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Relationship between patient activation and self-efficacy among patients undergoing hemodialysis: a cross-sectional study

Reyhane Mirmazhari[1], Mansour Ghafourifard[1,2*] and Zahra Sheikhalipour[1]

Abstract

Background: Patient activation in chronic kidney disease (CKD) is increasingly being prioritized and considered a quality metric in CKD. Given the importance of patients' activation in improving the quality of chronic disease care, this study aimed to assess patients' activation levels and its relationship with self-efficacy among patients undergoing hemodialysis.

Methods: In this cross-sectional study, a total of 180 patients undergoing maintenance hemodialysis were selected by random sampling from the largest hemodialysis center (dialysis center of Emam Reza hospital, Tabriz) in Iran. Data were collected by demographics, patient activation measure, and chronic kidney disease self-efficacy (CKD-SE) scale from March to May 2021. Collected data were analyzed using SPSS software (ver. 26) using ANOVA, *t*-test, Pearson correlation coefficient, and multiple regression tests.

Results: The majority of the participants (35%) were at level 1 of activation and only 28.9% of the individuals were at level 4. According to the results, the mean score of self-efficacy in patients undergoing hemodialysis (in a possible range of 0–10) was 5.50 ± 1.45. Multiple regression analysis showed that factors including self-efficacy, educational level, and marital status were significant predictors of change in patient activation ($R^2 = 0.85$, adjusted $R^2 = 0.66$, $p < 0.001$). The results showed that self-efficacy was the main predictor of patient activation ($\beta = 0.49$, $p < 0.001$).

Conclusion: According to the result, improving the patients' self-efficacy could improve the patient's activation. Moreover, patients with lower educational level reported the lower activation score; therefore, health care providers should improve the knowledge of patients with lower educational level, encourage them to be more active in their health care, and help them in providing more tailored strategies to improve the quality of care more efficiently. Furthermore, Measuring patients' activation level at admission to the dialysis unit is recommended for all patients undergoing hemodialysis.

Keywords: Patient activation, Chronic kidney disease (CKD), Self-efficacy, Hemodialysis

Introduction

Chronic kidney disease (CKD) is as considered a global health challenge [1, 2]. The prevalence of CKD in two recent decades is increasing globally, and about 13.4% of people in the world suffer from this disease [3]. The prevalence of this disease in Iran is greater than global reports and is reported about 15.4% [4]. The higher prevalence of this disease is related to the increasing number of

*Correspondence: m.ghafori@yahoo.com

[1] Department of Medical Surgical Nursing, Faculty of Nursing and Midwifery, Tabriz University of Medical Sciences, Shariati-Jonubi St., Tabriz, Iran
Full list of author information is available at the end of the article

underlying chronic disease such as diabetes mellitus and hypertension in our country [5].

Patients with CKD need Kidney replacement therapy (KRT) including kidney transplantation [6], hemodialysis, and peritoneal dialysis (PD), which prevent disease progression and improves the patients' quality of life [7–9]. Among these treatments, hemodialysis is the most common kidney replacement therapy in Iran and worldwide [10–12].

Patients with chronic diseases such as CKD should not be passive recipients of care but they should be more active and behave as active participants in the improvement of their health [13]. Patients' willingness and ability to participate in care decisions and take independent actions to manage their health are called "patient activation" [14]. Patient activation is described as the ability and tendency of patients to perform their role in health care management [15]. Although there are various definitions regarding patient activation, the most comprehensive description is related to Hibbard et al. definition as "the state in which an individual possesses the knowledge, skills, and confidence to take independent actions to manage their health and care" [16]. Patient activation is considered as the main component of high quality care for patients suffering from chronic diseases. The goal of patient activation interventions is to develop a tailored care plan for improving patients' knowledge, skills, motivation, and assurance to manage their health [17].

Patient activation has been associated with a broad range of health-related outcomes such as patients' satisfaction, improvement of health care processes, receiving appropriate treatment, decrease in hospitalization, adherence to the treatment, and decline in health care costs [17, 18].

Patient activation is a modifiable and flexible process that could be increased or decreased over time [19, 20]. The literature review shows that factors such as age, gender, social and economic status, CKD stage, disease duration, and co-morbidities could influence the patients' activation in the hemodialysis [15].

Patient activation is classified into four levels. Level 1: patients feel overwhelmed by disease and they tend to be passive in managing their own health. Level 2: Individuals tend to engage in self-care but they lack the knowledge and confidence to manage their health. Level 3: Individuals begin to take actions to maintain and improve one's health, but they do not yet have sufficient skill and belief for self-care behaviors. Level 4: patients achieved sufficient knowledge and skill in managing their own health care and they have an active role in the management of the disease [21–23]. Identification of patient activation levels helps the health care providers to tailor patient care plans based on their activation level [21].

One of the other important concepts in caring for patients with chronic diseases which may influence patients' activation is self-efficacy [24]. Bandura describes self-efficacy as an individual's belief, expectations, and judgment in one's capability to organize and perform the sequences of action to produce specific performance achievements [25]. Moreover, self-efficacy is described as a set of abilities of an individual in overcoming obstacles in order to do specific behaviors of self-management [26]. Self-efficacy could affect all aspects of an individual's life [27], and enable them to do health-promoting behaviors and avoid health-threatening behaviors [28]. The literature review shows that factors such as age, gender [29], occupation [30], social support [31], living environment [32], and education could affect the individuals' self-efficacy [29]. According to the literature review, higher self-efficacy is associated with positive outcomes such as patients' adherence to treatment [33], successful management of symptoms [34], improved nurse-patient interaction [35], improvement of adaptation with the disease [36], decreased depression and stress [37], and promotion of health care [37, 38].

Self-efficacy is considered as the most important prerequisite for a wide range of health behaviors and behavior change [39]. The literature review highlights the importance of self-efficacy in self-care behaviors of patients with chronic kidney disease (CKD) and HEMODIALYSIS [40, 41]. In a study on 218 HEMODIALYSIS patients in Beijing, Li et al. [42] found a positive relationship between self-efficacy and overall self-management and self-care behaviors. Moreover, a study done by John et al. [43] showed a strong correlation of self-efficacy with daily fluid and nutritional restrictions and self-efficacy. In a recent study, Ghodsian et al. [5] highlighted the importance of shared decision-making in the care of patients with CKD and HEMODIALYSIS.

Health care providers, especially nurses, could play the main role in improving patients' activation in loge term disease [44]. According to Jerofke et al. [45], nurses should encourage and support patients with chronic disease to be active in decision-making and their own health care, improve patients' knowledge and skills, and help them to collaborate with other health care providers with the goal of improving patient activation.

Although patients' activation has been studied in some chronic diseases, the literature review shows that this issue is less investigated in CKD patients undergoing hemodialysis [46]. Findings from a recent study in Australia showed that patient activation was low in patients with CKD [15]. The emerging studies highlight the essential role of patients' activation in the management of CKD [17, 47]. Patient activation in CKD is increasingly

being prioritized, and it is considered as a quality metric in CKD [48].

Patients with HEMODIALYSIS deal with multifaceted difficulties related to the complications of disease and dialysis modality that need active self-management behaviors from the CKD patients [49]. A literature review shows that patients' self-efficacy is a crucial factor for the successful management of chronic diseases such as CKD [26]. It seems that hemodialysis patients with better self-efficacy show an improved likelihood to get involved in self-management behaviors [34]. A previous study has shown a positive association between self-efficacy and self-management in patients with CKD [50]. But, there is almost no study about the association between the HEMODIALYSIS patients' self-efficacy and patient activation. Given the importance of patients' activation in improving the quality of chronic disease care, this study aimed to assess patient activation level and its relationship with self-efficacy among patients undergoing hemodialysis.

Methods

Design

This study is a cross-sectional study that has been carried out in the largest hemodialysis center in Iran (Imam Reza dialysis center) affiliated with Tabriz University of Medical Sciences, Tabriz.

This study was approved by the Ethical Review Board at Tabriz University of Medical Sciences (code: 1399, 569). All methods were carried out following relevant guidelines and regulations such as the guideline for cross-sectional studies (STROBE Statement).

Sample and setting

This study was done in the largest hemodialysis center in Iran (Imam Reza dialysis center) located in the northwest of Iran. About 340 patients are undergoing hemodialysis in this center. Krejcie & Morgan's sampling table was used to estimate the sample size of the research (30). A total of 180 patients undergoing maintenance hemodialysis were selected by the random sampling method. A lottery method of sampling was used in this study. For this, a number was given to each member of the population. Then, the numbers were drawn randomly from the box to choose the samples. Inclusion criteria consisted of all CKD patients with age greater than 18 years old who undergoing maintenance hemodialysis at least three time a week. Patients with acute kidney injury (AKI) and patients who have cognitive or mental problems were excluded from the study. Eligible patients entered the study after obtaining informed consent from the participants.

Data collection

Data were collected by demographics, patient activation measure (PAM), and chronic kidney disease self-efficacy (CKD-SE) scale. The PAM was developed by Hibbard et al. [51], and it consists of 13 questions. This is a valid and reliable scale for measuring patient activation in nephrology The answers in the PAM are based on five points Likert scale including absolutely disagree (1), disagree (2), agree (3), absolutely agree (4), and not applicable (no score). Total raw scores varied between 13 and 52. The lower scores show low activation, and higher scores indicate high activation [48]. Based on the scoring instruction proposed by Hibbard et al. [51], the overall score of activation was standardized to a 0–100 and divided into four levels of activation (The higher levels indicating high activation): disengaged and overwhelmed (level 1 = score ≤ 47); becoming aware in self-management tasks (level 2, score 47.1–55.1); taking action (level 3, score 55.2–67); and maintaining behaviors and pushing further (level 4, score > 67.1).

The validity and reliability of the PAM have been assessed in previous studies and its Cronbach's alpha coefficient was 87% [51]. In this study, the reliability and validity of the Persian version of the PAM scale were investigated based on content validity. For this purpose, after translation and back-translation of the scale by an expert in English and Persian, the scale was provided to 10 faculty members of the school of nursery and midwifery and their comments were used to modify the questionnaire. Cronbach's alpha coefficient of 91%.was achieved for the Persian version of the PAM.

The Chronic kidney disease self-efficacy (CKD-SE) scale developed by Lin et al. [26] in 2012 was used for assessing the self-efficacy of patients undergoing hemodialysis. This scale consists of 25 items with four domains including autonomy (8 questions), self-integration (7 questions), problem solving (6 questions), and seeking social support (4 questions). The responses varied from completely uncertain (score = 0) to completely certain (score = 10). The total score ranged from 0 to 250. The higher score represents the higher self-efficacy in each domain. Reliability and validity of the Persian version of CKD-SE have been assessed by Baghaei-Lakeh et al. with reporting a Cronbach's alpha coefficient of 95% which represents the higher reliability of the scale [52]. In this study, Cronbach's alpha coefficient of CKD-SE was achieved as 93%.

Data analysis

Collected data were analyzed by statistical package SPSS (ver. 26) software using ANOVA, T-test, Pearson correlation coefficient tests, and multiple regression analysis.

Moreover, descriptive data were shown in tables using descriptive analysis such as M ± Sd. p-value < 0.05 was considered as the significance level.

Results

Background characteristics of the patients

A total of 180 patients undergoing HEMODIALYSIS participated in this study. The majority of them (109 patients) were men. The mean age of the participants was 58.86 ± 16.11 years old, and the majority of them were married (80.6%). The mean duration of hemodialysis was 3.69 ± 2.55 years (Table 1). Regarding the etiology of CKD, most factors were related to hypertension (53.9%) and diabetes mellitus (17.2%) (Table 2).

Factors affecting patients' activation

The mean score of patient activation in a possible range of 0–100 was 56.25 ± 16.77%. The majority of the participants (35%) were at level 1 of activation and only 28.9% of the individuals were at level 4 activation (Table 3).

Table 1 Demographic characteristics of patients ($N = 180$)

Variables	Mean ± SD
Age (years)	58.86 ± 16.11
Time since first dialysis (years)	3.69 ± 2.55
	N(%)
Gender	
Male	109(60.6)
Female	71(39.4)
Marital status	
Single	9(5)
Married	145(80.6)
Widow	26(14.4)
Education level	
Illiterate	79(43.9)
Elementary school	36(20)
Junior high school	19(10.6)
Diploma	27(15)
licentiate	15(8.3)
Master of science	4(2.2)
Living in	
City	150(83.3)
Village	30(16.7)
Income	
< 10 million Rials	4(2.3)
10–20 million Rials	33(18.3)
20–30 million Rials	107(59.4)
> 30 million Rials	36(20)
History of renal transplantation	
Yes	21(11.7)
No	159(88.3)

Table 2 Etiology of ESRD in patients undergoing HD

Etiology	*N*(%)
Hypertension	97(53.9)
Diabetes	31(17.2)
Glomerulonephritis	8(4.4)
Polycystic	11(6.2)
Stone	6(3.3)
Autoimmune	5(2.8)
Multiple myeloma	4(2.2)
Trauma	1(0.6)
Others	17(9.4)
Total	180(100)

Results showed that the mean score of patients' activation was not statistically different regarding variables of gender and treatment duration ($p > 0.05$). Independent t-test showed that the mean score of activation of individuals who live in the city (30.39 ± 8.59) is greater than those who live in the rural (23.53 ± 7.06). In addition, individuals with a history of kidney transplantation (34.95 ± 5.97) had higher activation compared with those who had no history of kidney transplantation (28.50 ± 8.76) ($p < 0.05$). ANOVA test also showed that the mean score of activation of single individuals (37.33 ± 6.80) was higher than married (29.87 ± 8.69) and widows (22.96 ± 5.23) ones ($p < 0.05$). The analysis showed that patients with higher education had a higher activation score ($p < 0.05$) (Table 4).

Based on analysis by Pearson correlation test, there was a significant negative association between patients' age and mean score of activation ($r = -0.48$, $p < 0.05$). Moreover, the results showed a statistically significant difference based on patients' income. The analysis showed that individuals with higher income had a higher mean score of activation ($p < 0.05$).

Patients' perception of self-efficacy

According to the results, the mean score of self-efficacy in patients undergoing hemodialysis in a possible range

Table 3 Levels of patient activation in patients undergoing hemodialysis

Patient activation measure (0–100)	*N*(%)	Mean ± SD
Level 1 (score ≤ 47)	63(35)	
Level 2 (score 47.1–55.1)	26(14.4)	
Level 3 (score 55.2–67)	39(21.7)	
Level 4 (score > 67.1)	52(28.9)	
Total score of patient activation		56.25 ± 16.77

Table 4 Comparison of mean score of patient activation based on patients' characteristics ($N=180$)

Variables	Mean ± SD	*p*-value
Gender		
Male	29.76 ± 8.52	0.331
Female	28.46 ± 9.02	
Marital status		
Single	37.33 ± 6.80	< 0.001
Married	29.87 ± 8.69	
Widow	22.96 ± 5.23	
Education level		
Illiterate	23.49 ± 5.66	< 0.001
Primary education	23.05 ± 7.11	
High school education	32.58 ± 5.81	
Diploma	36.59 ± 6.00	
University education	46.25 ± 3.30	
Living in		
City	30.39 ± 8.59	< 0.001
Rural	23.53 ± 7.06	
Income		
< 10 million Rials	28.50 ± 2.52	< 0.001
10–20 million Rials	24.33 ± 7.00	
20–30 million Rials	28.48 ± 8.06	
> 30 million Rials	36.14 ± 8.54	
History of renal transplantation		
Yes	34.95 ± 5.97	< 0.01
No	28.50 ± 8.76	

of 0–10 was 5.50 ± 1.45. The minimum and maximum score of self-efficacy was related to subscales of problem solving (3.64 ± 2.55) and seeking social support (6.58 ± 2.08), respectively (Table 5). Pearson correlation coefficient showed a significant positive association between the mean score of activation and all subscales of self-efficacy and total score ($p<0.05$) (Table 6).

Multiple regressions on factors affecting patient activation

A multiple regression analysis was performed to predict patients' activation based on the demographic and clinical variables. The multiple linear regression model of the patients' activation is shown in Table 5. Patients' Age, gender, marital status, education level, income, living with, work status, income, history of kidney replacement therapy, etiology of CKD, Kt/v, and self-efficacy were included as independent variables. The analysis showed that factors including patients' educational level, marital status, and self-efficacy were significant predictors of change in patient activation ($R^2=0.85$, adjusted $R^2=0.66$, $p<0.001$). According to the analysis, the R^2 of this model was 0.66. It means that about 66% of the variance of patient activation could be explained by these variables (Table 7). Moreover, the results showed that self-efficacy was the main predictor of patient activation ($\beta=0.49$, $p<0.001$) (Table 7).

Discussion

Activation is an important concept in the management of chronic diseases that emphasizes individualized care and considers patients and their families as important members of the health care team [53, 54]. Moreover, the caring needs of patients are different based on their activation level and interventions should be designed and tailored based on the patients' knowledge and skills [55]. Therefore, recognition of individuals' activation level

Table 5 Mean score of Self-efficacy in patients undergoing HD

	Mean	SD	Minimum score	Maximum score
Autonomy subscale	5.77	1.39	2	9
Self-integration subscale	5.99	1.63	2.43	10
Problem solving subscale	3.64	2.55	0	9.83
Seeking social support subscale	6.58	2.08	0.25	10
Total score of self efficacy	5.50	1.45	2.46	9.23

Table 6 The correlation between mean score of patient activation and self efficacy

	Autonomy	Self-integration	Problem solving	Seeking social support	Total score of self efficacy
Total score of patient activation	$r=0.402$ $p<0.001$*	$r=0.716$ $p<0.001$*	$r=0.841$ $p<0.001$*	$r=0.216$ $p=0.004$*	$r=0.76$ $p<0.001$*

*Correlation is significant ($p<0.05$)

Table 7 Results from multivariate regression analysis of patient activation ($n = 180$)

Independent variables	*B*	SE	Beta (*β*)	*p*	95% CI for *B*	
					Lower	Upper
(Constant)	14.89	5.42		0.007	4.1	25.6
Age	− 0.02	0.041	− 0.04	0.601	− 0.10	0.06
Gender						
Male						
Female	0.36	1.6	0.02	0.822	− 2.8	3.52
Marital status						
Married						
Single	− 4.16	2.46	− 0.10	0.092	− 9.02	0.69
Widow	− 4.64	1.83	− 0.19	0.012*	− 8.25	− 1.03
Education level						
Illiterate						
Elementary school	1.35	1.22	0.06	0.272	− 1.07	3.76
Junior high school	3.43	1.71	0.12	0.047*	0.05	6.82
Diploma	6.28	1.73	0.26	0.000*	2.85	9.71
Bachelorette degree	6.54	2.43	0.21	0.008*	1.74	11.34
Master of science	8.74	3.47	0.15	0.013*	1.88	15.60
Living in						
City						
Rural	− 1.62	1.17	− 0.07	0.170	− 3.93	0.70
Living status						
Living alone						
Living with family	− 2.33	1.97	− 0.08	0.239	− 6.22	1.56
Work status						
No work						
Full time work	2.11	2.38	0.06	0.377	− 2.59	6.81
Part time work	1.67	1.71	0.09	0.329	− 1.70	5.05
Retired	− 0.67	1.92	− 0.03	0.726	− 4.47	3.13
Income						
< 10 million Rials	− 1.91	3.09	− 0.03	0.538	− 8.01	4.20
10–20 million Rials	− 1.01	1.24	− 0.04	0.414	− 3.46	1.43
20–30 million Rials						
> 30 million Rials	0.11	1.23	0.00	0.93	− 2.33	2.55
History of KT						
Yes						
No	0.76	1.52	0.03	0.617	− 2.25	3.78
History of PD						
Yes	− 2.60	3.89	− 0.03	0.505	− 10.29	5.08
No						
Etiology of CKD						
Hypertension						
Diabetes mellitus	− 0.97	1.10	− 0.04	0.378	− 3.15	1.20
Glomerulonephritis	− 2.01	1.97	− 0.05	0.309	− 5.92	1.89
Autoimmune disease	3.56	2.77	0.07	0.200	− 1.91	9.03
Polycystic disease	1.12	1.82	0.03	0.539	− 2.47	4.71
Nephrolithiasis	− 0.75	2.35	− 0.02	0.749	− 5.40	3.89
Trauma	− 5.14	5.27	− 0.04	0.331	− 15.54	5.27
Other	0.05	1.49	0.00	0.971	− 2.9	3.01
Duration of HD	0.10	0.17	0.03	0.578	− 0.25	0.44
Kt/v	− 0.96	0.87	− 0.05	0.272	− 2.68	0.76
Self-efficacy	0.12	0.02	0.49	0.0001*	0.08	0.15

Table 7 (continued)

$R^2 = 0.85$, adjusted $R^2 = 0.66$, SE = 5.08, $F(31, 148) = 12.24$, $p < 0.001$

RT Renal transplantation, *PD* Peritoneal dialysis, *HD* Hemodialysis

*$p < 0.05$

could improve the quality of health care and decrease the treatment costs [56, 57]. There is growing evidence that patients with a higher level of activation have better health-related outcomes [58]. Furthermore, healthcare costs are lower in these persons due to their engagement in healthy behaviors, fewer visits to emergency departments, a lower rate of rehospitalization and readmission to hospital after being discharged [59, 60].

According to the results, the mean score of activation was (56.25 ± 16.77) (out of the standardized score of 0–100). In terms of activation levels, 35% of participants were at level 1 activation, 14.4% at level 2, 21.7% at level 3, and 28.9% at level 4 activation. In a study conducted by Bulck et al. [46], the mean score of activation was 51.10 ± 10 and the majority of individuals were at level 1 activation (44%). This result is in line with our findings. In another study conducted in the USA by Velez-Bermudez et al. [19], the mean activation score was achieved as 65.02 ± 16.60; which activation score is greater than our study. They included patients with advanced renal impairment who were not receiving renal replacement therapy. It seems that hemodialysis as a renal replacement therapy could impact patients' activation level and the lower score of patient activation in HEMODIALYSIS patients could be explained by this. Other reasons for these differences could be related to the differences in context, facilities of hemodialysis centers, and patients' education in these studies. In our dialysis center, although patients are educated for self-care and dialysis related complications, the educations are not tailored based on the patients' activation level. In addition, patient activation measure is not routine care in dialysis centers of Iran [5].

Results of the study showed that the mean activation score does not differ based on variables of gender and treatment duration. Similar to our findings, a study conducted in Belgium by Bulck et al. [46], showed no significant statistical difference among activation score and variables of gender and time since the first dialysis in patients undergoing hemodialysis. A cross-sectional study by Zimbudzi et al. [15] showed no significant differences between males and females. However, worse self-reported health in the mental subscale was correlated with lower activation in participants who were male. Moreover, they found that greater renal impairment in women correlated with a lower activation score. The authors argued that compared with men, women tend to have lower physical activity and they receive less support from their caregivers which could lead to lower activation.

According to our findings, the mean activation score showed a significant statistical difference based on marital status, habitat in city or rural, educational level, history of a kidney transplant, and patients' age. Individuals who live in the city have higher activation rather than those who live in the rural. We could not find any study which investigates the effect of habitant on patient activation.

In this study, patients with higher education level showed a higher activation score. This finding is in line with results reported by Curtin et al. [50]. It seems that individuals with higher educational levels has more information on their disease, and consequently try to engage actively in their own self-care. A recent study conducted in Sweden by Hellstrom et al. [61] showed that patients with higher educational levels had more activation. Moreover, in a study in Belgium, Van Bulck et al. [46] found that patients with primary education had lower activation scores compared to participants with a university degree. These findings support our results. These findings support our results. Mitchell et al. [20] believe that higher education levels could play a critical role in increasing patients' activation.

In a large cross-sectional survey on older people with long-term conditions, a higher level of education was found to be associated with higher patient activation [22]. Previous studies have shown that patients with long-term conditions experience greater problems in understanding health information than the healthy population and have greater difficulties engaging with their health care [62, 63].

Results of our study indicate that the mean score of activation of individuals with a history of kidney transplantation [6] is higher than those with no history of KT. Similar to our findings, a study on patients undergoing hemodialysis treatment showed that individuals with a history of kidney transplantation had higher activation scores than others [46]. Additionally, in a review study, Nair et al. [48] found that activation of individuals with a history of kidney transplantation is more than those without a history of kidney transplantation. This finding is in line with our findings.

Our results showed that the income of individuals affects their activation indicating that individuals with higher income had higher activation. Similar to our results, Greene and Hibbard [57] and Solomon et al.

[64] found that activation in individuals with a higher income is greater than those with low income. However, a study in Australia on patients with comorbid diabetes and chronic kidney disease showed no association between patients' socioeconomic status and activation level [15]. It seems that patients' income is a confounding factor. When we used multiple regression analysis for controlling potential confounding variables, patients' income showed no significant relationship with patient activation.

Our findings showed a significant negative relationship between patients' age and their activation so that by an increase in age, activation is decreased. Consistent with our results, previous studies have shown that higher activation associates with lower age [46, 65, 66]. In this regard, Bos-Touwen et al. [67] argue that higher levels of activation improve the quality of life of patients and decrease the treatment cost, but this is not always possible and most patients aged greater than 65 years had not sufficient ability and tendency to have active role and engagement in health care.

In chronic diseases, management of problems and side effects of the disease depends on patients' self-efficacy and their engagement in self-care [68]. In the current study, the mean self-efficacy score of patients undergoing hemodialysis was 5.50 ± 1.45 (The possible score of 0 to 10). The results showed that the lowest and highest mean score belonged to the subscales of problem solving and seeking social support, respectively. In a study by Baghaie Lakeh et al. [52] on 73 patients undergoing hemodialysis, the mean score of self-efficacy was (5.9 ± 1.4). This results in line with our results. But, in their study, the self-integration subscale (6.8 ± 1.9) showed the highest score and the subscale of seeking social support (5 ± 2.2) showed the lowest score. These findings are inconsistent with our findings.

According to our results, the mean activation score showed a positive and significant association with all subscales of self-efficacy and with a mean total score of self-efficacy. Therefore, by increasing patients' self-efficacy, activation of patients will be increased. According to the literature review, there was no study that investigated the association between activation and self-efficacy in patients undergoing hemodialysis. However, Van Do et al. [69] investigated the association between activation, self-management and, self-efficacy in patients with heart failure. Results of their study which was conducted in patients with chronic diseases showed that patients with higher self-efficacy had higher levels of activation. This finding supports our finding.

Multiple regression analysis was performed to predict patients' activation. Our study found a group of characteristics that were associated with patients' activation such as self-efficacy, educational level, and marital status. These factors explained about 66% of the variance in the total score of the patient activation measure.

In a study on patients with diabetes and CKD, Zimbudzi et al. [15] used multiple regression to predict the patients' activation. The results showed that older age, lower self-care scores, and lower quality of life were independently associated with lower patient activation. In a recent study in Belgium on hemodialysis patients, 31% of the variance in patient activation was explained by variables such as older patients, living in a residential care home, without leisure-time activities, and a lower score of health [46].

According to the results, patients' self-efficacy was the main predictor of patient activation. In a study on 174 patients with CKD, Curtin et al. [50] found that patients' perceived self-efficacy was the main predictor of self-management behavior than were other demographic or health characteristics. This finding supports our results.

In a cross-sectional study in Palestine, Musa et al. [70] assessed the factors affecting self-efficacy and quality of life of patients on hemodialysis. They found that lower levels of education, a lower score of self efficacy, and a higher number of co-morbidities were significantly associated with the worst health-related quality of life.

In a cross-sectional study on patients with chronic disease, Schmaderer et al. [71] found a significant relationship between higher educational level and income with higher activation. However, they found no significant association between patients' age and activation score. Multivariate analysis showed that the patients' health literacy, engagement in chronic illness care, and satisfaction with social role predicted the patient activation significantly.

Another study by Poole et al. [72] on patients with multiple sclerosis (MS) showed that self-efficacy in patients at activation levels of 3 and 4 was more than those at levels of 1 and 2. This finding was in line with ours. It seems that by increasing self-efficacy, individuals accept the responsibilities of their health and try to actively engage in self-care.

Wu et al. [36] investigated the effect of self-efficacy on self-care in patients with CKD. Results of the study showed a significant positive association between self-efficacy and self-care activities. Emaliyawati and Sriati [73] argue that self-efficacy improves self-confidence and promotes self-care behaviors which could finally improve management of the disease.

Another study by Curtin et al. [50] on patients with CKD showed that there was a significant positive association between self-efficacy of patients and self-management. They found that higher self-efficacy reinforces self-management, adherence to treatment and,

performing self-care behaviors. Curtin et al. [50] believe that self-efficacy acts as the initiator of health-promoting activities and reinforces individuals' motivation. In contrast, Dixon et al. [74] argue that patients with lower activation levels have lower self-care behaviors due to a lack of knowledge and self-confidence. In a recent study on patients suffering from Chronic obstructive pulmonary disease (COPD), Yadav et al. [75] found a positive association between patient activation and self-management. As Velez-Bermudez et al. [19] argued, patient activation includes the ability in the independent management of health care, and when self-management increases the patients' activation will be increased. Moreover, Nair and Cavanaugh [48] highlighted the importance of assessing the patient activation in kidney disease. They argued that patient activation measure facilitates and supports the successful management of patients' kidney health.

Limitations

This study has some limitations. This cross-sectional study was carried out in one dialysis center, and it should be cautious when generalizing the findings to other contexts with linguistically and culturally diverse populations. Moreover, patient activation was studied from the perspective of patients. Therefore, a multicenter study which includes the patients' family, as well as healthcare providers could provide further insight in this regard. In addition, we only included the patients undergoing hemodialysis. Other studies are needed to better understand and compare the activation level between patients on hemodialysis and patients who receive other renal replacement therapies including peritoneal dialysis and kidney transplantation.

Conclusions

The findings showed that activation of patients undergoing hemodialysis was moderate and only 28.9% of the individuals were at level 4 of activation. Therefore, it is recommended that sufficient information regarding disease and self-care should be provided for all patients with CKD and their families, especially at the first stages of CKD. The results showed a positive significant association between self-efficacy and patient activation; therefore, empowerment of patients and improving their self-efficacy by education could improve patients' activation. For this purpose, engaging patients in selecting treatment choices and developing shared decision-making could help patients to become more activated in their care management. Finally, measuring patients' activation level at admission to the dialysis unit is recommended for all patients undergoing hemodialysis. By understanding a patient's level of activation, the health care providers and clinicians can more correctly understand the patients and help in providing more tailored strategies to improve the quality of care and meet patients' needs and allocate resources more efficiently. Furthermore, the patients with a higher level of activation could be recruited and encouraged as peer supporters for those with a lower level of activation scores.

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Author contributions

MG, RM, and ZS participated in study conception and design. RM collected the data. Data analysis and drafting of the article were done by RM, MG, and ZS. All authors read and approved the final manuscript.

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Availability of data and materials

The datasets used and/or analyzed during the current study available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

The approval for this study was obtained from the Regional Committee of Medical Ethics of Tabriz University of Medical Sciences (code: IR.TBZMED.REC.1399.5691). The informed consent was obtained from all subjects.

Consent for publication

Not Applicable.

Competing interests

The authors declare that they have no competing interests.

Author details

[1]Department of Medical Surgical Nursing, Faculty of Nursing and Midwifery, Tabriz University of Medical Sciences, Shariati-Jonubi St., Tabriz, Iran. [2]Medical Education Research Center, Health Management and Safety Promotion Research Institute, Tabriz University of Medical Sciences, Tabriz, Iran.

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