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The Effects of Elderly Diabetic Patients' Self-Care Agency on their Self-Care Behavior

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Abstract

Background/Objectives: To survey elderly diabetes mellitus patients' self-care agency and self-care behavior, analyze the relationship between the two, and provide information for programs to improve elderly diabetes mellitus patients' self-care behavior. **Methods/Statistical Analysis:** The subjects of this study were 222 elderly diabetes mellitus patients aged over 60 who had been diagnosed with diabetes mellitus and were under treatment for the disease, and were using a senior welfare center. Data were collected from September to November, 2013. **Findings:** Among the patients' demographic characteristics, age, whether to have a spouse, economic status, and cohabitation type made a difference in the score of self-care agency; age, whether to have a spouse, economic status, cohabitation type, and smoking made a difference in the score of self-care behavior. Among the diabetes-related characteristics, diabetes duration and diabetes education made a difference in the score of self-care agency; diabetes duration, self-monitoring of blood glucose, and diabetes education made a difference in the score of self-care behavior. Elderly diabetes mellitus patients' self-care agency was in a significant positive correlation with their self-care behavior ($r=.82$, $p<.001$). That is, self-care behavior was higher when self-care agency was high. According to the results of hierarchical regression analysis, the explanatory power of self-care agency was 77% ($p<.001$), showing that self-care agency is a powerful influencing variable for self-care behavior. **Applications/Improvements:** The findings of this study suggest that programs for enhancing elderly diabetes mellitus patients' self-care agency should be developed and applied in order to improve their self-care behavior.

Keywords: Diabetes, Self-Care, Self-Care Agency, Self-Care Behavior

1. Introduction

The development of medicine and science-technology, rising standard of living, and extended life expectancy are leading the contemporary society rapidly into an aged society. According to the National Health and Nutrition Survey in 2013, the pattern of elderly diseases is also evolving from acute infectious diseases to chronic degenerative diseases, and 88.5% of the elderly population is reported to have one or more chronic diseases[1]. Among chronic diseases, diabetes mellitus is reported as a representative disease that increases mortality by inducing complications, causes many functional disorders, and has negative impacts on the quality of life[2]. The prevalence of diabetes among the elderly population is increasing throughout the world[3], and it is 22.7% in the Korean elderly population aged over 65. Moreover, diabetes mellitus is reported to be the 5th major cause of death in the aged, and this requires the awareness of the importance and necessity of diabetes management. Patients with diabetes mellitus can lead a normal healthy life by preventing and managing complications through drug therapy, dietary therapy, exercise therapy, etc[4]. Therefore, elderly diabetic patients should live a quality life through the practice of desirable self-care behavior[5]. With the reduced amount of activities and impaired cognitive abilities induced by aging, however, elderly diabetes mellitus patients tend to have difficulty in learning skills for managing diabetes

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mellitus and doing required self-care behavior and, as a result, they continue to be admitted to the hospital and in the course they often experience the aggravation of the disease and delayed recovery. If an elder with diabetes mellitus neglects self-care, he/she may fall into a coma or suffer risky complications such as visual impairment, cardiovascular disease, and skin infection[5]. If hyperglycemia continues, it not only damages the eyes, kidneys, and nerves but also causes complications such as stroke, angina, myocardial infarction, and peripheral vascular diseases[6], and consequently, raises serious health problems as well as social and economic problems[7,8].

However, elderly diabetic patients' self-care is not satisfactory[9] and previous studies on adult diabetic patients' self-care assessed only diabetic patients' self-care behavior, which is merely a part of self-care[10,11]. In the current situation with few previous studies on the relationship between self-care agency and self-care behavior in elderly diabetic patients, it is necessary to survey the current state of elderly diabetic patients' self-care agency and self-care behavior.

Thus, this study purposed to survey self-care agency and self-care behavior among elderly diabetic patients who were using A and D Senior Welfare Centers and G Health Center in J Province, to analyze the relationship between self-care agency and self-care behavior with controlling for general characteristics, and ultimately to get basic information for nursing interventions to enhance elderly diabetic patients' self-care behavior.

2. Method

2.1 Design

This study was conducted as a descriptive survey to grasp the levels of elderly diabetic patients' self-care agency and self-care behavior and the relationship between the two variables, and based on the findings, to make nursing strategies for enhancing elderly diabetic patients' self-care behavior and to provide basic information for developing materials to be included in self-care interventions and education programs.

2.2 Subjects

The subjects of this study were sampled from elders who were living in J Province, Korea, aged over 60, and able to communicate, and questionnaires collected from 222 elders who understood the purpose of this study and signed a written consent to participate in the study were used as valid data. The required sample size for this study was estimated using G*power 3.1, and it was 200 with significance level of 0.05, 80% power of test, and effect size of 0.25.

2.3 Instruments

- Elderly diabetic patients' self-care agency was measured with the self-care agency scale consisting of 33 items, which was developed[12] through revising the 40 items of the Self-as-Care Inventory (SCI) developed[13]. Each of the items is answered on a 6-point equal-interval Likert scale, and a high score means a high level of perceived self-care agency. The reliability (Cronbach's Alpha) of the scale was 0.96 originally when it was developed with 40 items by Geden and Taylor (1988), and 0.92 when it was revised by So Hyang-sook (1992), and its internal reliability was 0.98 in this study.
- Elderly diabetic patients' self-care behavior was measured with the self-care behavior scale consisting of 20 items developed[14]. Each of the items is answered on a 5-point Likert scale, and a high score means a high level of self-care behavior. The reliability (Cronbach's Alpha) of the scale was .84 in Kim Yeong-ok's study, and its internal reliability was .94 in this study.

2.4 Data Collection Method

Data were collected for 40 days from September 15 to October 25 in 2013, and the present researcher and two assistants who had gone through a specific process of training conducted a survey through 1:1 interviews using a questionnaire. The survey interviewed 240 elders who agreed to participate in the survey, and 225 questionnaires were recovered (response rate: 94%). With three questionnaires excluded for insincere answers, a total of 222 questionnaires (93%) were used as valid data in analyses.

2.5 Ethical Considerations

This study was conducted under the approval of the Institutional Review Board of Chonbuk National University (2013-09-004). The questionnaire survey was conducted with those who voluntarily gave informed written consent. It was informed that their answers would

be kept confidential, processed anonymously, and not be used for any purpose other than this research, and the researcher's name and contact information were provided on the written consent form. This study was conducted ethically for the subjects by letting them to sign the written consent form before answering the questionnaire.

2.6 Data Analyses

Collected data were analyzed using SPSS/WIN 20.0. The subjects' general characteristics, self-care agency, and self-care behavior were analyzed through descriptive statistics. Differences in self-care agency and self-care behavior according to the subjects' general characteristics were analyzed through *t*-test, and one-way ANOVA, and Scheffe's test was used for post-hoc test. Correlations among the research variables were tested using Pearson's correlation coefficients, and the predictive power of factors influencing the subjects' self-care behavior was assessed through hierarchical regression.

3. Results

3.1 Self-Care Agency According to General Characteristics

Of the subjects, 46.40% were male while 53.60% were female, and 31.5% were at the age of 70-74. In addition, 48.6% had a spouse. The most common economic status was 'Average' (59.5%), and the most common cohabitation type was living with the spouse (48.2%). Drinking frequency was 1-2 times a week in 33.8%, and smoking frequency was 'Every day' in 13.1%, and 'Occasionally' in 14.0%. The most frequent diabetes duration was 121-180 months or 10~15 years (33.8%). Many (53.2%) of the subjects had never been educated on diabetes, and as to self monitoring of blood glucose, 23.4% were testing blood glucose regularly and 44.1% were occasionally. The perceived reason for difficulty in diabetes management was 'The disease is intractable' in 39.6%, and 'Time and money are not enough' in 25.7% (Table 1).

3.2 Self-Care Behavior According to General Characteristics

As to elderly diabetic patients' self-care behavior according to general characteristics, the score of self-care behavior showed a statistically significant difference according to age ($F = 5.16$, $p<0.001$), whether to have a spouse ($t = 5.27$, $P<0.001$), economic status ($F = 12.75$, $p<0.001$), cohabitation type ($F = 9.95$, $p<0.001$), and smoking ($t = 2.65$, $p<0.001$), but not according to gender or drinking. In the results of a post-hoc test (Scheffe's test) on differences among groups by age, economic status, and cohabitation type, the score of self-care behavior was higher in younger elders, in those whose economic status was high, and in those living with the spouse, and lower in those who were smoking. Accordingly, self-care behavior is believed to be higher in younger elders, those having a spouse, those whose economic status is high, those living with the spouse, and those who do not smoke.

As to elderly diabetic patients' self-care behavior according to diabetes-related characteristics, the score of self-care behavior showed a statistically significant difference according to diabetes duration ($F = 8.54$, $p<0.001$), self monitoring of blood glucose ($F = 3.59$, $p = 0.029$), perceived reason for difficulty in diabetes management ($F = 5.34$, $p<0.001$), and diabetes education ($t = -4.98$, $p<0.001$). In the results of a post-hoc test on differences in self-care behavior among the groups by diabetes duration, self-care behavior was poorer in those whose diabetes duration was 60 months or shorter. According to self monitoring of blood glucose, the score of self-care behavior was higher in those who were monitoring blood glucose regularly or occasionally than in those who did not monitor blood glucose. With regard to perceived reason for difficulty in diabetes management, self-care behavior was poorer in those who had difficulty in diabetes management because of lack of management skills or not enough time and money. In addition, self-care behavior was better in those who had diabetes education. That is, self-care behavior is believed to be better in those whose diabetes duration is long, those who had diabetes education, and those who do not perceive diabetes management to be difficult (Table 1).

3.3 Differences in Self-Care Agency and Self-Care Behavior According to General Characteristics

As to elderly diabetic patients' self-care agency according to general characteristics, the score of self-care agency showed a statistically significant difference according to gender (-2.58, $p =.011$), age ($F = 8.71$, $p<.001$), whether to have a spouse ($t = 5.73$, $p<.001$), economic status ($F =$

Table 1. Differences in Self-care agency and Self-care behavior according to general characteristics (N=222)

Characteristics	Categories	n(%)	Self- Care Agency		Self- Care Behavior	
			M ± SD	F/t(p)/scheffe	M ± SD	F/t(p)/scheffe
Gender	Male	119(53.6)	127.04±33.38	-2.580(0.011)*	65.51±15.70	-8.440(0.399)
	Female	103(46.4)	138.24±30.89		67.26±15.03	
Age(year)	65-74 a	68(30.6)	140.89±29.54	9.522(<0.001)***	68.44±15.07	9.522(<0.001)**
	75-84 b	122(55.0)	132.84±30.29		67.52±13.96	a, b> c
	≧85 c	32(14.4)	111.53±39.09		57.25±18.29	
Spouse	Yes	108(48.6)	120.96±33.80	5.737(<0.001) ***	61.37±15.79	5.277(<0.001) ***
	No	113(50.9)	144.39±26.63		71.67±13.03	
Economic Status	Low a	63(28.4)	108.69±29.62	36.803(<0.001) ***	56.50±14.44	24.996(<0.001) ***
	Moderate b	132(59.5)	137.87±28.22	c> d > a	68.94±14.10	c> d > a
	High c	27(12.2)	159.59±26.10		76.40±11.72	
Living Arrangement	Living with child a	29(13.1)	114.24±28.62	10.257(<0.001) ***	58.96±13.14	9.953(<0.001) ***
	Living with spouse b	107(48.2)	143.47±29.60	b> a, c	71.61±13.90	b> a, c
	Living alone c	82(36.9)	123.62±32.85		61.81±15.67	
	Other d	4(1.8)	136.75±33.26		70.50±16.29	
Drinking	No	111(50.0)	131.34±34.36	-.408(0.684)	66.60±1.52	.270(0.788)
	Yes	111(50.0)	133.13±30.99		88.04±1.40	
Smoking	NO	140(63.1)	133.56±33.08	.789(0.431)	68.39±15.17	2.653(<0.001) ***
	Yes	82(36.9)	129.97±32.00		62.79±15.19	
Diabetes Duration (month)	1-62 a	56(25.2)	118.57±32.02	4.829(0.030) **	58.81±15.00	7.245(<0.001) ***
	63-123b	55(24.28)	134.98±29.56	b, c> a	68.53±13.46	b, c, d> a
	124-162c	56(25.2)	139.69±24.49		66.58±12.54	
	Above 163d	55(24.8)	135.81±38.89		71.30±17.62	
Self-Monitoring of Blood Glucose	Regularly measure a	52(23.4)	138.55±35.26	1.954(0.144)	71.17±16.59	3.594(0.029) **
	Often measure b	98(44.1)	127.82±30.37		64.30±12.86	a, b> c
	none c	72(32.4)	133.68±33.29		65.56±17.01	
Difficulty in Diabetes Management	Lack of management skills a	57(25.7)	113.78±29.62	8.658(<0.001) ***	60.00±15.38	5.348(<0.001) ***
				e, d> a		e> a, b
	Not enough time and money b	23(10.4)	125.82±22.33		62.17±9.98	
	Intractable nature of disease c	88(39.6)	137.76±30.68		68.13±13.00	
	Unable to control diseased	40(18.0)	145.35±33.34		71.00±18.59	
	Management not difficult e	14(6.3)	145.71±37.11		74.14±17.49	
Experience of Diabetes Education	No	104(46.8)	141.40±30.55	-4.06(<0.001) ***	71.45±14.06	-4.98(<0.001) ***
	Yes	118(53.2)	124.16±32.45		61.80±15.16	

*p<.05 **p<.001

18.31, p<.001), and cohabitation type (F = 10.25, p<.001), but not according to drinking, smoking, or religion. That is, the score of self-care agency was higher in the male elders, in those aged 74 or younger, and in those whose economic status was high. According to cohabitation type, the score of self-care agency was higher in those living with the spouse or with children than in those living alone. Thus, self-care agency is believed to be higher in men, in those aged 74 or younger, those with a spouse, those whose economic status is high, and those living with the spouse.

As to elderly diabetic patients' self-care agency according to diabetes-related characteristics, the score of self-care agency showed a statistically significant difference according to diabetes duration (F = 5.28, p = .002), reason for difficulty in diabetes management (F = 8.65, p<.001), and diabetes education (t = -4.06, p<.001). In the results of a post-hoc test on differences in self-care agency among the groups by diabetes duration, there was a significant difference between those of 1-60 months and those of 121-181 months. The score of self-care agency was statistically significantly different according to diabetes education, and perceived difficulty in diabetes management. Accordingly, self-care agency is believed to be higher in those whose diabetes duration, those who do not perceive diabetes management to be difficult, and those who had diabetes education (Table 1).

3.4 The Levels of the Subjects' Self-Care Agency and Self-Care Behavior

The elderly diabetic patients' self-care agency was surveyed for six domains, which are cognitive aspect, physical skill, decision making and judgment process, information seeking behavior, perception of self-regulation, and attention to self-care, and the mean score of self-care agency measured on a 6-point scale was 4.00 (±0.98, range from 1.67 to 6). Among the six domains of self-care agency, attention to self-care showed the highest score as 4.26 (±1.06). In addition, cognitive aspect was 4.06 (±1.01), physical skill 3.92 (±1.05), decision making and judgment process 3.97 (±1.07), information seeking behavior 3.91 (±1.08), and perception of self-regulation with one item 3.84 (±1.33).

Self-care behavior was analyzed for six domains, which are diet practice, taking medications, physical exercise, blood glucose test, foot care, and general health management, and the mean score of self-care behavior measured on a 5-point scale was 3.32 (±0.77). Among the six domains of self-care behavior, medication showed the highest score as 3.76 (±0.97). In addition, diet practice was 3.23 (±0.82), physical exercise 3.21 (±1.00), blood glucose test 3.11 (±1.00), foot care 3.27 (±0.93), and general health management 3.44 (±0.97) (Table 2).

3.5 Correlations Among Major Variables

Among the major variables of this study, self-care agency showed the highest correlation with self-care behavior (r = .823, <0.001). According to the results of analysis, self-care agency was in a positive correlation with economic status (r = .486, p<0.001), diabetes duration (r = .245, p<0.001), and diabetes education (r = 0.264, p<0.001), and in a negative correlation with age (r = -.334, p<0.001), and spouse (r = -.368, p<0.001). This means that self-care agency is higher when the patient's economic status is

Table 2. The levels of the subjects self-care agency and self-care behavior

Self-Care Agency				Self-Care Behavior			
Variables	**M±SD**	**Min**	**Max**	**Variables**	**M±SD**	**Min**	**Max**
Cognitive Aspect	4.06±1.01	1.67	6.00	Diet Practice	3.23±0.82	1.00	5.00
Physical Skill	3.92±1.05	1.55	6.00	Taking Medications	3.76±0.97	1.00	5.00
Decision Making and Judgment Process	3.97±1.07	1.44	6.00	Blood Glucose Test	3.21±1.00	1.00	5.00
Information Seeking Behavior	3.91±1.08	1.40	6.00	Physical Exercise	3.11±1.00	1.00	5.00
Perception of Self-Regulation	3.84±1.33	1.50	6.00	Foot Care	3.27±0.93	1.00	5.00
Attention to Self-Care	4.26±1.06	1.00	6.00	General Health Management	3.44±0.97	1.00	5.00
Total	**4.00±0.98**			**Total**	**3.32±0.77**		

*p<.05 **p<.001

high, when the patients' diabetes duration is long, and when the patient had diabetes education, and lower when the patient's age is old, and when the patient does not have a spouse.

Self-care behavior was in a positive correlation with economic status (r = 0.425, p<0.001), diabetes duration (r = 0.289, p<0.001), difficulty in diabetes management (r = 0.279, P<0.001), and diabetes education (r = 0.314, p<0.001), and in a negative correlation with age (r = -0.236, p<0.001), spouse (r = -0.344, p<0.001), and smoking (r = -0.176, p<0.05). This means that self-care behavior is higher when the patient's economic status is high, when the patients' diabetes duration is long, and when the patient had diabetes education, and lower when patient's age is old, when the patient does not have a spouse, and when the patient smokes (Table 3).

3.6 The Effect of Self-Care Agency on Self-Care Behavior

This study conducted hierarchical regression in order to analyze the effect of the subjects' general characteristics and self-care agency on their self-care behavior. In the hierarchical regression analysis, the input variables at the 1st stage were general characteristics such as age, spouse, economic status, cohabitation type, and smoking, and diabetes-related variables such as diabetes duration, difficulty in diabetes management, and diabetes education, and the input variable at the 2nd stage was self-care agency.

In Model 1 with general characteristics as the input variables, those found to have a statistically significant effect were spouse (β = -0.217, t = -3.350, p = 0.001), economic status (β = 0.280, t = 4.584, p<0.001), cohabitation type (β = 0.176, t = 2.775, p = 0.006), smoking (β = -0.147, t = -2.669, p = 0.008), diabetes duration (β = 0.214, t = 3.818, p<0.001), difficulty in diabetes management (β=0.163, t = 2.890, p = 0.004), and diabetes education (β = 0.192, t = 3.375, p = 0.001). As revised R^2 was 0.373 and the significance (F) of the regression equation was 17.413 (p<0.001), the regression equation of Model 1 was found to be statistically significant. Then, Model 2 was derived by inputting self-care agency to Model 1 that used general characteristics as the input variables. In Model 2, smoking (β = -0.130, t = -3.912, p<0.001) was found to have a significant effect on self-care behavior. In addition, self-care agency (β = .825, t = 19.200, p<0.001) was found to have a significant effect on self-care behavior. As revised R^2 was 0.770 and the significance (F) of the regression equation was 75.164 (p<0.001), the regression equation of Model 2 was also found to be statistically significant.

In the results of hierarchical regression as presented above, revised R^2 was .373 when self-care agency was not added and 0.770 when it was added, so the input of self-care agency increased explanatory power by 39.7%. This shows that self-care agency is a highly influential variable for self-care behavior (Table 4).

Table 3. Correlation among variables (N=222)

	Age	Spouse	Economic status	Cohabitation type	Smoking	Diabetes duration	Glycemic control	Diabetes education	Self-care agency	Self-care behavior
Age	1									
Spouse	0.367**	1								
Economic Status	-0.351**	-0.366**	1							
Cohabitation Type	0.395**	0.470**	-0.242**	1						
Smoking	0.005	-0.009	0.063	-0.100	1					
Diabetes Duration	0.038	-0.104	0.111	-0.041	0.033	1				
Difficulty in Diabetes Management	-0.161*	-0.204*	0.279**	-0.076	-0.028	-0.058	1			
Diabetes Education	-0.147*	-0.122	0.102	-0.097	-0.176*	0.239**	-0.031	1		
Self-Care Agency	-0.334**	-0.368**	0.486**	-0.026	-0.053	0.245**	0.299**	0.264**	1	
Self-Care Behavior	-0.236**	-0.344**	0.425**	-0.051	-0.176*	0.289**	0.270**	0.314**	0.823**	1

*p<.05 **p<.001

Table 4. The influence of self-care agency on self-care behavior (N=222)

Variable		Model 2			Model 3		
Variable		B	β	t(p)	B	β	t(p)
Constant		31.926		5.318 (<0.001)	10.136		2.661(0.008)
General Characteristics	Age	-1.054	-0.080	-1.294 (0.197)	1.131	0.086	.234 (0.027)
	Spouse	-6.543	-0.217	-3.350 (0.001)	-0.680	-0.023	-.556 (0.579)
	Economic status	5.986	0.280	4.584 (<0.001)	0.451	0.021	.536 (0.593)
	Cohabitation type	3.824	0.176	2.775 (0.006)	-1.098	0.050	-1.258 (0.210)
	Smoking	-4.661	-0.147	-2.669 (0.008)	-4.139	0.130	-3.912 (<0.001)
	Diabetes duration	3.134	0.214	3.818 (<0.001)	0.991	0.068	1.945 (0.053)
	Difficulty in Diabetes Management	2.409	0.163	2.890 (0.004)	0.376	0.025	.729 (0.467)
	Diabetes education	5.904	0.192	3.375 (0.001)	1.858	0.060	1.720 (0.087)
Self-care agency					0.389	0.825	19.200 (<0.001)
Statistics			R^2=.395 Revised R^2=.373 F=17.413(.000)			R^2=.779 Revised R^2=.770 F=75.164(.000)	

*p<.05 **p<.001

4. Conclusions

This study was conducted in order to survey elderly diabetic patients' self-care agency and self-care behavior, to analyze the relationship of these factors with other variables, and to examine the effect of self-care agency on self-care behavior.

The elderly diabetic patients' mean score of self-care agency was 4.00 (±0.98) on a 6-point scale. This was higher than 3.23 (±0.63) reported by Shin Dong-soon (2006) [15] but lower than 4.48 (±0.81) reported [14]. Among the sub-domains of self-care agency, perceived self-regulation was low as 3.84 (±1.34) and information seeking behavior was low as 3.91 (±1.08), and these results are consistent with the reports[15,16]. The elderly diabetic patients' mean score of self-care behavior was 66.32 out of 100 or 3.32 (±0.76) out of 5, showing an average level of self-care behavior. This result is similar to 3.51 (±0.63), the mean score of self-care behavior in Type II diabetic patients measured with the same scale[17]. The sub-domain of self-care behavior showing the highest score in this study was medication (3.76±0.97), and this is consistent with previous studies. This is probably because diabetic patients under medication have a positive idea on the effect of drugs in improving diabetic symptoms or they consider it the most important part of diabetes management to take medicine in time as a result of information and education on the importance of drug therapy. The domain showing the lowest score in self-care behavior was blood glucose monitoring (3.11±1.00). This is consistent with the reports[17-20] and Park Gi-seon et al. (2009) that the rate of glucose self-monitoring was very low among Korean diabetic patients. The low rate of glucose self-monitoring among diabetic elders may be explained by their poor skill and visual impairment but the rate may also be lowered by the fact that the elders often stop self-monitoring in the middle of long-lasting diabetes management, economic burden for buying supplies for blood glucose testing, and pains in the process of blood glucose measuring. Accordingly, it is necessary for diabetes education programs to include knowledge and skills for the self-monitoring of blood glucose and efficient diabetes management, and to provide elderly diabetic patients with materials on diabetes management and information on the importance and method of blood glucose self-monitoring. Among the sub-domains of self-care behavior, physical exercise was reported to be lowest (2.70) in the performance rate in a previous study[21], but in this study, it was 3.21, somewhat lower than the average but higher than previous reports. This is probably because more than half of the participants in this study were using a senior welfare center and they were participating in various exercise programs provided by the center.

As to elderly diabetic patients' self-care agency according to their general characteristics, self-care agency was higher in men than in women, in those young in age,

and in those with a spouse, and this is consistent with the result[22]. Consistent with the result of this study,[23] also reported that self-care agency was higher in those with high economic status. According to cohabitation type, self-care agency was highest in those living with the spouse and lowest in those living with children. This is probably because elders living with their children are highly dependent on the children in the processes of self-care, decision making, and information search. Elderly diabetic patients' self-care agency was low in the group whose diabetes duration was 60 months or shorter,[24] reported that diabetes duration did not make a significant difference in self-care agency. Those who had experience in diabetes education showed a higher score of self-care agency, and the same result was reported[25]. This is probably because those who had diabetes education recognize the necessity of self-care and this reinforces their ability in self-care and, resultantly, induces higher self-care agency. Accordingly, interventions for enhancing self-care agency should be developed specifically for female elderly diabetic patients, advanced-age diabetic patients, elderly diabetic patients without a spouse, elderly diabetic patients with low economic status, and elderly diabetic patients whose diabetes duration is shorter than 60 months.

As to elderly diabetic patients' self-care behavior according to their general characteristics, self-care behavior showed a statistically significant difference according to age, spouse, economic status, cohabitation type, and smoking. Consistent with this[26], studying elderly diabetic patients' self-care behavior, reported that self-care behavior was poorer in older diabetic patients. Thus, it is necessary to develop education programs in consideration of the participants' age and their pattern of diabetes management. The score of self-care behavior was higher in those with a spouse, those whose economic status was high, those living with the spouse, and those who did not smoke, and this is consistent with previous studies[20,21,26]. In addition, the elderly diabetic patients' self-care behavior was significantly different according to diabetes duration, self monitoring of blood glucose, perceived reason for difficulty in diabetes management, and diabetes education. The level of self-care behavior was low in those whose diabetes duration was 60 months or shorter, and this is consistent with report[27] that diabetes duration was in a statistically significant correlation with self-care behavior. Thus, it is necessary to develop nursing interventions including early education programs for elderly diabetic patients whose diabetes duration is shorter than 5 years in order to prevent or minimize complications. The level of self-care behavior was higher in those performing glucose self-monitoring, and this is consistent with the report[28] that the level of self-care behavior was higher in those using a self-check glucometer[29] did not report a significant difference according to perceived difficulty in diabetes management, but Kim Min-gyeong (2011) reported that the level of self-care behavior was higher in those with perceived difficulty in diabetes management, contrary to the result of this study that self-care behavior was higher in elderly diabetic patients who did not perceive diabetes management to be difficult. This is probably because of the research assistants' mistaken explanation about the difficulty in diabetes management to the elderly diabetic patients in this study. Moreover, the score of self-care behavior was higher in elderly diabetic patients who had experience in diabetes education, and this is consistent with previous reports. It is believed that diabetes education provides knowledge and skills reinforcing the participants' awareness of the importance of self-care and their ability in self-care. As this shows that education is an important supporting resource for self-care behavior, it is necessary to develop self-care education programs for elderly diabetic patients.

In the results of hierarchical regression to find factors influencing elderly diabetic patients' self-care behavior, revised R^2 was .373 without self-care agency as an input variable and .770 with self-care agency. As the input of self-care agency increased explanatory power by 39.7%, self-care agency was found to be a highly influential variable for self-care behavior. This result supports the report[30] that self-care agency was the most significant variable influencing diabetic patients' self-care behavior[31] also reported that self-care agency was an important factor influencing patients' self-care behavior and the education of education based on each patient's self-care agency might enhance the patient's self-care behavior.

Accordingly, elderly diabetic patients' self-care agency was found to have a direct effect on their self-care behavior, and therefore, the level of self-care behavior may be raised through nursing interventions reinforcing the self-care agency of elderly diabetic patients who are young in age and those who are smoking.

5. Discussion

The findings of this study showed that elderly diabetes mellitus patients with high self-care agency tended to be better in self-care behavior, and this suggests the necessity of education programs for enhancing their self-care agency. Accordingly, we need to develop diabetes education programs for enhancing self-care agency among elderly diabetes mellitus patients whose economic status is low, those who are smoking, and those whose diabetes duration is less than 60 months. Moreover, there should be nursing interventions that apply such programs to elderly diabetes mellitus patients and assess the results so that elderly diabetes mellitus patients may continue self-care behavior.

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7. References

1. Korea National Statistical Office. Population and Housing Census. Available from: http://census.go.kr/dat/ysr/ysrList.do?q_menu=5&q_sub=7. Date accessed: 04/03/2015.
2. Eun Y, Song KA, Park OH, Ko SH, Park MH, Kim JS. Gerontological nursing (2nd ed), Hyunmoonsa.Press, Seoul, Korea, 2010.
3. Gong SJ, Kim KH. Factors related to Meaning in Life in Elderly. J Korean Acad Adult Nurs. 2010 Aug; 22(4):438–47.
4. Frankl VE. The will to meaning foundation and application of logotherapy. New American Library New York USA; 1969.
5. Jung YJ, Shin KI, Choi SO. A Survey on the Meaning in Life of Elderly People. J Korean Acad Fundam Nurs. 2006; 13(3):501–9.
6. Kwon Y-S. Metabolic syndrome components and living habits according to fasting blood sugar measured by glucometer in workers. Indian Journal of Science and Technology. 2015 Apr; 8(S8):37–45.
7. Chang SO, Burbank PM. Meaning in life among the elderly. J Korean Acad Nurs. 2000; 30(2):259–71.
8. Pinquart M. Creating and maintaining purpose in life in old age: A meta analysis. Aging International. 2002 Mar; 27(2):90–114.
9. Choi SO, Kim SN, Shin KI, Lee JJ. Meaning in Life of a Resident Community of Normal Adults. Korean Journal of Adult Nursing. 2002; 14(3):359–67.
10. Choi MS, Son CN. The effects of purpose in life on self-esteem, problem solving attitudes and fear of negative evaluation. The Korean Journal of Health Psychology. 2007; 12(4):951–67.
11. Lee KS, Chung SJ. A correlational study among gender equality awareness, meaning in life, and depression. Journal of Korean Academy of Psychiatric and Mental Health Nursing. 2006; 15:14–21.
12. Choi SO, Kim SN, Shin KI, Lee JJ, Jung YJ. Development of Elderly Meaning in Life(EMIL) Scale. J Korean Acad Nurs. 2003 Jun; 33(3):414–24.
13. Cho AJ. Impact of social support and health improvement activities on perceived health of elders. Master Thesis of Ewha Women's University, Seoul; 2010.
14. Choi YH, Kim SI. Development of Health Behavior Assessment Measurement of the Korean Elders. J Korean Acad Nurs. 1997; 27(3):601–13.
15. Belloc NB, Breslow L. Relationship of physical health status and health practices. Preventice Medicine. 1972; 1(3):409–21.
16. Kim OS. Korean Version of the revised UCLA Loneliness scale: reliability and validity test. J Korean Acad Nurs. 1997; 27(4):137–48.
17. Pepla LA, Perlman D. Perspectives on loneliness: A source book of current theroy, research and therapy. An Aspen Publication, Wiley, New york, USA. 1982 May .
18. Zimet GD, Dahlem W, Zimet, SG, Farley GK. The multidimensional scale of perceived social support. Journal of Personality Assessment. 1988; 52(1):30–41.
19. Shin JS, Lee, YB. Research on the effect of social support on psychological wellbeing of unemployed. Korean Academy of Social Welfare. 1999; 37:241–69.
20. Cloninger CR, Przybeck TR, Svrakic DM, Wetzel RD. The Temperament and Character Inventory(TCI): A Guide to its Development and Use. St. Louis, Missouri, 1994.
21. Min BB, Oh HS, Lee SY. Temperament and character inventory-family manual. Seoul: Maumsarang; 2007.
22. Rokach AR, Matalon BR, Safarov A. the effects of gender and marital status on loneliness of the aged. Social Behavior and Personality. 2007; 35(2):243–54.
23. Lee HJ. The impact of isolation and loneliness on life satisfaction and depression in community-dwelling elderly: The mediation effect of perceived control. Journal of Community Welfare. 2012; 42:157–77.
24. Oh SY. Family Function and Loneliness on Life Satisfaction in the Aged. Journal of Welfare for the Aged Institute. 2008; 42:267–90.
25. Cornwell E, Waite L. Social disconnectedness, perceived isolation, and health among older adults. Journal of Health and Social Behavior. 2009 Mar; 50(1):31–48.
26. Sung MH, Lim YM, Joo KS. The Relationship between Social Support and Loneliness in Elderly Women Living Alone. J of Korean Public Health Nursing. 2011; 25(1):95–106.

27. Kim HG. Factors Influencing Ego Integrity of Elderly. Journal of Korean Gerontological Nursing. 2006; 8(1):25–36.
28. Kim C, Ko MH, Kim MJ, Kim J, Kim HJ, Moon JH, Baek KS, Son HM, Oh SE, Lee YA, Choi JH. The life of elderly women living alone. J Korean Acad Nurs. 2008 Oct; 38(5):739–47.
29. Depp C, Jeste D. Definitions and predictors of successful aging: A comprehensive review of a larger quantitative studies. American Journal of Geriatric Psychiatry. 2006 Jan; 14 (1):6–20.
30. Chung YJ. Comparison between hospitalized and normal elders on the subject of value of life. Thesis of Graduate Studies of Nursing in Busan Catholic University, Busan; 2002.
31. Jung YM. Factors Influencing Meaning in Life among the Middle-aged. Korean J Adult Nurs. 2011Jun; 23(3):209–20.