ORIGINAL RESEARCH

Influence Of Uncertainty, Depression, And Social Support On Self-Care Compliance In Hemodialysis Patients

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Purpose: This study was conducted to examine the associations among uncertainty, depression, social support, and self-care compliance in patients undergoing hemodialysis, and to identify the factors influencing self-care compliance.

Methods: A convenience sample of 152 patients receiving hemodialysis was selected. Data were analyzed using descriptive statistics, independent t-test, ANOVA, Pearson correlations, and hierarchical regression analysis with the SPSS 23.0 program.

Results: Participants performed a moderate level of self-care consisting of factors such as knowledge of hemodialysis, dietary knowledge of hemodialysis, dietary compliance with hemodialysis, and compliance with hemodialysis order. The self-care compliance of participants undergoing hemodialysis showed a significant relationship with depression, uncertainty, and social support. The factors significantly influencing self-care compliance were social support and occupation. These variables explained 24.9% of the variance in self-care compliance.

Conclusion: Findings from this study confirmed that uncertainty, depression, and social support are major factors affecting self-care compliance, and that the higher the patients' uncertainty, the lower their self-care compliance. Thus, interventions should be performed to reduce uncertainty and to improve self-care through accurate information and education on disease progression and self-care.

Keywords: self care, social support, uncertainty, renal dialysis

Introduction

End-stage renal disease (ESRD), the final stage of chronic kidney disease that exists in 8–16% of the population worldwide,[1] is characterized as irreversible impairments in kidney function, and its prevalence is increasing annually.[2,3] Hemodialysis is an important and commonly used renal replacement therapy (RRT) for ESRD patients.[4] According to the International Society of Nephrology, 2.62 million people received RRT to treat ESRD worldwide, of which most were treated with hemodialysis.

Although hemodialysis may help patients with chronic kidney disease to maintain their physical function and prevent complications, it is difficult to cure chronic kidney failure with hemodialysis alone, and the disease requires continued treatment and care.[5] Self-care for hemodialysis patients may require significant restrictions in lifestyle habits and behaviors,[6] yet only about 50.0% of patients adhere to recommended self-care strategies.[7,8]

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Factors that may influence hemodialysis patients' self-care compliance include the burden of a changed life, depression, social support, family support, hope, and knowledge, as well as complexity of their treatment.[9,10] Among these influencing factors, anxiety and depression are the major emotional reactions that prevent hemodialysis patients from effectively coping with disease and treatment,[5] and 40.2% of hemodialysis patients have been found to experience depression.[11,12] Severe depression is also associated with a lower level of compliance with treatment,[13] higher suicide risk,[12] and lower quality of life.[6] Nonetheless, social support reduces complications and mortality by facilitating health promoting behaviors, reducing stress, and helping individuals to adapt psychologically.[9] Social support also contributes to lowering hemodialysis patients' depression and suicidal ideation[11] as well as reducing uncertainty.[12] Kammerer et al[14] reported that support from health professionals is a major factor that contributes to self-care compliance.

Uncertainty, a concept originating from Mishel's uncertainty theory,[15] is recognized when a patient cannot accurately understand the implications of disease-related events or predict the outcomes of the disease.[15] For many hemodialysis patients, the inability to identify or predict treatment prognosis and disease progression may lead to a high level of uncertainty.[16] Uncertainty acts as a major source of stress for hemodialysis patients:[17] not only does uncertainty exacerbate psychological problems, such as depression, anxiety, and fear, experienced by patients during disease progression, but it also causes negative coping strategies and reduces self-care compliance.[16–18] In this regard, a nursing intervention that can identify and control hemodialysis patients' level of uncertainty could be applied to improve the patients' coping and self-care compliance.

Hemodialysis patients' self-care compliance is directly related to their health status and quality of life;[6] thus, it is necessary to develop an intervention program that increases the patients' self-care compliance. Although chronic disease patients' sociopsychological problems, such as depression, anxiety, social support,[11,13] and uncertainty,[12] have been reported as factors that influence self-care compliance, few studies have examined the relationship between hemodialysis patients' uncertainty and self-care compliance. Because uncertainty could act as a factor that causes negative emotions and ineffective coping behaviors during the disease process,[12] it is important to examine the effect of hemodialysis patients' uncertainty, along with social support and depression, on their self-care compliance.

Therefore, the major variables in this study stem from the general characteristics that were found to affect self-care practice in prior studies (sex, age, marital status, educational level, religion, employment status, income, regular exercise, hemodialysis period, weekly hemodialysis frequency, history of kidney transplantation, type of vascular access),[19–21] uncertainty,[16–18] depression,[9,10,13] and social support,[14,22] and we will assess how these variables affect self-care compliance among hemodialysis patients.

Methods

Design

This was a quantitative cross-sectional study performed in a renal replacement therapy unit in Korea.

Participants

Data collection took place from December 15, 2018 to March 31, 2019. Investigators visited 5 hospitals (2 general hospitals and 3 hemodialysis centers) to explain the purpose and methods of the study. Data collection was conducted by a principal investigator and a sub-investigator who received training on data collection procedures. No pilot study was conducted prior to the present study.

The sample size was calculated using the G*Power software program. With 0.80 set for statistical power (1-β), 0.05 for p-value (α), and a moderate level of 0.15 for effect size in regression analysis, the sample size required for 15 independent variables was calculated as 143 patients. Considering the dropout rate of 20%, we administered questionnaire to 171 patients. The inclusion criteria were as follows: age >19 years, able to communicate, and presence of cognitive ability to respond to the instrument. The following exclusion criteria were adopted: presence of comprehension deficit for filling the instrument, having started hemodialysis within the past 3 months, and having clinical hemodynamically unstable condition. We excluded 19 participants whose responses were missing for 4 or more items.

Tools

Uncertainty

We used a tool adapted by Jung[19] from Mishel's Uncertainty in Illness Scale (MUIS)[15] to examine uncertainty. The MUIS had a total of 33 items, which consisted of 4 sub-items of uncertainty (ambiguity, complexity, inconsistency, unpredictability) and other items. The MUIS used a 5-point Likert scale, in which a higher score represented a higher level of uncertainty. Cronbach's α was 0.91 at the time when

the tool was developed,[15] 0.08 in a study by Jang et al[23] that assessed uncertainty in hemodialysis patients, and 0.79 in the present study. At the time of development, construct validity was determined by differentiation of medical, surgical, and diagnostic patients; individuals with unconfirmed diagnoses had higher uncertainty scores.[24,25]

Depression

Depression was assessed using the Patient Health Questionnaire-9 (PHQ-9) originally developed by Spitzer et al[26] and adapted later by Shin et al[27] The tool had 9 items in total and used a 4-point Likert scale, in which a higher score represented a higher level of depression. Cronbach's α was 0.88 at the time when the tool was developed,[26] 0.92 in a study by Linda et al[28] that measured depression in hemodialysis patients, and 0.81 in the present study. At the time of development, the concurrent validity was verified using SF-20,[29] and it was verified as general health perceptions (r=0.55, $p<0.001$), social functioning (r=0.52, $p<0.001$), role functioning (r=0.43, $p<0.001$), physical functioning (r=0.37, $p<0.001$), and bodily pain (r=0.33, $p<0.001$).

Social Support

Social support was assessed in the present study using the Multidimensional Scale of Perceived Social Support (MSPSS) developed originally by Zimet et al[30] and adapted later by Shin and Lee.[31] The MSPSS had a total of 12 items, which consisted of support from family, significant others, and friends. The tool used a 5-point Likert scale, in which a higher score represented a higher level of social support. Cronbach's α was 0.85 at the time the tool was developed,[30] 0.92 in a study by Lee et al[32] that measured social support for hemodialysis patients, and 0.84 in the present study. At the time of development, the concurrent validity (r=−0.35, $p<0.002$) was verified using the Beck depression inventory.[33]

Self-Care Compliance

For the assessment of self-care compliance, the present study used a tool developed and validated by Lee and Lim[34] for hemodialysis patients. The tool had 30 items and used a 4-point Likert scale, in which a higher score represented a higher level of self-care compliance. Cronbach's α was 0.90 at the time the tool was developed[34] and 0.87 in the present study. At the time of development, validity was verified with a significant positive correlation (r=0.66, $p<0.001$) through concurrent

validity assessed using the self-care questionnaire on hemodialysis patients.

Ethical Considerations

Before collecting data, the present study obtained approval from the institutional review board (IRB) of the Daejeon university (1040647-201810-HR009-03) and written informed consent was obtained from all individual participants included. All investigations were conducted in accordance with the Declaration of Helsinki.

Statistical Analyses

Collected data were analyzed using the SPSS 23.0 statistics program. The differences in variables according to each participant's characteristics were evaluated using independent sample t-test and ANOVA. A Shapiro–Wilk test was conducted to check for normal distribution. The correlation was analyzed using Pearson's correlation coefficients. The factors that were hypothesized to influence self-care compliance were analyzed using hierarchical multiple regression analysis.

Results
Differences In Self-Care Compliance According To Participants' Demographics And Disease Characteristics

The average age of the participants was 53.28 (±11.17) years, and 97 were men (63.8%) and 55 were women (36.2%). Ninety-eight (64.5%) of the participants were married. In total, 97 (63.8%) of the participants were unemployed. The hemodialysis period ranged from 3 months to 322 months, the average being 81.26 months (±70.01). There were significant differences in self-care compliance based on educational attainment, religion, occupation, and family monthly income. In particular, the participants whose educational level was elementary school or less showed the lowest level of self-care compliance (F=3.08, $p=0.029$) (Table 1).

The weekly hemodialysis frequency was 3 in 145 (95.4%) participants and 1–2 in 7 (4.6%) participants. There was no significant difference in self-care compliance based on the HD frequency. There were 14 (9.2%) participants with a history of kidney transplantation, and 146 (96.1%) participants had hemodialysis through an arteriovenous fistula as the type of vascular access. There were no differences in self-care compliance based on the characteristics of hemodialysis (Table 1).

Table 1 Differences Of Self-Care Compliance According To Socioeconomic And Disease-Related Characteristics

Characteristics	Categories	n(%)	Self-Care Compliance	t/F (p)
			M±SD	
Gender	Male Female	97(63.8) 55(36.2)	75.02±14.01 78.83±15.66	−1.54(0.125)
Age(year)	≤39 40–49 50–59 ≥60	19(12.5) 40(26.3) 49(32.2) 44(28.9)	77.21±3.95 77.15±12.35 79.14±15.40 72.31±17.96	1.78(0.153)
	Range(year)=20~79. Mean ± SD=53.28±11.17			
Marital status	Single Married Others	41(27.0) 98(64.5) 13(8.5)	75.92±11.66 76.86±15.28 74.38±19.21	0.19(0.826)
Educational level	≤Elementary[a] Middle school[b] High school[c] ≥College[d]	18(11.8) 20(13.2) 67(44.0) 47(41.0)	68.66±8.97 75.05±24.05 76.00±12.58 80.51±13.01	3.08(0.029)
	Scheffe test (a, b, c, d)			a<d
Religion	Yes No	78(51.3) 74(48.7)	73.96±15.35 78.97±13.61	−2.12(0.035)
Employment status	Employed Unemployed	55(36.2) 97(63.8)	79.03±15.94 74.58±13.57	1.84(0.047)
Monthly household income(10,000won)	≤200 ≥201	91(59.9) 61(40.1)	74.13±14.12 79.79±15.00	−2.36(0.020)
Regular exercise	Do Do not	62(40.8) 90(59.2)	79.03±15.94 74.58±13.57	1.84(0.051)
Hemodialysis periods (year)	≤3 4~6 ≥7	50(32.9) 45(29.6) 57(37.5)	74.34±17.36 78.51±13.04 76.54±13.29	0.96(0.386)
	Range(month)=3~322, Mean ± SD=81.26±70.01			
Hemodialysis frequency/week	1–2 times 3 times	7(4.6) 145(95.4)	74.42±12.94 76.49±14.81	−0.41(0.925)
History of kidney transplantation	Yes No	14(9.2) 138(90.8)	74.42±10.49 76.39±15.06	0.01(0.271)
Type of vascular access	Arteriovenous fistula Arteriovenous Graft	146(96.1) 6(3.9)	74.49±14.85 74.50±11.00	0.32(0.611)

Levels Of Uncertainty, Depression, Social Support, And Self-Care Compliance In The Participants

The average self-care compliance score was 76.40 ± 14.70 (maximum: 120), and uncertainty score ranged from 33 to 165, with a mean value of 90.00 ± 11.63. The average depression score was 13.05 ± 4.85 (range: 0–27), and the average social support score was 44.19 ± 9.08 (range:

12–60). Among the sub-items of self-care compliance, the average score for dietary knowledge of hemodialysis and knowledge of hemodialysis were 20.86 ± 5.07 and 19.19 ± 4.97 (range: 4–28), respectively. The average compliance with hemodialysis and dietary compliance with hemodialysis scores were 17.28 ± 3.44 (range: 4–28) and 14.73 ± 4.11 (range: 4–24), respectively. The average compliance with hemodialysis score was 9.61 ± 2.70 (range: 4–12) (Table 2).

Table 2 Self-Care Compliance, Uncertainty, Depression And Social Support In Hemodialysis (N=152)

Variables		n(%)	M±SD	Range
Self-care Compliance	Dietary knowledge of hemodialysis		20.86±5.07	4–28
	Knowledge of hemodialysis		19.19±4.97	4–28
	Compliance with hemodialysis		17.28±3.44	4–28
	Dietary compliance with hemodialysis		14.73±4.11	4–24
	Compliance with hemodialysis order		9.61±2.70	4–12
	Total		76.40±14.70	30–120
Uncertainty			90.00±11.63	33–165
Depression	None	13(8.6)	13.05±4.85	0–27
	Mild	43(28.3)		
	Moderate	88(57.8)		
	Severe	8(5.3)		
Social Support			44.19±9.08	12–60

Correlations Between The Participant Uncertainty, Depression, Social Support, And Self-Care Compliance

Self-care compliance showed significant negative correlations with uncertainty (r=−0.25, p=0.002) and depression (r=−0.30, p<0.001) and a positive correlation with social support (r=0.32, p<0.001). This finding suggested that a lower level of uncertainty and depression and a higher level of social support were associated with higher levels of self-care compliance in the HD patients (Table 3).

Uncertainty had a significant positive correlation with depression (r=0.31, p<0.001) and a negative correlation with social support (r=−0.29, p<0.001). Depression and social support showed a significant negative correlation (r=−0.29, p=0.002) (Table 3).

Factors Influencing The Participants' Self-Care Compliance

We found no autocorrelation as the Durbin-Watson statistic was 1.77, which was closer to the baseline of 2. Tolerance ranged from 0.73 to 0.87, which exceeded 0.1, and the variance inflation factor (VIF) ranged from 1.03 to 1.38, which indicated no evidence of multicollinearity. In addition, the significance probability in the Shapiro–Wilk test ranged from 0.07 to 0.91, which satisfied the assumption of normality of distribution and homoscedasticity of residuals and was therefore fit for a regression analysis model.

For the analysis of factors that influenced the participants' self-care compliance, Model 1 used education level, religion, occupation, and household income, which showed significant correlations with self-care compliance as control variables. Model 1 revealed that the presence or absence of employment (β=0.38, p<0.001) had a significant effect, and its explanatory power was 18.1% (F=9.37, p<0.001). In Model 2, which included the independent variables, the explanatory power increased significantly to 24.9%, and when controlling for demographic characteristics, social support (β=0.20, p=0.013) was found to be the variable that influenced self-care compliance (F= 8.15, p<0.001) (Table 4).

Discussion

The present study was conducted to identify the uncertainty, depression, social support, and self-care compliance levels of ESRD patients undergoing hemodialysis. We examined correlations between these variables, and the factors that influenced self-care compliance were examined.

The results showed that the average self-care compliance score in hemodialysis patients was 76.40 points when

Table 3 Correlations Between Self-Care Compliance, Uncertainty, Depression And Social Support In Hemodialysis (N=152)

Variables	Self-Care Compliance						Uncertainty	Depression
	Total	DKH	KH	CH	DCH	CHO		
	r(p)	r(p)	r(p)	r(p)	r(p)	r(p)	r(p)	r(p)
Uncertainty	−0.25(0.002)	−0.21(0.007)	−0.30(<0.001)	0.16(0.055)	−0.22(0.006)	−0.180.021)	–	
Depression	−0.30(<0.001)	−0.38(<0.001)	−0.27(0.001)	0.09(0.292)	−0.25(0.002)	−0.17(0.034)	0.31(<0.001)	–
Social Support	0.32(<0.001)	0.34(<0.001)	0.25(0.002)	−0.09(0.227)	0.33(<0.001)	0.34(<0.001)	−0.29(<0.001)	−0.29(0.002)

Abbreviations: DKH, Dietary knowledge of hemodialysis; KH, Knowledge of hemodialysis; CH, Compliance with Hemodialysis; DCH, Dietary compliance of hemodialysis; CHO, Compliance of hemodialysis order.

Table 4 The Influencing Factors On Self-Care Compliance (N=152)

Variables	Model 1					Model 2				
	B	SE	β	t	p	B	SE	β	t	p
(Constant)	74.43	3.32		22.34	<0.001	74.47	12.51		5.97	<0.001
Educational level	1.58	2.66	0.05	0.59	0.554	−0.59	2.62	−0.02	−0.23	0.822
Religion§	−3.65	2.19	−0.13	−1.67	0.098	−3.51	2.10	−0.12	−1.67	0.097
Employment status	11.52	2.33	0.38	4.93	<0.001	10.68	2.23	0.35	4.67	<0.001
Household income§	−0.2.52	2.33	−0.08	−1.08	0.281	−0.89	2.32	0.03	−0.38	0.701
Uncertainty						−0.11	0.09	−0.08	−1.08	0.280
Depression						−0.32	0.27	−0.10	−1.10	0.244
Social Support						0.33	0.13	0.20	2.50	0.013
R^2	20.3					28.4				
Adj R^2	18.1					24.9				
F	9.37					8.15				
p	<0.001					<0.001				

Notes: §Dummy Variable: Education-≤middle school(1), ≥High School(0); Religion-Yes(1), No(0); Occupation-Yes(1), No(0); Family income- ≤200(1), ≥201(0).
Abbreviations: SE, Standard error; Adj, Adjusted.

converted into a maximum of 120. This score is similar to that in a previous study that measured hemodialysis patients' self-care.[35] Among the sub-items, dietary knowledge of hemodialysis received the highest score, followed by knowledge of hemodialysis. Compliance with hemodialysis and dietary compliance with hemodialysis, which represents self-care compliance in practice, scored lower than the aforementioned knowledge sub-items. These results are consistent with those from Park et al.'s study[20] on hemodialysis patients' self-care. These findings suggest that hemodialysis patients experienced difficulty in practicing self-care, despite having knowledge about self-care. Compliance with hemodialysis and dietary compliance with hemodialysis are essential for hemodialysis patients to properly manage their disease. Recently, Riegel et al[36] developed the middle-range theory of self-care of chronic illness and suggested that experience, skill, motivation, culture, confidence, habits, function, cognition, support from others, and access to care are the factors that have an effect on the self-care compliance of patients with chronic illness. The middle-range theory of Riegel et al[36] may serve as a useful tool to develop a program that enhances the self-care of hemodialysis patients, and an education program for hemodialysis patients needs to be developed and applied on the basis of such evidence.

The degree of uncertainty in hemodialysis patients was above the moderate level, and it had a negative correlation with self-care practice as well as with self-care compliance. These results are consistent with those from a previous study[35] that studied the relationship between hemodialysis patients' self-care and uncertainty. They are also similar to the results of another study on the uncertainty of patients re-admitted after coronary interventions,[37] which indicated that a higher level of uncertainty resulted in a lower level of patient compliance. hemodialysis patients experience a high level of uncertainty due to psychological problems, such as depression and anxiety, due to their condition and the treatment process because they cannot anticipate disease progression or the complications that may arise.[12,16] hemodialysis patients' uncertainty has a negative effect on self-care and health-promoting behaviors,[18] which contributes to deterioration in health status and negatively affects the individual's subjective perception of health.[21] Stiegelis et al[38] found that "ambiguity" was the most noticeable among other sub-items of uncertainty. Ambiguity intensifies when patients do not have enough information or knowledge about how to treat their disease, which can increase their uncertainty and cause negative treatment outcomes. Hence, to reduce hemodialysis patients' uncertainty and ultimately increase their level of self-care, health professionals should provide detailed explanations to patients about their disease

and treatment, and educate them from the beginning of treatment. This could decrease patients' uncertainty and ultimately increase their level of self-care.

This study found that 63.1% of participants had a moderate or high level of depression. The prevalence of depression reported in our study is comparable to that documented in previous investigations in Jordan (51.5%)[39] and China (45.9%).[40] Furthermore, depression had a positive correlation with uncertainty and a negative correlation with self-care compliance. Keshin and Engin's study[41] on depression, suicidal ideation, and coping strategies among hemodialysis patients found that the higher the level of depression, the stronger the suicidal ideation and the lower the level of coping strategies. As such, high levels of depression increase a patient's uncertainty and further hamper the compliance of self-care. Therefore, it would be important to develop and apply a psychological support program that can reduce hemodialysis patients' depression. A study that analyzed the relationship between the levels of depression and physical activity in hemodialysis patients showed that an increase in physical activity reduces depression.

The present study's regression analysis of the variables that influenced hemodialysis patients' self-care compliance showed that social support and the presence or absence of employment had a significant effect. This finding indicates that a higher level of social support and being employed are more likely to increase self-care compliance. This finding that social support had a significant effect on hemodialysis patients' self-care is similar to that of Cha's study[22] on the structural model of hemodialysis patients' self-care, which showed that support from family, friends, fellow patients, as well as from health professionals had the biggest effect on self-care behaviors. In addition, Simmons[42] found that a higher level of support from health professionals led to a higher level of self-care compliance. These results strongly suggest that various coping strategies, such as establishing a support system with family and health professionals beyond simply improving behaviors related to the disease are necessary to increase self-care compliance. Although these individuals represent a vulnerable group and need substantial social and institutional support to increase self-care compliance, this finding demonstrates a lack of connection between health services and local community support services.

Limitation

This study has some notable limitations. First, since this was a cross-sectional study that enrolled a relatively small

number of adult patients with ESRD treated by hemodialysis, the probability of identifying additional risk factors was low. Future research should analyze data from a larger sample of participants and study self-care compliance at various levels in order to assess the influence of various hemodialysis-related characteristics on self-care compliance. Second, previous studies[18,43] report that uncertainty evaluation had a significant correlation with the participants' coping strategies. Hence, a follow-up study should more closely examine hemodialysis patients' level of uncertainty, uncertainty evaluation, and coping strategies.

Conclusion

The findings from this study are significant as they highlight the relationship between hemodialysis patients' self-care compliance, uncertainty, depression, and social support. hemodialysis patients were found to experience moderate levels of uncertainty, which had a positive correlation with depression and was a factor that impeded compliance with self-care. These results suggest that thorough discussion, education, and information about the treatment process and decision-making during the early stage of hemodialysis, as well as support from close relationships, could reduce participants' uncertainty and ultimately contribute to increasing their self-care compliance and health status.

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