08	(-0.30 to 4.76)				
Hypertension	No*	0							
	Yes	-1.35	0.56	0.01	(-2.47 to -0.23)				
Diabetes	No*	0							
	Yes	-2.11	0.54	<0.001	(-3.19 to -1.03)				
Polycystic kidney disease	No*	0							
	Yes	2.18	1.38	0.11	(-0.53 to 4.90)				
Proteinuria	No*	0							
	Yes	2.91	1.50	0.05	(-0.05 to 5.86)				
Eye disease	No*	0				0			
	Yes	-3.23	0.53	<0.001	(-4.28 to -2.18)	-0.90	0.28	0.001	(-1.45 to -0.35)

Abbreviation: GFR, glomerular filtration rate.
* Reference group

education are better able to understand, interpret, and evaluate the information provided than people with a lower education (27).

In the study of Jessup et al, a significant association was found between older age and lower HL (28), which is consistent with the results of the present study. An explanation for the relationship between age and HL may be that the age range in the present study sample was somewhat observed. However, the present study population reflects the typical age for dialysis, and a larger study population may be necessary to identify a possible association between age and HL.

In this study, there was a significant relationship between hypertension and diabetes with HL (hypertension $P = 0.018$ and diabetes $P < 0.001$), which is consistent with the results of a study in Australia (11) and inconsistent with a study in Brazil (13) and a study in the United States (20).

In the present study, among the demographic variables, there was a significant relationship between age, gender, and education with HL (age and gender $P < 0.001$, education $P = 0.022$). However, in the study of Lohrasbi et al, there was no significant relationship between gender and HL (19), but there was a significant relationship between education and HL (19-21).

Patients in the inadequate HL level group may not be aware of their health status or the consequences of choosing it. Active self-management motivation in dialysis patients is also likely to be influenced by the patients' perceptions of the risks and benefits of different treatments, which may be difficult for these patients (27).

Integrating HL training into the training of healthcare professionals and patient HL screening are solutions that are proposed to increase the ability to identify vulnerable patients with low HL (29). When health care providers diagnose patients with HL as inadequate, alternative methods of disseminating information, such as retrospectives, may be helpful in ensuring that important information is understood (30).

Limitations
This study has some limitations. First, the questionnaire used in this study could not measure medication adherence well. Second, different researchers have used various methods and tools to measure HL, this subject makes it difficult to compare the results. Third, this study was conducted only in a city, Kerman, and the results of this research have limited generalizability.

Conclusion
The studied hemodialysis patients did not have the desired level of HL, which as the most important determinant of self-care can reduce the quality of life of patients and increase health care costs. Therefore, when designing and implementing HL interventions for dialysis patients, more

focus should be on providing solutions for patients' access to health information, social empowerment, knowledge, information acquisition, and individual empowerment for this population. In addition, vulnerable patients should be considered for their complex health status, advanced age, low level of education, and the presence of comorbidities, including eye disease.

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