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Mediating Effect of Depressive Symptoms in the Relationship between Cardiovascular Risk Factors and Health Conservation in Community-dwelling Vulnerable Diabetic Elderly People

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Abstract:

Purpose: The purpose of this study was to examine the mediation of depressive symptoms in the relationship between cardiovascular risk and the health conservation of community-dwelling vulnerable diabetic elderly in order to provide a basis for planning nursing interventions to improve the health conservation of vulnerable diabetic elderly.

Methods: The participants were 99 vulnerable diabetic elderly who registered at the community health centers in D city. Data were collected using self-report questionnaires and analyzed with the SPSS-WIN 19.0 program. The instruments were Sung's Health Conservation Scale, the Arizona Heart Institute Cardiovascular Risk Factor Questionnaire, and the Geriatric Depression Scale Short Form-Korea version (GDSSF-K).

Results: The mean score for health conservation was 100.52. Overall depressive symptoms were 11.84, cardiovascular risk was 20.35. There were significant correlations among the three variables: health conservation, depressive symptoms, and cardiovascular risk. Also, depressive symptoms had a proportional mediating effect in the relationship between cardiovascular risk and health conservation.

Conclusion: Based on the findings of this study, health management programs focusing on cardiovascular risk management and depressive symptom improvement are highly recommended to promote health conservation in the vulnerable diabetic elderly

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Introduction

Necessity for the Research

As of 2013, 29.9% of the 380,000 social assistance recipients in South Korea are the elderly. Of the total population, 6.0% is elderly social assistance recipients, higher than any other generation in South Korea [1]. Elderly recipients of social assistance or the elderly at the next higher tier receive minimal support from the state but are suffering from absolute poverty economically [2], are vulnerable to health risks due to old age, low education, and low medical accessibility, and are diagnosed with one or more chronic diseases [3]. In addition, their rate of illness and death rates are high and their quality of life is low [4]. In particular, the prevalence rate of those who are in this vulnerable class, such as social assistance recipients and the next higher tier, is higher than that of the top 25% of income earners [1].

The most serious complications among diabetic patients are cardiovascular complications, with cardiovascular diseases accounting for 19.5% of Korea's total deaths. Furthermore, the death rate from cardiovascular diseases increases with age [5]. High blood pressure and dyslipidemia from diabetes increase micro/macrovascular complications and increase the death rate [6]. In addition, diabetic patients have a 2-4 times higher chance of being diagnosed with cardiovascular diseases, which serve as the largest cause of death and loss of function in type 2 diabetic patients; 65% of diabetic patients die from cardiovascular diseases.

Moreover, depression is commonplace among patients with vascular diseases such as high blood pressure, cardiovascular diseases, and cerebrovascular diseases, and depression patients are frequently diagnosed with vascular diseases [8]. These depression symptoms influence the occurrence of vascular diseases by a response to mental stress such as myocardial ischemia and ventricular instability [9]. Mental and physical events can induce stress, which increases extraventricular activity and risks of ventricular fibrillation [9]. Furthermore, according to a cohort study of coronary artery diseases, depressed subjects have a 50% higher chance of vascular disease risk compared to non-depressed subjects. Depression symptoms represented 31% of cardiovascular risk even after adjusting for associated conditions [10].

On the other hand, the chance that a diabetic patient has accompanying depression is two times higher than that of a normal subject [11]. If diabetes is accompanied by depression, the degree of a diabetic patient's performance of self-management such as meal control and blood glucose checks is lower, and poor regulation of meals and glucose control increases the frequency of chronic complications and death rates [12].

For diabetic elderly people in vulnerable classes, their advanced age and lower income levels are the key factors resulting in difficulties in understanding health information and how to utilize it [13]. Diabetes is a disease whose complications can be prevented, and contrary to other diseases that require complete dependency on the medical staff, complications accompanying diabetes can be prevented simply through appropriate self-management in one's daily life [14]. Since the elderly have complex factors such as physical, cognitive, social/psychological, and disease states [15], to continue providing quality healthcare to them, their physical, mental, and social stability must be maximized to maintain their functions as much as possible; to ensure a healthy life among the elderly, integrated conservation of these values is extremely important [16,17]. Therefore, prevention of cardiovascular risks in elderly diabetic patients must be approached with health conservation in mind. According to Sung's research (2015) [18], the cardiovascular risks of elderly diabetic patients are related to the conservation of health, which accounts for 49% of the cardiovascular risk. Furthermore, in the research involving elderly facilities [19], depression accounts for 24.5% of health conservation, which signifies a relationship between

depression and health conservation.

However, although conservation of health and prevention of cardiovascular diseases for diabetic elderly people in vulnerable classes are important, we have not considered ways to relieve symptoms of depression in strategic cardiovascular disease risk management. Evidence on the mediating effects of depression in the relationship between cardiovascular risks and health conservation is still lacking.

Thus, in this research, with the question of "Can we take the concept of health conservation, for which depression can be a mediating factor in its relationship with cardiovascular risks, as a strategy for preventing such cardiovascular risks in diabetic elderly people in vulnerable classes?", we would like to define the mediating effect of depression in the relationship between cardiovascular risks and health conservation of diabetic elderly people in vulnerable classes. In addition, to enhance the health conservation of diabetic elderly people in vulnerable classes with cardiovascular risk factors, we would like this research to be used as a basis for developing nursing intervention programs considering depression.

2. Purpose of the Research

The purpose of this study is to examine the mediation of depressive symptoms in the relationship between cardiovascular risk and the health conservation of community-dwelling vulnerable diabetic elderly people. The specific goals are as follows:

- Discover cardiovascular risk, depressive symptoms, and health conservation levels of community-dwelling vulnerable diabetic elderly people.
- Discover the relationship between cardiovascular risk, depressive symptoms, and health conservation of community-dwelling vulnerable diabetic elderly people.
- Discover mediation of depressive symptoms in the relationship between cardiovascular risk and health conservation of community-dwelling vulnerable diabetic elderly people.

Methodology

Research Design

This study is a descriptive correlation study to confirm the mediation of depressive symptoms in the relationship between cardiovascular risk and health conservation of community-dwelling diabetic elderly people.

2. Research Subjects

The subjects of this study are community-dwelling vulnerable elderly people living in D city who are 65 years old or older and are registered at one of the four public health offices. The subjects were diagnosed with diabetes by a physician more than one year ago, and do not have any problems communicating, with scores of 24+ points on the MMSE-K. We have obtained their written consent to participate in the study. In this research, vulnerable elderly people are defined as elderly people aged 65 or older who receive social assistance or who are in the next higher income tier (under 120% of the poverty line). According to the G*Power 3.1 program, the two-tailed significance (□) level for the number of subjects is .05, the multivariate regression analysis effect size is .15, statistical power is 1-β, calculated based on .80, and the sample size must be 98. Taking the failure rate into account, we distributed 120 copies, excluded 21 copies with insufficient answers, and analyzed 99 samples.

3. Ethical Considerations

In this research, for bioethics and subjects' safety,* the study was carried out after receiving research approval (IRB No. ****-2014-0078) through the university's biomedical research ethics committee, and complied with the guidelines of the committee. We explained to the subjects, before collecting any data, the purposes and goals of the research, and the fact that the subjects could withdraw their participation at any time. Moreover, we have acquired their written consent that the collected data shall be used only for research purposes, and the fact that the research guarantees the participants' anonymity and autonomy. We granted a

small amount of compensation to the participants.

4. Research measurements

Cardiovascular Risk Level

We used scores derived from the Framingham Risk Score (FRS). The Framingham Risk Score issues scores according to gender, age, smoking, blood pressure, total cholesterol (TC), high-density lipoprotein cholesterol, and diabetic status. Gender, age, smoking status, and diabetic status were collected through surveys, blood pressure was taken using an aneroid device (Baumanometer®, USA), and total cholesterol (TC) and high-density lipoprotein cholesterol were measured through spectrophotometer (Japanese HITACHI 7020). Framingham Risk Score was calculated by scoring gender, age, smoking status, blood pressure, total cholesterol (TC), high-density lipoprotein cholesterol (HDC), and diabetic status. Based on the total scores, we classified ten-year risk of occurrence as low risk (<10%), moderate risk (10-20%), and high risk (>20%) [21]. Ten-year risk of occurrence for a woman, is 8% at 19 points, 11% at 20 points, and 30% at 25+ points. For men, ten-year risk of occurrence is 10% at 12 points, 20% at 15 points, and 30% at 17+ points.

In this research, the reliability of values measured with surveys, sphygmomanometer, and spectrophotometer was calculated using a research-review method, done by two researchers re-measuring the same variables and calculating the conformity of their measurements. The survey's conformity average was 0.86, and the average conformity of sphygmomanometer and spectrophotometer was 0.78.

Depressive Symptoms

We used Kee's (1996) [22] Geriatric Depression Scale Short Form-Korea version (GDSSF-K). It consists of 15 binomial questions (1=yes, 0=no), giving it a range of 0-15 points, with higher points indicating a more severe depressive status. We classified 4 points and under as normal, 5-9 points as mild depression, and 10-15 points as severe depression. Cronbach's α coefficient was .83 at the time of development and .76 in this study.

3) Health conservation

Health conservation was measured by Sung's (2005)[15] health conservation measurement device, which consists of 37 questions, including 14 individual integration questions, 8 energy conservation questions, 8 structural integration questions, and 7 social integration questions. Each question has a scale of 4; 6 questions are reversely converted, and the total range of possible points is 37-148. Higher points signify superior health conservation. Regarding the tool's reliability, the Cronbach's α coefficient was .94 at the time of development, and in this study, it was .86.

Data Collection

Data collection was conducted from August to October of 2015. The researcher and five research assistants with prior training visited four public health centers, received permission to collect data from the head of each center, explained the purpose and the contents of the research to working-level representatives, and determined the data collection agenda based on each center's health inspection visitation schedules. We provided research explanation pamphlets and data collection guidelines. The pamphlets included the purpose and procedures of the research, data collection processes, and non-disclosure agreements, and assessed the research participants' participation potential. The data collection guidelines described the specific methods of data collection and the data's significance. Furthermore, we directly visited each subject, provided research explanations and data collection guidelines, and confirmed their understanding of the research through Q&A. To the participants from whom we received written consent after fully explaining the research, we distributed surveys on-site and allowed the participants to fill them out; for participants who appeared to have difficulty filling out the survey due to impaired vision, did not understand the survey, or had questions, researchers or assistants read the surveys

and let the participants fill them out, or they answered through individual interviews. The surveys took approximately 30 minutes to complete, and small gifts were provided to the participants who finished the surveys.

Data Analysis

Data collection was conducted by following statistical analysis using IBM SPSS 20.0.

·General and health-related characteristics of the participants, through technical statistics, were calculated by measuring averages, standard deviations, frequencies, and percentages.

· Difference of health conservation levels stemming from the participants' general and health-related characteristics were analyzed by one-way ANOVA and independent t-test, and the post-test was conducted by applying Scheffe's test.

· Cardiovascular risk, depressive symptoms, and health conservation levels were measured using average, standard deviation, and range.

· Correlation between cardiovascular risk levels, depressive symptoms, and health conservation of the participant was calculated using Pearson's correlation.

· Verification of depressive symptom's mediation of the relationship between the participant's cardiovascular risks and health conservation was conducted using simple and multivariate regressions and Sobel test.

We used Baron and Kenny's [26] methods to verify the mediation effect. For the verification, we conducted, first, regression analysis on mediating variables to independent variables, second, regression analysis on dependent variables to independent variables, and third, regression analysis on dependent variables to all independent and mediating variables. The regression analysis results must satisfy all three conditions to confirm the mediation; independent variables must significantly influence the mediating variables in the first step, independent variables must significantly influence dependent variables in the second step, and, in the third step, mediating variables must significantly influence the dependent variables, and independent variable's influence on dependent variables must be reduced compared to the second step. In this event, if the relationship between the independent and dependent variables is not significant, we interpret this as complete mediation. If not, we interpret it as partial mediation.

Results

General Characteristics of the Participants and Health Conservation Differences According to General Characteristics

There were a total of 99 research subjects, with more female than male participants at 79.8%. Participants ranging in age from 76 to 80 were most prevalent (31.3%), whereas atheists or members of other religions were most common (33.3%). Those with elementary school education were most common with 42.4%, and 55.6% of the participants were living alone. The most common economic status of the participants was "extremely poor" (42.4%). Of all the local social resources, the elderly welfare center was the most commonly used (64.6%), and homes for the elderly were second (39.4%).

Education levels dictated health conservation differences according to the general characteristics of the participants ($F=5.90$, $p=.001$); participants with no education ($SD=15.01$) showed lower average health conservation points (96.60) compared to participants having graduated middle school ($SD=11.81$), who showed an average of 115.00 points (Table 1).

Health-related Characteristics of the Participants and Differences of Health Conservation according to Health-Related Characteristics

In terms of the participants' health-related characteristics, according to BMI tests (kg/m^2), overweight participants were most common at 65.7%; and of the participants who had diseases other than diabetes, high blood pressure was most common at 54.5% of the participants. Of the participants, 69.7% were exercising, 9.1% of them were smokers, and 14.1% drank alcohol. Furthermore, 66.7% of the

Table 1: General Characteristics and Difference in Health Conservation according to General Characteristics of Subjects

Variables	Categories	n (%)	M ± SD	F(*p*) *or t(p) Scheffe*
Gender	Male	20 (20.2)	104.75 ± 17.76	1.24 (.228)
	Female	79 (79.8)	99.44 ± 14.48	
Age (yrs)	65–70	14 (14.1)	103.50 ± 13.56	2.47 (.067)
	71–75	23 (23.2)	98.35 ± 14.88	
	76–80	31 (31.3)	105.42 ± 17.59	
	≥81	31 (31.3)	95.87 ± 12.40	
Religion	Buddhist	24 (24.2)	99.50 ± 17.44	.42 (.742)
	Catholic	11 (11.1)	102.64 ± 16.46	
	Protestant	31 (31.3)	98.61 ± 14.23	
	None or other	33 (33.3)	102.33 ± 14.51	
Education level	No formal education[a]	40 (40.4)	96.60 ± 15.01	5.90 (.001)
	Elementary school[b]	42 (42.4)	99.02 ± 14.09	a< c
	Middle school[c]	17 (17.2)	115.00 ± 11.81	
	Above high school[d]	8 (8.1)	111.63 ± 13.02	
Economic status	Very poor	42 (42.4)	97.67 ± 16.05	1.26 (.293)
	Poor	25 (25.3)	100.64 ± 14.20	
	Moderate	22 (22.2)	106.41 ± 13.97	
	Good	4 (4.0)	101.50 ± 4.04	
	Very good	6 (6.1)	97.67 ± 20.52	
Community	Homes for the elderly	39 (39.4)		
Resources	Senior school	9 (9.1)		
(Multiple choice)	Elderly welfare center	64 (64.6)		
	Religious facilities	38 (38.4)		
	Public health center	11 (11.1)		
	Regional cultural center or other	6 (6.1)		

participants had regular meals, and 34.3% of the participants had tooth discomfort. And 77.8% of the participants had less than 8 hours of sleep per night, whereas 35.4% of the participants had low sleep satisfaction, showing the highest rate. Of the participants, 34.3% reported poor subjective health status.

Exercise (t=3.05, p=0.04), regular meals (F=7.74, p=.001), tooth discomfort (F=2.54, p=.045), sleep satisfaction (F=10.54, p<.001), and subjective health status (F=7.33, p<.001) showed different health conservation levels according to participants' health-related characteristics.

Participants who exercised (average 103.52 ± 14.43 points) had higher points than those who did not (average 93.60 ± 15.08), participants who regularly had meals (average 104.27 ± 14.49 points) had higher points than those who did not (average 89.33 ± 10.92 points), participants with healthy teeth (average 108.35 ± 14.41 points) had higher points than those with bad teeth (average 122.78 ± 10.71 points), and participants who subjectively perceived themselves as being in good health (average 124.50 ± 11.20 points) had higher health conservation points than those who did not (Table 2).

Cardiovascular Risk, Depressive Symptoms and Health Conservation of Participants

The cardiovascular risk of the participants was 20.35 ± 2.51 on average for a total of 94 points; in terms of ten-year risk of occurrence, 3 people (3.0%) had low risk (under 10%), 38 (38.4%) had moderate risk (10-20%), and 58 (58.6%) participants had high risk (more than 20%). Average depression was 11.84 ± 1.74 out of 15 total points; there were no normal participants under 4 points, 8 (8.1%) participants showed mild depression, and 85 (85.9%) of the participants showed severe depression. Average health conservation was 100.52 ± 15.25 out of 148 total points. Of the underlying factors of health conservation, individual integration averaged 39.30 ± 6.09 out of 56 total points, energy integration averaged 20.08 ± 3.91 out of 32 total points, structural integration averaged 23.37 ± 4.36 out of 32 total points, and social integration averaged 17.76 ± 4.26 out of 28 total points (Table 2).

Correlation among Cardiovascular Risk, Depressive Symptoms, and Health Conservation of Participants

In terms of the correlation between cardiovascular risk, depressive symptoms, and health conservation, health conservation showed a negative correlation between cardiovascular risk (r=-.353, p<.001) and depressive symptoms (r=-.587, p<.001) (Table 3).

Mediation of Depressive Symptoms in the Relationship between Cardiovascular Risk and Health Conservation

To discover mediation of depressive symptoms in the relationship between cardiovascular risk and health conservation, we primarily confirmed normal distribution and homoscedasticity; according to our multicollinearity tests, there were no problems.

To test mediation of depressive results in the relationship between cardiovascular risks and health conservation in this study, we tested mediation according to Baron and Kenny's [26] three-step regression analysis (Table 5). First, if we observed mediation verification results in the relationship between cardiovascular risk and health conservation in step 1, in the regression analysis that tests cardiovascular risks (the independent variable) and influence of depressive symptoms (the mediating variable), the β was .22 and was statistically significant (p=.029). In step 2, in the regression analysis that tests whether the independent variable, cardiovascular risk, influenced the dependent variable, health conservation, the β value was -.35 and was statistically significant (p<.001). Last, in order to see if the mediating variable, depressive symptoms, influenced the dependent variable, health conservation, we conducted regression analysis by setting health

Table 2. Health-related Characteristics and Difference in Health Conservation according to Health-related Characteristics of Subjects

Variables	Categories	n (%)	M ± SD	F (*p*) or t (*p*) Scheffe
BMI (kg/m^2)	M±SD		24.02 ± 2.89	
	Under weight (<23)	3 (3.0)	104.00 ± 19.52	.46 (.630)
	Normal weight (23–24.9)	31 (31.3)	98.42 ± 15.55	
	Over weight (≥25)	65 (65.7)	101.35 ± 15.09	
Diseases other than diabetes	Hypertension	54 (54.5)		
(Multiple choice)	Hyperlipidemia	4 (4.0)		
	Arthritis	11 (11.1)		
	Cardiovascular disease	11 (11.1)		
	Other	43 (43.4)		
Exercise	Yes	69 (69.7)	103.52 ± 14.43	3.05 (.004)
	No	30 (30.3)	93.60 ± 15.08	
Smoking	Yes	9 (9.1)	100.54 ± 15.31	-.06 (.954)
	No	90 (90.9)	100.22 ± 15.55	
Alcohol	Yes	14 (14.1)	100.48 ± 15.02	.05 (.963)
consumption	No	85 (85.9)	100.71 ± 17.22	
Regular diet	Very regular[a]	66 (66.7)	104.27 ± 14.49	7.74 (.001)
	Regular[b]	18 (18.2)	96.06 ± 15.95	a〉c
	Irregular[c]	15 (15.1)	89.33 ± 10.92	
Tooth	Very comfortable[a]	17 (17.2)	108.35 ± 14.41	2.54 (.045)
comfort	Comfortable[b]	18 (18.2)	103.61 ± 13.72	a〉e
	Moderate[c]	10 (10.1)	101.30 ± 14.16	
	Uncomfortable[d]	34 (34.3)	98.62 ± 14.18	
	Very uncomfortable[e]	20 (20.2)	93.90 ± 17.20	
Duration of	〈8	77 (77.8)	99.29 ± 13.80	-1.51
				-0.134
sleep (hours)	≥8	22 (22.2)	104.82 ± 19.27	
Satisfaction	Very poor [a]	9 (9.1)	94.33 ± 8.26	10.54 (*<.001)*
of sleep	Poor [b]	35 (35.4)	93.26 ± 12.09	a,b,c,d 〈e
	Moderate [c]	15 (15.2)	105.53 ± 15.02	
	Good [d]	31 (31.3)	101.61 ± 14.32	
	Very good [e]	9 (9.1)	122.78 ± 10.71	
Subjective	Very poor[a]	12 (12.1)	92.83 ± 11.12	7.33 (*p<.001)*
health status	Poor[b]	34 (34.3)	96.94 ± 14.81	a,b,c, 〈e
	Moderate[c]	22 (22.2)	97.82 ± 12.18	
	Good[d]	25 (25.3)	105.68 ± 14.50	
	Very good[e]	6 (6.1)	124.50 ± 11.20	

Table 3. Degree of Cardiovascular Risk, Depressive Symptoms, and Health Conservation

Category	Mean ± SD	N (%)	Observed Range
Cardiovascular Risk	20.35 ± 2.51		
Low-risk group (<10%)		3 (3.0)	
Moderate-risk group (10–20%)		38 (38.4)	
High-risk group (≥20%)		58 (58.6)	
Depressive Symptoms	11.84 ± 1.74		5–14
Normal (≤4)		-	
Mild (5–9)		8 (8.1)	
Severe (10–15)		85 (85.9)	
Health preservation	100.52 ± 15.25		71–133
Personal integrity	39.30 ± 6.09		27–53
Conservation of energy	20.08 ± 3.91		11–29
Structural integrity	23.37 ± 4.36		13–31
Social integrity	17.76 ± 4.26		8–27

Table 4. Relationships among Cardiovascular Risk, Depressive Symptoms, and Health Conservation

Variables	Cardiovascular risk r (p)	Depressive symptoms r (p)
Depressive symptoms	0.22	
	-0.029	
Health Preservation	-0.353	-0.587
	(<.001)	(<.001)

Table 5. Mediating Effect of Depressive Symptoms in the Relationship between Cardiovascular Risk and Health Conservation

Step		B	Beta (β)	t	p	Adj. R2	F	p
1	Cardiovascular risk→ Depressive symptom	0.15	0.22	2.22	0.029	0.04	4.94	0.029
2	Cardiovascular risk→ Health Conservation	-2.15	-0.35	3.72	< .001	0.12	13.84	< .001
3	Cardiovascular risk→ Health Conservation	-1.43	-0.24	2.9	0.005	0.39	31.64	< .001
	Depressive symptom→ Health Conservation	-4.71	-0.54	6.59	< .001			
Sobel test: z=5.37 *p* ⟨.001								

conservation as the dependent variable and cardiovascular risks/depressive symptoms as predictors; the results showed that cardiovascular risks (β=-.24, t=2.90, *p*=.005) and depressive symptoms (β=-.54, t=6.59, *p*<.001) were statistically significant predictors, and the explanatory power of the model was 39% (F=31.64, *p*<.001). To test the significance of depressive symptoms' mediation size, we conducted a Sobel test; the results showed that depressive symptoms were significant partial mediate variables in the relationship between cardiovascular risk and health conservation (Z=5.37, *p*<.001).

Discussion

In this research, the average cardiovascular risk for vulnerable diabetic elderly people was 20.35 points, and according to Framingham Risk Scores, 58.6% of the participants had a 20%+ chance of developing cardiovascular diseases over the next ten years. Cardiovascular risk among diabetic elderly people using elderly welfare centers according to Sung's (2015) research tools [18] averaged 21.39, a step 2 medium-level risk. We can conclude that the cardiovascular risk of diabetic elderly people is high, and demonstrates the importance of preventing their cardiovascular risk. Framingham Risk Scores used in this research were devised to predict cardiovascular diseases through twelve years of prospective research, and calculated the risk by using age, total cholesterol, high-density cholesterol, high blood pressure treatment status, and systolic blood pressure [20, 21]. If we observe the variables predicting cardiovascular risk, Jee et al. (2004) [23], who established the ischemic heart disease prediction model through an average of 9.3 years of tracking observation among 931,468 Koreans, used age and total cholesterol to calculate cardiovascular risks, and argued that body mass index also influences cardiovascular risks [24]. An analysis of Koreans' risk of death from cardiovascular diseases through data on death from ischemic heart diseases revealed that Korean males with a 34+ BMI index had a 2.99 times higher risk of death from ischemic heart diseases than normal people, and 2.56 times higher risk for people with a high blood pressure of 140 mmHg+ [25]. According to Jee et al.'s (2006) [24] nine years of tracking research of 1.2 million Koreans, risk of death from cardiovascular risks increased with an increase in BMI. These results demonstrate that age, dyslipidemia, high blood pressure, and BMI are variables related to cardiovascular diseases, and that a complex approach, rather than a single intervention, is necessary to prevent cardiovascular diseases in diabetic elderly people.

In this research, we have found that depressive symptoms are statistically significant partial mediate variables in the relationship between cardiovascular risk and health conservation (Z=5.37, p<.001), as cardiovascular risk levels (β=-.24) and depressive symptoms (β=-.54) showed significant predicting factors. The participants' average depression points were high at 11.84 points, with no normal status (under 4 points), and 8.1% and 85.9% of the participants scored for mild and severe depression, respectively. Even in previous studies, elderly people aged 60 years or older showed a significant level of depression regardless of the age of onset [8]. In particular, Kim & Choi (2011) [26] suggested that vulnerable elderly people living alone have more severe depression as age increases, and those who do not have any religion also have notable depressive symptoms, demonstrating that activities of daily living and life satisfaction are influential variables in depressive symptoms. Depressive symptoms for elderly people are related to their chronic diseases, such as diabetes, high blood pressure, and hyperlipidemia [8], and especially for elderly people in vulnerable classes, depression increases due to social and economic difficulties [26]. Many doctors, patients, and families of patients often perceive elderly depression as a natural response to chronic diseases and environmental/psychological problems, thereby hindering early diagnosis and appropriate treatment,

causing the elderly to suffer [27]. In addition, if depression accompanies diabetes in elderly people, complications will arise due to difficulties in blood glucose control and meal control [12].

Furthermore, Butters et al. (2008) [28] explained that depressive symptoms are related to cerebrovascular diseases, as the symptoms increase blood cortisol, cerebrovascular disease risk, and result in hippocampal atrophy and general ischemia. As observed, depressive symptoms and cardiovascular risks among the elderly are interrelated and increase each other's risk of occurrence. Therefore, continuous evaluation of cardiovascular risk is necessary in terms of elderly depressive symptom treatment plans and predictions.

On the other hand, health conservation was an average of 100.52 points out of a total of 148. Health conservation of vulnerable class diabetic elderly people was higher than that of elderly women with arthritis and elderly people with chronic diseases, as elderly women with arthritis recorded an average of 93.84 points in Nam et al.'s research (2014) [16], an average of 93.60 points in Sung's research (2014) [17] on elderly people with chronic diseases, and an average of 100.91 points in Oh & Kim's research (2009) [29] on home-living elderly people. Moreover, of the underlying factors of health conservation, individual integration averaged 39.30 points, energy integration 20.08, structural integration 23.37, and social integration 17.76. In Chang's research (2015) [30] measured with the same tools, individual integration averaged 35.29 points, energy conservation 23.79, structural integration 21.71, and social integration 18.01; comparing these two results, our research reported higher individual integration points, lower energy conservation and social integration, and similar structural integration. These differences stem from different research subjects in Chang's research (2015) [30] and ours. The subjects for Chang's research (2015) were home-living elderly people, whereas the subjects of this research were diabetic elderly people in vulnerable classes. In particular, diabetic elderly people in vulnerable classes have insufficient energy conservation [15] that can control energy input and output, such as rest, nutrition, appetite, excretion, and sleep; they also show lower social integration [15] in organizations that allow meaningful interactions with significant subjects of culture, ethics, religion, and family relationships.

For diabetic elderly people, appropriate self-management in daily life is required to manage complications [14], and as they must take care of themselves on their own, health conservation reflects self-care activities. These results show that diabetic elderly people in vulnerable classes must integrate the concept of health conservation into their self-management methods to prevent diabetic complications. The health conservation of the elderly is intended to promote physical, mental, and social well-being in order to maintain physical, mental, and socio-psychological unity [29]. Elderly people with diabetes were closely exposed to poor lifestyle habits for a long time; appropriate health practices must be integrated with health conservation.

On the other hand, health conservation is closely related to physical health, and possesses structural integration which refers to energy conservation and recuperation of physical structures that control energy input and output, such as rest, nutrition, appetite, excretion, and sleep, as well as recuperation/ maintenance of physical structure, prevention of physical destruction, and promotion of healing [15]. Elderly people have lower physiological reaction efficiency due to physical aging and are susceptible to diseases, generally focusing more on the state of physiological adaptations for health conservation [29].

Moreover, health conservation has individual integration, which means preservation of sense of value and subject, and social integration, which means meaningful mutual interaction with people in terms of culture, ethics, religion, and family relationships [15].

Therefore, considering the traits of the elderly in vulnerable classes, as a more efficient intervention measure to reduce cardiovascular risk factors, we must prevent cardiovascular diseases by not only reducing obesity, dyslipidemia, and high blood pressure, but also by developing intervention methods including depressive symptom management of the elderly in vulnerable classes, which must be approached through integrated health conservation.

A benefit of this study is that it has confirmed depressive symptoms as a partially mediating factor in the relationship between cardiovascular risk factors and health conservation of diabetic elderly people in vulnerable classes. However, the study also shows limitations in that the results cannot be generalized, as the subjects were not randomly selected.

Conclusion

This study is a descriptive study to confirm mediating effects in the relationship between cardiovascular risk levels and health conservation of diabetic elderly people in vulnerable classes. With 99 diabetic elderly people in vulnerable classes aged over 65, we have used the Framingham Risk Score to measure cardiovascular risk, the GDSSF-K to measure depressive symptoms, and Sung's (2005) health conservation measurement tools to measure health conservation.

The research showed that cardiovascular risk (β=-.24, t=2.90 p=.005) and depressive symptoms (β=-.54, t=6.59, p<.001) are statistically significant predictors of health conservation, and the model's explanatory power was 45% (F=31.64, p<.001). Mediating effects of depressive symptoms showed that they are a statistically significant partial mediating variable in the relationship between cardiovascular risk and health conservation (Z=5.37, p<.001).

Based on the research results, we propose the following:

• We propose conducting a random sampling and repeating the study again.

• We propose utilizing additional mediating variables in the relationship between cardiovascular risk and health conservation.

• We propose developing nursing intervention programs that consider depressive symptoms to improve the health preservation of diabetic elderly people in vulnerable classes with cardiovascular risks.

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