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Mediating Effect of Social Relationship on the Effects of Activities of Daily Living on the Depression in Elderly Women with Chronic Diseases

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Abstract: The present study aimed to determine the mediating effect of social relationship on the effects of Basic and Instrumental Activities of Daily Living (BADL and IADL) on the depression of elderly women with chronic diseases. Of the raw data of the 2014 National Survey of the Living Conditions and Welfare Needs of Older Koreans which was conducted on a national sample, the data of 5,633 elderly women aged 65 years or older with one or more chronic diseases diagnosed by a doctor were analyzed. Data were analyzed using t-test, ANOVA, Pearson correlation, Hierarchical regression analysis and Sobel's test. The results showed that BADL and IADL were positively correlated with depression and negatively correlated with social relationship whereas depression was negatively correlated with social relationship. The findings also showed a partial mediating effect of social relationship on the effect of BADL and IADL on depression. These results indicate that social relationship can act as a protective factor that contribute to reducing the depression of elderly women with chronic diseases that may be caused by their decreased daily life competence.

Key words: Activities of daily living, depression, social relationship, elderly, competence, protective

INTRODUCTION

The older adult population is rapidly growing worldwide owing to the extension of the average human life span by the advancement of modern medical technology and improvement of living standards. In particular, the speed of aging has been progressing in Korea which has been rapidly becoming a full-fledged aged society, since, 2015. The population aged 65 years or older comprises 14.9% of the entire population. Given such change, management of and policies for the issues related to physical and psychological health and quality of life of the increasing older adult population are emerging as important social issues.

Chronic diseases and depression are major health issues in old age. Reaching old age, physical function declines owing to aging and the risk of contracting chronic diseases increases owing to various physiological changes. Chronic diseases are permanent owing to their characteristics and may cause difficulties in performing daily activities because of physical function decline in most cases (Huang *et al*., 2015). As such these conditions require continuous treatment and management and bring about psychological distress such as depression or despair. In addition, the possibility of inducing depression is further increased by the risk of social exclusion and loneliness because of absence from important social relations and loss of functional independence (Hao *et al*., 2017; Storeng *et al*., 2018). The depression rate among adults aged 65 years or older has been reported to be 21.1%; in terms of sex, 17.2 and 24% of male and female older adults, respectively, reported having depression (KSIS., 2019). Recently, the average life expectancy of South Korean males and females to be 80.1 and 86 years, respectively, in other words, life expectancy is 5.9 years longer for females than males. Moreover, the expected remaining lifetime of males and females at 65; 18.4 and 22.6 years, respectively, indicating a remaining lifetime for females that is 4.2 years longer than that of males. Consequently, the ratio of elderly women living their declining years with chronic diseases and depression is high.

Studies have reported that elderly women have not only a higher rate of depression diagnosis than their male counterparts but also a more vulnerable health status, lower education, poorer financial status (Kim, 2018) and higher prevalence rate of chronic diseases and physical functional limitations (Song *et al*., 2015; Griffith *et al*., 2017), all of which necessitate more social attention and support. Despite these vulnerabilities, however, research on these people is relatively less than that of the general population.

Meanwhile, factors related to the depression of older adults have been reported to be diverse including socio-demographic factors such as age and education level, health-related characteristics such as Basic

Activities of Daily Living (BADL), Instrumental Activities of Daily Living (IADL), pain, subjective health status, physical activity and chronic diseases (Bhamani *et al*., 2015) and characteristics of social relationship such as social support and social networks including family, friends and neighbors (Lee and Kim, 2016).

In particular because the ability to carry out daily living is an important factor that directly affects the depression of older adults with chronic diseases, their living environment and their quality of life (Gobbens, 2018), research on the significant mediating factors between the ability to carry out daily living and depression is necessary. The probability of the characteristics of social relationship acting as significant mediating factors between the ability to carry out daily living and the depression of elderly women with chronic diseases appears to be high: psychosocial interventions are possible for them and they also indirectly influence physical health andactivities of daily living (Liao *et al*., 2015; Tomioka *et al*., 2017). In this context, the present study investigated the mediating effects of social relationship on the effect of the ability to carry out daily living on the depression of elderly women with chronic diseases.

MATERIALS AND METHODS

Research design: This descriptive studywas designed to determine the mediating effect of social relationship on the effects of BADL and IADL on the depression of elderly women with chronic diseases using data from the 2014 National Survey of the Living Conditions and Welfare Needs of Older Koreans.

Research data and participants: The present study used the raw data of the 2014 National Survey of the Living Conditions and Welfare Needs of Older Koreans conducted by the Korea Institute for Health and Social Affairs (KIHASA) which is affiliated with the Ministry of Health and Welfare.

The raw data were approved by the National Statistical Office (Approval Number 11701) and an application for micro-data use for research was filed at the health and welfare data portal of KIHASA. Approval was obtained before using the data. Female adults aged 65 years or older with one or more chronic diseases diagnosed by a doctor (5.736 people) were selected as the participants of the present study from a total of 10,451 people. The data of a total of 5.633 selected participants, excluding 103 proxy and incomplete responses were used in the final data analysis.

Research instruments

General characteristics: Participant's age, marital status, education level, place of residence and working status were used as demographic characteristics. For the health-related characteristics of the participants, exercise, smoking, drinking, height, body weight and Body Mass Index (BMI) were used. BMI is a value obtained by dividing body weight (kg/m^2). The participant's weights were categorized into underweight for BMI<18.5, normal for 18.5ABMI<23.0, overweight for 23.0• BMI<25.0 and obesity for BMI• 25.0 based on recommended Asian standards by WHO.

Activities of Daily Living (ADL): These activities were measured using the Korean Version of BADL and IADL developed by Won *et al*. (2002a, b). BADL consists of 7 items; dressing, washing the face and hair and brushing, taking a shower or bath, eating prepared meals, getting out of bed and leaving a room using the bathroom and controlling urination and defecation. Each item is scored according to the range from complete independence (1 point), requiring partial help (2 points) and requiring full help (3 points). The total score ranges from 7-21 points; a lower score indicated better ability to carry out daily living. The reliability measured with Cronbach's • coefficient was 0.92 in this study.

In addition, IADL was scored from complete independence (1 point), to requiring partial help (2 points) and requiring full help (3 points) for 7 items: grooming, working on household chores, preparing meals doing laundry, taking medicine, managing money, going out a short distance on foot while purchasing items, making and receiving calls and going out using transportation. These items were scored as follows: complete independence (1 point), requiring slight help (2 points), requiring significant help (3 points) and total incapacitation (4 points). The total score ranges from 10-33 points with a lower score indicating better competence. The reliability measured with Cronbach's • coefficient was 0.95 in this study.

Depression: Depression was measured by the short form of Geriatric Depression Scale developed by Sheikh and Yesavage (1985) and translated by Cho *et al*. (1999). The scale consists of 15 items including negative judgments of the past, present and future (7 items), depressed affect (4 items) and cognitive inefficiency and motor function deficiency (4 items). The 1 point was assigned for "Yes" and 0 points were assigned for "No" and 5 items (1, 5, 7, 11, 13) were reverse coded. The total score ranges

from 0-15 points with a higher score indicating worse depression. The reliability measured with Cronbach's • coefficient was 0.92 in this study.

Social relationship: The study used a total of 3 items on relationship with family, friends and community. Each item was converted into scores from 0 (no relationship) to 5 points (very good relationship), resulting in a total score ranging from 0-15 points with a higher score indicating better relationships.

Data analysis: The collected data were analyzed using PASW Statistics Ver. 18.0 (IBM Corp., Somers, NY, USA). The general characteristics of the participants and the means and standard deviations of the research variables were analyzed using frequencies and descriptive statistics. Difference in the variable according to the characteristics of the participants was tested using t-test, ANOVA and Scheffe's test. In addition, Pearson correlation analysis was performed to determine relationships among variables. Hierarchical regression analysis according to the three-step procedure (Baron and Kenny, 1986) and Sobel's test using Statistics Calculator 4.0 were performed to determine the mediating effect of social relationshipon the effects of activities of daily living on the depression. All statistical significance was verified as a $p>0.05$.

RESULTS AND DISCUSSION

Differences in depression according to the general characteristics of the participants: The distribution and differences in depression according to the general characteristics are presented in Table 1. Regarding the age distribution of the participants, 3.092 participants (54.9%) were aged from A65 years to <75 years and 2.541 participants (45.1%) were aged 75 years or older. While 3.121 participants (55.4%) did not have a spouse, 2,593 participants (46%) had no education and 4.120 participants (73.1%) were unemployed. A normal BMI was reported by the highest number of participants (2.156 participants, 38.3%), followed by obesity (1.893 participants, 33.6%), overweight (1,322 participants, 23.5%) and underweight (262 participants, 4.7%).

Significant differences in depression were found according to the general characteristics of age ($t = -11.67$, $p<0.001$), presence of a spouse ($t = -10.45$, $p<0.001$), education level ($F = 101.86$, $p<0.001$), employment status g ($t = -12.57$, $p<0.001$), exercise status ($t = -13.64$, $p<0.001$), smoking status ($t = 4.20$, $p<0.001$), drinking status ($t = 3.69$, $p<0.001$) and BMI ($F = 10.99$, $p<0.001$). In addition, in a posteriori analysis of education level, the number of participants with no education was found to be significantly higher compared with elementary, middle and high school graduation and above. The number of participants who had completed elementary school graduation was also found to be significantly higher compared with those who had completed middle and high school graduation and above. In a posteriori analysis of BMI, the number of underweight participants was found to be significantly higher compared with that of normal, overweight and obese participants. These results indicated that depression is higher, if the elderly woman is older does not have a spouse, unemployed does not exercise, smokes and does not drink. The results also showed that elderly women with a low level of education and those who are underweight tend to have a higher level of depression than that observed in other comparison groups.

The means, standard deviations, maximums and minimums of BADL, IADL, depression and social relationship are presented in Table 2.

Correlations among BADL, IADL, depression and social relationship: Correlation coefficients among BADL, IADL, depression and social relationship are presented in Table 3. The highest correlation was found between BADL and IADL ($r = 0.74$, $p<0.001$). BADL was positively correlated with depression ($r = 0.19$, $p<0.001$) and negatively correlated with social relationship ($r = -0.08$, $p<0.001$). IADL was also positively correlated with depression ($r = 0.29$, $p<0.001$) and negatively correlated with social relationship ($r = -0.15$, $p<0.001$). Depression was negatively correlated with social relationship ($r = -0.34$, $p<0.001$). These findings indicated that if the scores of BADL and IADL are high (i.e., if the ability to carry out daily livingis decreased), then depression increases while social relationship decrease.

Mediating effect of social relationship on the effects of BADL and IADL on depression: The three-step procedure suggested by Baron and Kenny (1986) was performed to determine the mediating effect of social relationshipon the effects of BADL and IADL on the depression. Sobel's z test was performed to test the significance of the mediating effect. The results of testing the assumptions of regression analysis of the independent variables showed that multicollinearities among the variables were >0.1, ranging from 0.978-0.994 whereas variance inflation factors were <10, ranging from 1.006-1.023. The independence of the residuals was tested with the Durbin-Watson statistic, systematic correlation was found to be low with Durbin-Watson values between 1.609 and 1.956.

Table 1: Differences in depression according to general characteristics (n = 5.633)

		Depression			
Variables/categories	N (%)	M±SD	t/F	p-values	Scheffe
Age (years)					
65-74	3.092 (54.9)	5.46±4.53	-11.67	<0.001	
• 75	2.541 (45.1)	6.87±4.53			
Marital status					
Have a spouse	2.512 (44.6)	5.40±4.46	-10.45	<0.001	
No spouse	3.121 (55.4)	6.66±4.59			
Education level					
No education [a)]	2.593 (46.0)	7.11±4.56	101.86	<0.001	a>b>c, d
Elementary [b)]	1.954 (34.7)	5.70±4.40			
Middle [c)]	529 (9.4)	4.52±4.33			
• High [d)]	557 (9.9)	4.30±4.29			
Working status					
Employed	1.513 (26.9)	4.92±4.11	-12.57	<0.001	
Unemployed	4.120 (73.1)	6.53±4.67			
Place of residence					
Urban area	3.697 (65.6)	6.07±4.59	-0.56	0.578	
Rural area	1.936 (34.4)	6.15±4.55			
Exercise					
Exercises	2.913 (51.7)	5.31±4.37	-0.13.64	<0.001	
Not exercises	2.720 (48.3)	6.95±4.65			
Smoking					
Smoking	189 (3.4)	7.47±4.38	4.20	<0.001	
Not smoking	5.444 (96.6)	6.05±4.58			
Drinking					
Drinking	741 (13.2)	5.52±4.44	3.69	<0.001	
Not drinking	4.892 (86.8)	6.19±4.59			
Body Mass Index (BMI)					
Underweight[e)]	262 (4.7)	7.55±4.59	10.99	<0.001	e>f, g, h
Normal[f)]	2.156 (38.3)	6.13±4.63			
Overweight[g)]	1.322 (23.5)	5.78±4.57			
Obesity[h)]	1.893 (33.6)	6.08±4.48			

[a)]No education; [b)]Elementary school graduation; [c)]Middle school graduation; [d)]High school graduation and above [e)]Underweight (BMI<18.5); [f)]Normal (18.5 = BMI<23.0); [g)]Overweight (23.0 = BMI<25.0); [h)]Obesity (BMI = 25.0)

Table 2: Descriptive statistics of the variables (n = 5.633)

Variables	Mean	SD	Min	Max	Possible ranges
Basic activities of daily living	7.17	0.89	7	21	7-21
Instrumental activities of daily living	10.85	2.42	10	32	10-33
Depression	6.10	4.58	0	15	0-15
Social relationship	8.69	2.52	1	15	0-15

Table 3: Correlations among the variables (n = 5.633)

	BADL		IADL		DEP		SR	
Variables	r	p-values	r	p-values	r	p-values	r	p-values
BADL	1							
IADL	0.74	<0.001	1					
DEP	0.19	<0.001	0.29	<0.001	1			
SR	-0.08	<0.001	-0.15	<0.001	-0.34	<0.001	1	

BADL: Basic Activities of Daily Living; IADL; Instrumental Activities of Daily Living, DEP; Depression; SR; Social Relationship

Table 4: Mediating effect of social relationship on BADL and depression (n = 5.633)

Steps	Variables	B	SE	•	t(p)	R^2	F(p)
1	BADL• Social relationship	-0.21	0.04	-0.08	-5.62(<0.001)	0.01	31.61(<0.001)
2	BADL• Depression	0.99	0.07	0.19	14.73(<0.001)	0.04	216.85(<0.001)
3	BADL• Depression	0.87	0.06	0.17	13.59(<0.001)	0.14	468.87(<0.001)
	Social relationship• Depression	-0.59	0.02	-0.33	-26.35(<0.001)		

Sobel Z = 5.17 (p<0.001) BADL; Basic Activities of Daily Living

The mediating effect of social relationshipon the effect of BADL on depression is presented in Table 4. In the first step, the independent variable BADL significantly explained the mediating variable social relationship (• = -0.08, p<0.001) and in the second step, BADL significantly explained the dependent variable

Table 5: Mediating effect of social relationship on IADL and depression (n = 5.633)

Steps	Variables	B	SE	•	t(p)	R^2	F(p)
1	IADL• Social relationship	-0.16	0.01	-0.15	-11.35(<0.001)	0.02	128.92(<0.001)
2	IADL• Depression	0.55	0.02	0.29	22.53(<0.001)	0.08	507.80(<0.001)
3	IADL• Depression	0.46	0.02	0.24	19.76(<0.001)	0.17	585.07(<0.001)
	Social relationship• Depression	-0.55	0.02	-0.30	-24.65(<0.001)		

Sobel Z = 13.83 (p<0.001) IADL: Instrumental Activities of Daily Living

depression (• = 0.19, p<0.001). In the final step, the mediating variable social relationship was found to have a significant influence (• = -0.33, p<0.001) on depression. Moreover, the partial mediating effect of social relationship between BADL and depression was identified because the influence of BADL on depression was significantly decreased (• = 0.19•• = 0.17, Sobel Z = 5.17, p<0.001) compared with the influence in the second step.

The mediating effect of social relationshipon the effect of IADL on depression is presented in Table 5. In the first step, the independent variable IADL significantly explained the mediating variable social relationship (• = -0.15, p<0.001) and in the second step, IADL significantly explained the dependent variable depression (• = 0.29, p<0.001). In the final step, the mediating variablesocial relationship was found to have a significant influence (• = -0.30, p<0.001) on depression. Moreover, the partial mediating effect of social relationship between IADL and depression was identified because the influence of IADL on depression was significantly decreased (• = 0.29•• = 0.24, Sobel Z = 13.83, p<0.001) compared with the influence in the second step.

The present study investigated the mediating effect of social relationshipon the effects of BADL and IADL on the depression of elderly women with chronic diseases. The main findings of the present study are as follows. Of the differences in depression according to the characteristics of the participants, depression was found to be higher, if the elderly women is older does not have a spouse, unemployed, does not exercise, smokes and does not drink. In addition, depression was higher in elderly women characterized as having no education or a low level of education (i.e., elementary school graduation) and underweight. These findings are consistent with previous studies (Bhamani *et al*., 2015) suggesting that living with a spouse, working for an income, exercising, smoking cessation and maintaining healthy weight are the positive factors for managing the depression of elderly women with chronic diseases.

Correlations between variables indicated that depression deepened and social relationship reduced when the ability to carry out daily living decreased. The study also found that more social relationship indicated lower levels of depression. The finding is consistent with that in previous studies (Aung *et al*., 2016; Griffith *et al*., 2017); reduced ability to carry out daily living owing to chronic diseases can bring about depression whereas increased social relationship can reduce depression.

In addition, a partial mediating effect was found through a test of the mediating effect of social relationship on the effects of basic and instrumental activities of daily living on depression by entering it as a psychosocial protective factor for the depression of elderly women with chronic diseases. Social relationship refers to contacts and ties with people who have a relationship with oneself in an environment where one belongs to and it includes acceptance, encouragement, interest and information provision. The results showed that the social relationship of elderly women with chronic diseases can help reduce their depression by positively influencing depression that is caused by decreased ability to carry out daily living. Moreover, the results confirmed that the support and good relationships received from social networks are protective factors that can reduce depression that is due to chronic diseases.

Sufficient comparison and discussion on the mediating effect of social relationship between the decreased ability to carry out daily living of elderly women with chronic diseases and depression are limited because of the lack of previous studies. The findings of the present study can be interpreted in the same context as the studies that found family support as a factor that improves depression and physical condition of older adult patients with chronic diseases (Huang *et al*., 2015) and study that found social networks such as having a spouse and meetings with acquaintances as a predictor variable for reducing depression.

In addition, a study that investigated the mediating effect of social support on the depression of male and female patients with chronic diseases (Xie *et al*., 2018) and studies that reported that limitations of older adults in the ability to carry out daily living affects depression with social networks acting as a mediator (Tomioka *et al*., 2017; Hao *et al*., 2017) can be considered to support the findings of the present study.

The findings of the research discussed above suggested the necessity of public health interventions for the improvement of the ability of elderly women with chronic diseases to carry out daily living. Moreover, active psychosocial interventions are needed to promote social relationship that have a mediating effect on the

decline in competence in BADL, IADL and depression. Establishing a comprehensive social support system including family, friends and human networks in the community and making practical efforts that activate depression interventions within the therapeutic environment are necessary for the depression intervention of elderly womenwith chronic diseases.

CONCLUSION

The present study determined the mediating effect of social relationship on the effects of activities of daily living on the depression of elderly women with chronic diseases using large-scale survey data on the actual conditions of South Korean older adults. This research also provided significant results that identified differences in depression according to the characteristics of the participants. The significance of the present study lies in the fact that the findings can be used as basic data for the development and research of programs for the depression intervention of women with chronic diseases and for the promotion of their mental and psychosocial health. Based on the results of the present study, more attention should be given to the prevention of and intervention for depression inelderly women with chronic diseases who are vulnerable to depression. Specific plans to promote their social relationship are needed. Future research should consider the characteristics of participant's chronic diseases and the attributes of social relationship.

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