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The Mediating Effect of Acceptance Action in the Relationship between Diabetes Distress and Self-stigma among Old Adults with Diabetes in South Korea

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Purpose: This study investigated the mediating effects of acceptance action on the relationship between diabetes distress and self-stigma in older adults with diabetes. **Methods:** A descriptive research approach was adopted using 187 patients diagnosed with diabetes mellitus by an endocrinology doctor. The data were collected from 26 to 31 March, 2020 and were analyzed using descriptive statistics, t-test, one-way ANOVA, Pearson's correlation coefficient analysis, and hierarchical multiple regression. **Results:** The mean scores for diabetes distress, self-stigma, and acceptance action were 2.98±0.64, 2.54±0.74, and 4.16±0.35, respectively. Acceptance action partially mediated the relationship between diabetes distress and self-stigma (z=1.98, p=.024), with an explanatory power of 51.0%. **Conclusion:** To reduce diabetes self-stigma among old adults in diabetes distress situations, it is necessary to improve their acceptance action and develop step-by-step differentiated acceptance action enhancement programs through multidisciplinary collaborations.

Key Words: Acceptance and commitment therapy; Aged, Diabetes mellitus; Social stigma; Stress

INTRODUCTION

1. Background

Diabetes mellitus is a common lifestyle-related disease in the old adult population in Korea, with a prevalence of approximately 16.7% in the population aged 30 years and older and over 30.1% in the population aged 65 years and older [1]. Diabetes, if not properly managed, can cause various complications; therefore, active lifestyle changes and appropriate drug treatment should be maintained from the early stages of the diagnosis [2]. In particular, to maintain an appropriate blood sugar level, self-management, including diet, is required throughout one's life. In this process, patients with diabetes experience a lot of stress related to the disease and its management [3]. In the case of old adult patients with diabetes, diabetes self-management is more difficult because they have complex diseases and geriatric syndromes such as sleep disturbance, depression, cognitive impairment, and physical dysfunction [4,5]. Additionally, in a previous study that studied the intensive glucose lowering in type 2 diabetes, the intensive therapy group (targeting a glycated hemoglobin level below 6.0%) had more unexplained mortality than the standard group (targeting a level from 7.0 to 7.9%) [6]. Strict control of blood sugar has been reported to increase not only the risk of hypoglycemia, but also increase the risk of death [6], making the management of diabetes in old adult patients more difficult. When diabetes was strictly managed, the drug or insulin dose was changed several times [6]. Adaptation to the changing drug therapy, including a tight diet, may be more difficult for older diabetes patients than for younger diabetes patients. Therefore, older diabetes patients are expected to have a high

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level of diabetes distress. Diabetes distress must be managed because it is a factor that reduces their quality of life [7].

People diagnosed with diabetes face great disappointment as they have to manage themselves for the rest of their lives, and they also have adjustment difficulties [8]. Additionally, it is difficult to inform others about having diabetes as they are aware of the social stigma around diabetes that it is caused by a poor lifestyle, and they feel ashamed of having diabetes [8]. In particular, they do not understand the need to completely change their lifestyle until they are diagnosed with diabetes and have a diabetes management diet [9]. Additionally, there are cases where people think that diabetes or its complications are caused by their own mistakes or karma, and they perceive it negatively [9]. As such, people diagnosed with diabetes feel stressed out due to various factors, and when these negative emotions are internalized, self-stigma occurs.

In diabetes self-stigma, people with diabetes devalue themselves and have negative emotions regarding their disease [10]. Diabetes self-stigma reduces self-efficacy related to diabetes management, and causes a decrease in self-management behavior [11]. Additionally, since self-stigma is a factor that lowers diabetes patients' quality of life due to depression or social isolation [10], it is necessary to manage self-stigma in diabetes patients so that they do not develop mental health conditions.

In fact, in a qualitative study of diabetes patients' life experiences, those diagnosed with diabetes for the first time considered whether they should accept that they had diabetes in the early stages and were depressed [12]. They also denied management methods to treat diabetes while worrying about an unhealthy future [12]. However, once they accepted the diagnosis, they revealed their diabetes diagnosis to those around them, found treatment methods that suited them, and created a new self-identity, turning their weakness into opportunity [8]. This process is called acceptance of the disease; acceptance means actively accepting thoughts, emotions, and physical sensations with non-judgmental self-perception [13]. Previous studies have shown that acceptance and commitment therapy reduces emotional distress in older adults with type 2 diabetes [14]. Based on this, it is expected that a patient's acceptance of diabetes will play a mediating role in diabetes distress among the old adults, thereby reducing self-stigma due to disease or disease management. However, studies on the factors affecting self-stigma in diabetes patients and the role of acceptance behavior in managing the stress affecting self-stigma are insufficient.

This study identifies the role of acceptance action in the relationship between diabetes stress and self-stigma and provides fundamental data for establishing strategies for reducing self-stigma in diabetes patients by examining the relationship between stress, self-stigma, and acceptance action in older diabetes.

2. Purpose

This study aimed to explore the mediating effects of acceptance action between distress and self-stigma among old adults with diabetes, and it had the following goals. First, the degree of acceptance diabetes distress, self-stigma, and acceptance action in older adults with diabetes were identified. Second, the differences in diabetes distress, self-stigma, and acceptance action according to general characteristics were identified. Third, the correlation between diabetes distress, self-stigma, and acceptance action was investigated. Fourth, the mediating effect of acceptance action between diabetes distress and self-stigma was investigated.

METHODS

1. Study Design

This secondary analysis study used the data collected during the "Development of a tool for measuring the health equilibrium of diabetes patients" (JIRB-2020101201-02-201101), and explored the mediating effects of acceptance actions on diabetes distress and self-stigma.

2. Participants

The participants of this study were analyzed using data from 187 diabetes patients aged 55 years or older among the data of 4,800 panel. The inclusion criteria were as follows: 1) adults aged 55 years or older diagnosed with diabetes by a doctor, 2) those who could understand and respond to the questionnaire, and 3) those who voluntarily agreed to the participate and subsequently completed the questionnaire.

3. Measures

1) Diabetes distress

To measure diabetes patients' distress, the Problem Areas in Diabetes (PAID) stress assessment paper developed by Polonsky et al. [15] was translated and modified as per the Korean culture using the Korean version of the Stress Assessment Paper (PAID-K) tool [16]. This tool con-

sists of 20 items on a Likert-type scale ranging from 1 to 5 points for each item, with 1 indicating no problem at all and 5 indicating a very serious problem. The higher the score, the higher the perceived stress level. The reliability of the PAID-K tool was Cronbach's α=.95 [16], and the reliability of the tool in this study was Cronbach's α=.93.

2) Self-stigma

The self-stigma measurement tool developed by Seo and Song [17] was used. This tool consists of 16 items and four sub-domains, including four items each, for comparative inability, social withdrawal, self-devaluation, and apprehensive feeling. Each question was measured on a 5-point Likert scale; a higher score indicates higher self-stigma of diabetes. At the time of tool development, the reliability of the tool in the study of Seo and Song [17] was Cronbach's α=.89, and the reliability of the tool in this study was Cronbach's α=.94.

3) Acceptance action

To study acceptance action, Moon's [18]'s translation of the acceptance behavior questionnaire developed by Hayes et al. [19] was used. This tool measures the willingness to accept thoughts or feelings while acting in a way that is consistent with one's values and goals. It consists of a total of 16 items rated on a 7-point Likert scale ranging from 1 (not at all) to 7 (always). The higher the total score, the higher the degree of acceptance. In the study by Moon [18], the reliability of the tool was Cronbach's α=.82, and the reliability of the tool in this study was Cronbach's α=.86.

4. Data Collection

The data for this study were collected from 26 to 31 March 2020, through a survey institution. A self-report questionnaire consisting of general characteristics, diabetes distress, self-stigma, and acceptance action questionnaires was prepared as an online questionnaire and distributed to 4,800 panelists of specialized survey institutions. The questionnaire was administered to those who answered that they had diabetes in the questions related to current health problems and diseases diagnosed by a doctor among 15 chronic diseases. The questionnaire was set to automatically end for participants who did not select diabetes for either of the two questions. Next, five questions about diabetes-related characteristics were asked, and after the responses to diabetes-related questions were completed, the remaining questions were presented.

The analysis in this study was conducted using the above raw data after obtaining approval from the Institution Review Board of Joongbu University (JIRB- 2021050302-01).

5. Statistical Analysis

The collected data were analyzed using IBM SPSS/WIN 24.0. Participants' general characteristics, diabetes distress, the degree of self-stigma, and acceptance action were analyzed using descriptive statistics. The differences in diabetes distress, self-stigma, and acceptance action according to the participants' general characteristics were analyzed using independent t-test and one-way analysis of variance (ANOVA); the Scheffé test was used as a post-hoc test. The correlation between participants' diabetes distress, self-stigma, and acceptance action was analyzed using Pearson's correlation coefficients. The mediating effect of acceptance action on the relationship between diabetes distress and self-stigma of participants was analyzed using a 3-step regression analysis as presented by Baron and Kenny [20]. In steps 1 and 2, regression analyses are performed on the influence of the independent variable on the parameter, and on the influence of the independent variable on the dependent variable to check whether each has a significant effect. In step 3, the influence on the dependent variable is checked by inputting the independent variable and the parameter simultaneously. In step 3, the influence of the independent variable is reduced as compared to step 2 to check if the parameter has a significant influence on the dependent variable to have a mediating effect; if the influence of the independent variable on the dependent variable is significant, there is a partial mediating effect, and if it is not significant, it is judged that there is a full mediating effect. The significance of the mediating effect was evaluated by bootstrapping in the PROCESS macro program. The number of bootstrap samples was set at 1,000, with a 95% confidence interval. If the confidence interval does not include 0, the mediating effect is considered significant.

RESULTS

1. Participants' Characteristics

The general characteristics of the participants are listed in Table 1. The participants of this study were 21.9% female and 78.1% male. Their mean age was 62.53±5.20 years, and the age range was 55~79 years. Regarding their educational level, 58.8% had the university level or higher education, and 86.6% had a spouse. Those who had a job accounted for 63.6%, and 48.7% answered that they practiced a religion. Regarding social activities, 46.5% answered

Table 1. Participants' General Characteristics (*N*=187)

Characteristics	Categories	n (%) or M±SD	Min~Max
Gender	Male	146 (78.1)	
	Female	41 (21.9)	
Age (year)		115 (61.5)	55.00~79.00
	≤64	68 (36.4)	
	65~74	4 (2.1)	
	≥74	62.53±5.20	
Educational level	≤Middle school	12 (6.4)	
	High school	65 (34.8)	
	≥University	110 (58.8)	
Marital status	Married	162 (86.6)	
	Not married	25 (13.4)	
Having a job	Yes	119 (63.6)	
	No	68 (36.4)	
Practicing a religion	Yes	91 (48.7)	
	No	96 (51.3)	
Social activities	3 or more times a week	32 (17.1)	
	Once a week	32 (17.1)	
	2~3 times a month	36 (19.3)	
	Less than once a month	87 (46.5)	
Perceived health status	Bad	57 (30.5)	
	Moderate	94 (50.3)	
	Good	36 (19.3)	
Duration of diabetes (year)		9.81±8.03	1.00~41.00
	≤3	53 (28.3)	
	4~10	51 (27.3)	
	≥11	83 (44.4)	
Type of hospital being treated at	Clinic	105 (56.1)	
	General hospital	45 (24.1)	
	University hospital	33 (17.6)	
	Public health	4 (2.1)	
Type of treatment method	Diet therapy	22 (11.8)	
	PO	137 (73.3)	
	Insulin	6 (3.2)	
	PO+insulin	22 (11.8)	
Experience of diabetes education	Yes	65 (34.8)	
	No	122 (65.2)	
Presence of comobidities	Yes	150 (80.2)	
	No	37 (19.8)	
Diabetes distress		2.98±0.64	1.25~4.65
Self-stigma		2.54±0.74	1.06~4.44
Acceptance action		4.16±0.35	3.44~5.44

M=mean; PO=per Os; SD=standard deviation.

that they engaged in social activities less than once a month, and only 19.3% answered that their perceived health was good. The average duration of diabetes was 9.81±8.03 years, and the prevalence ranged from 1~41 years. As for the type of hospital that they were being treated for diabetes, clinics accounted for the majority (56.1%). Of all, 73.3% were prescribed oral medications. Those with comorbidities accounted for 80.2%. The mean of diabetes

distress was 2.98±0.64, and that of self-stigma was 2.54±0.74. The mean of acceptance action was 4.16±0.35.

2. Difference of Independent Variables according to General Characteristics

Table 2 presents the results of the analysis of the differences in diabetes distress, self-stigma, and acceptance action according to the general characteristics of the participants. The differences in diabetes distress according to the general characteristics of participants were gender (t=-3.18, p=.002), perceived health status (F=7.44, p=.001), duration of diabetes (F=3.79, p=.024), type of hospital being treated at (F=4.44, p=.005), and the treatment method (F=6.91, p<.001).

The differences in self-stigma according to the general

Table 2. Differences in Independent Variables according to General Characteristics (*N*=187)

Characteristics	Categories	Diabetes distress		Self-stigma		Acceptance action	
		M±SD	t or F (p) Scheffé	M±SD	t or F (p) Scheffé	M±SD	t or F (p) Scheffé
Gender	Male	3.90±0.67	-3.18	2.48±0.73	-1.95	4.18±0.35	0.95
	Female	3.20±0.48	(.002)	2.73±0.73	(.056)	4.12±0.32	(.347)
Age (year)	≤64	2.96±0.64	0.07	2.52±0.75	0.25	4.16±0.34	0.26
	65~74	2.96±0.65	(.928)	2.55±0.72	(.782)	4.15±0.36	(.775)
	≥75	3.09±0.78		2.78±0.83		4.28±0.29	
Educational level	Middle school	3.11±0.51	0.32	2.75±0.83	0.72	4.28±0.31	0.93
	High school	2.96±0.62	(.727)	2.48±0.70	(.488)	4.13±0.36	(.395)
	≥University	2.95±0.67		2.55±0.75		4.17±0.34	
Marital status	Married	2.96±0.66	-0.20	2.55±0.74	0.60	4.17±0.35	0.44
	Not married	2.99±0.53	(.840)	2.46±0.71	(.550)	4.14±0.31	(.662)
Employed	Yes	2.95±0.67	-0.58	2.49±0.75	-1.28	4.17±0.36	0.33
	No	3.00±0.58	(.562)	2.63±0.71	(.202)	4.15±0.33	(.740)
Practicing a religion	Yes	2.96±0.71	-0.17	2.53±0.78	-0.07	4.17±0.37	0.16
	No	2.97±0.58	(.868)	2.54±0.70	(.946)	4.16±0.32	(.874)
Social activities	3 or more times a week	3.19±0.76	1.81	2.71±0.72	1.58	4.14±0.31	1.30
	Once a week	2.97±0.68	(.148)	2.42±0.77	(.195)	4.20±0.36	(.277)
	2~3 times a month	2.85±0.53		2.38±0.67		4.07±0.30	
	Less than once a month	2.93±0.61		2.58±0.75		4.20±0.37	
Perceived health status	Good[a]	2.62±0.70	7.44	2.15±0.72	9.40	4.37±0.40	8.97
	Fair[b]	3.01±0.56	(.001)	2.52±0.63	(<.001)	4.09±0.30	(<.001)
	Poor[c]	3.12±0.66	a<b<c	2.80±0.81	a<b,c	4.15±0.34	a>b, c
Duration of diabetes (year)	≤3[a]	3.16±0.62	3.79	2.66±0.80	1.93	4.11±0.28	1.30
	4~10[b]	2.85±0.59	(.024)	2.38±0.68	(.147)	4.15±0.33	(.275)
	≥11[c]	2.91±0.66	a>b	2.55±0.72		4.21±0.39	
Type of hospital being treated at	Clinic[a]	2.85±0.61	4.44	2.40±0.74	3.72	4.20±0.36	1.07
	General hospital[b]	3.25±0.64	(.005)	2.79±0.73	(.013)	4.09±0.28	(.363)
	University hospital[c]	2.93±0.66	a<b	2.60±0.67	a<b	4.16±0.38	
	Public health center[d]	3.16±0.44		2.95±0.21		4.06±0.18	
Type of treatment method	Diet therapy[a]	3.06±0.47	6.91	2.56±0.53	10.56	3.99±0.25	4.21
	PO[b]	2.86±0.64	(<.001)	2.41±0.71	(<.001)	4.21±0.36	(.007)
	Insulin[c]	3.49±0.30	b<d	3.72±0.25	a, b<c, d	3.94±0.26	a<b
	PO + insulin[d]	3.41±0.61		2.98±0.74		4.10±0.28	
Experience of diabetes education	Yes	3.01±0.67	0.67	2.57±0.72	0.40	4.19±0.35	0.83
	No	2.94±0.62	(.505)	2.52±0.75	(.690)	4.15±0.34	(.407)
Presence of comorbidities	Yes	2.93±0.63	1.20	2.50±0.73	1.38	4.15±0.33	0.57
	No	3.07±0.65	(.231)	2.68±0.75	(.169)	4.19±0.39	(.568)

characteristics of participants were perceived health status (F=9.40, p <.001), type of hospital being treated at (F=3.72, p =.013), and the treatment method (F=10.56, p <.001).

The differences in acceptance action according to the general characteristics of participants were perceived health status (F=8.97, p <.001) and the treatment method (F=4.21, p =.007).

3. Correlations among Study Variables

As shown in Table 3, diabetes distress was positively correlated with self-stigma (r=.71, p <.001) and negatively correlated with acceptance action (r=-.48, p <.001). That is, the higher the diabetes distress, the higher the self-stigma and the lower the acceptance action. Self-stigma also had a negative correlation with acceptance action (r=-.43, p <.001), indicating that higher the self-stigma, the lower the acceptance action.

4. Mediating Effect of Acceptance Action in the Relationship between Diabetes Distress and Self-stigma

To confirm the mediating effect of acceptance action on the relationship between diabetes distress and self-stigma in patients with diabetes, a 3-step regression analysis was performed according to the procedure suggested by Baron & Kenny [17] (Table 4). The Durbin-Watson value was checked to verify the independence of the residuals before verifying the mediating effect, and was found to be 1.81 to 2.04, which is close to 2, indicating that the dependent variable had no autocorrelation. In addition, as a result of confirming multicollinearity, the tolerance limit was 0.774, all below 1.0, and the variance expansion coefficient for all variables was 1.00 to 1.29, not greater than 10, so there was no multicollinearity, confirming that the model was suitable for regression analysis.

The result of the regression analysis in step 1 confirmed that diabetes distress, an independent variable, had a statistically significant effect on acceptance action as a parameter (β=-.48, p <.001). In the 2nd step of regression analysis, the effect of diabetes distress, an independent variable, on self-stigma, a dependent variable, was confirmed to be statistically significant (β=.71, p <.001). In the last step, regression analysis was performed by inputting the independent variable diabetes distress and the parameter acceptance action as independent variables to analyze the effect of the parameter acceptance action on the dependent variable self-stigma. Both diabetes distress (β=.65, p <.001) and acceptance action (β=-.12, p =.044) were found to affect self-stigma. In step 3, both the independent variables, diabetes distress and the parameter acceptance action, were significant, and the coefficient of diabetes distress, the independent variable, was smaller in step 3 than in step 2, so the acceptance action partially mediated the relationship between diabetes distress and self-stigma. That is, diabetes distress had a direct effect on self-stigma, and diabetes distress had an indirect effect on self-stigma by changing acceptance action (Figure 1). The explanatory power of the regression analysis in this study was confirmed to be 51.0%. As a result of the significance of the indirect media-

Table 3. Correlation among Study Variables (*N*=187)

Variables	Diabetes distress	Self-stigma	Acceptance action
	r (p)	r (p)	r (p)
Diabetes distress	1.00		
Self-stigma	.71 (<.001)	1.00	
Acceptance action	-.48 (<.001)	-.43 (<.001)	1.00

Table 4. Mediating Effects of Acceptance Action on the Relationship between Diabetes Distress and Self-stigma (*N*=187)

Step	Independent variables	Dependent variables	B	SE	β	t (p)	Adj. R^2	F (p)
1	Diabetes distress	Acceptance action	-0.26	.04	-.48	-7.35 (<.001)	.22	54.04 (<.001)
2	Diabetes distress	Self-stigma	0.81	.06	.71	13.62 (<.001)	.50	185.54 (<.001)
3	Diabetes distress	Self-stigma	0.75	.07	.65	11.12 (<.001)	.51	96.38 (<.001)
	Acceptance action	Self-stigma	-0.25	.12	-.12	-2.03 (.044)		
						Sobel test; Z=1.98, p=.024		

Adj.=adjusted; SE=standard error.

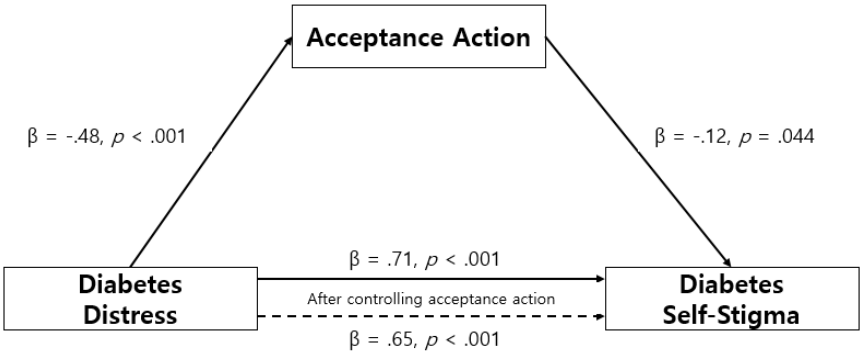

Figure 1. Mediating effects of acceptance action on the relationship between diabetes distress and self-stigma.

Table 5. Statistical Significance of Indirect Mediation Effects (*N*=187)

Effect	Boot SE	95% CI	
		Boot LLCI	Boot ULCI
0.06	0.03	-0.01	-0.13

CI=confidence interval; SE=standard error; LLCI=lower confidence interval; ULCI=upper level confidence interval.

ting effect using bootstrapping, the effect size was 0.06, the lower limit confidence interval was -0.01, and the upper limit confidence interval was -0.13, which was significant as it did not include 0 (Table 5).

DISCUSSION

This study aimed to determine the degree of diabetes distress, self-stigma, and acceptance action experienced by older patients with diabetes and confirm the mediating effect of acceptance action on the relationship between diabetes distress and self-stigma to provide basic data.

The participants' average score for diabetes distress in this study was 2.97 (out of 5), and there were differences according to gender, perceived health status, duration of diabetes, type of hospital, and treatment method. In a study by Keum et al. [21] using the same tool, the average score for diabetes distress was 2.30, which is different from the difference in diabetes distress scores depending on age, education level, and presence or absence of a blood glucose meter. In Keum et al.'s [21] study, diabetes distress increased with increasing age. In this study, however, there was no difference in diabetes distress according to age; it was found that the condition and treatment method of diabetes had more influence on diabetes distress. Choi and Kim [3] pointed out that patients' active coping could affect diabetes distress, and that oral hypoglycemic agents or insulin administration had a significant effect on diabetes distress. As shown in the results of this study, participants who received oral medication and insulin while attending a general hospital experienced more stress than those who received oral medication while attending a clinic. This could be inferred from high distress level, including that patients attending general hospital may have a higher severity of diabetes or may have more unstable blood sugar level. Instability in blood sugar levels may also be associated with more frequent changes in the treatment regimen applied, and may also be associated with greater insulin use [6]. So far, we have mainly studied the psychological and physical stress of participants with low diabetes self-management and their rate of unwillingness to self-care and interventions. It is now necessary to seek ways to reduce the psychological and physical stress of participants who practice diabetes self-management.

The average score for self-stigma regarding diabetes in the participants of this study was 2.54 (out of 5), and there were differences according to perceived health status, type of hospital being treated, and treatment method. In a study by Seo [11] using the same tool, the average score for diabetes self-stigma was 2.70 and there were differences according to general characteristics such as gender, age, education level, spouse status, and occupation. This result differs from the results of our study in that there was no significant difference in the score of diabetes self-stigma according to the general characteristics. This can be attributed to the fact that the age range of the participants in this study was not as wide as that in Seo's study [11], and the participants were older than 55 years. However, in this study, as in the study by Seo [11], there was a difference in the self-stigma score according to perceived health status, the type of hospital being treated, and the type of treatment. It can be considered that in the case of the old adults, the occurrence of diabetes-related self-stigma is affected more by diabetes-related characteristics than general characteristics, making it an essential element that must be

managed by patients [10]. The management goal of geriatric diabetes is to prevent hypoglycemia and maintain function [22]. In addition, it is suggested that strict glycemic control increases hypoglycemia and mortality, but rather has no benefit in cardiovascular disease [6,23]. Therefore, it is recommended that the old adults individualize the goal of glycemic control. However, in particular, the older adults need social support because they often complain of difficulties in self-management [5]. Self-stigma discourages diabetes patients from social activities and promotes social isolation [10]. Since social isolation is also a major social problem for the old adults, the self-stigma of diabetes in the old adults should be further managed [12]. However, domestic and overseas studies on the self-stigma of diabetes in the old adults are incomplete. Therefore, research should be conducted through a multi-faceted approach to study the self-stigma of diabetes in the old adults, and an intervention plan to reduce the self-stigma of the old adults should be prepared based on this study.

The acceptance action score of the participants in this study was 4.16 (out of 7 points), indicating that there was a difference depending on the perceived health status and type of treatment method. People with good perceived health had higher acceptance action than those with average or low perceived health, and those who received oral medications had higher acceptance action than those who took dietary therapy. To our knowledge, the only study in Korea that measured acceptance action in patients with diabetes was conducted by Yu and Son [24] on adolescents with type 1 diabetes. However, it is difficult to compare the results of this study with those of the present study. First, the study of Yu and Son [24] was different from the present study in terms of age because only 10 adolescents with type 1 diabetes mellitus were included. Second, there is a limitation since all adolescents are diabetes patients receiving insulin therapy. However, it is very high compared to the score of 3.12~3.25 in the study by Imani et al. [25], who investigated the acceptance action of diabetes patients in Iran. This may be attributed to the difference between the study participants of Imani et al. [25] and this study. Imani et al.'s [25] study involved participants in their 20s to 80s, whereas this study was limited to the old adults over 55 years of age. In addition, in their study, participants were recruited from public health centers with relatively low severity, whereas in this study, many of the participants were treated at general hospitals or university hospitals. It has been found through previous studies that the acceptance of disease affects self-care include diet adherence rate of diabetes patients and that it is also related to blood sugar management [26]. Therefore, efforts to increase the acceptance action of diabetes patients are necessary; outside Korea, the application of acceptance and commitment therapy, including the development of tools for diabetes acceptance action, is very actively carried out, but there is very little research on this topic in Korea. Therefore, in the future, multi-dimensional research is needed to understand the acceptance action of diabetes patients, including validation of the acceptance action tool focused on diabetes.

This study found that distress in patients with diabetes was positively correlated with self-stigma, and diabetes distress had a direct effect on self-stigma, meaning that people with high levels of diabetes distress have high diabetes self-stigma. Diabetes distress refers to negative experiences related to the treatment or management of diabetes [3]. These negative experiences are internalized in diabetes patients, leading to negative thoughts and emotions related to diabetes as well as diabetes self-stigma through a series of negative behaviors [9]. Since diabetes self-stigma not only reduces self-management for diabetes, but is also associated with social withdrawal [9], efforts are needed to prevent diabetes stress from leading to diabetes self-stigma. Therefore, it is necessary to understand the process that leads from diabetes distress to diabetes self-stigma, so a qualitative study to deeply explore the psychology of participants with high diabetes distress should be conducted.

The acceptance action of diabetes patients was negatively correlated with diabetes distress and self-stigma, and had a partial mediating effect on the relationship between diabetes distress and self-stigma. That is, if a person with diabetes distress engages in an acceptance action, self-stigma can be reduced. Diabetes distress was found to be experienced mainly by older participants and those with low education who had difficulty in managing diabetes [21], and tended to be higher in patients with a short duration and high severity of disease or receiving insulin treatment. Among these, notably, people with a short disease period or high insulin treatment may have a lower acceptance of diabetes. People with a short illness period may not be able to accept that they have diabetes, and patients receiving insulin treatment tend to want to return to their pre-insulin treatment [27]. In the case of these participants, they experienced negative emotions such as regret, fear, vagueness, and a sense of failure that they needed to receive insulin treatment [27]. These feelings are in line with those of participants who experienced self-stigma in relation to diabetes [10]. However, as shown in the results of this study, if old adult diabetes patients are induced to accept that they have the disease, the development of self-

stigma caused by diabetes distress can be reduced. A qualitative study of diabetes patients reported that if they accepted diabetes, they accepted it as a daily companion, revealed their disease, and sought suitable treatment [12]. Stress is believed to be essential for older people with diabetes to manage diabetes. However, this study found that such stress not only harms psychological well-being, but also creates self-stigma, which interferes with self-management of the old adults with diabetes and creates social withdrawal. In this process, it has been demonstrated that diabetes distress leading to self-stigma can be partially reduced through acceptance. Therefore, efforts to reduce the distress of old adults with diabetes and increase the acceptance of diabetes should be made in the future.

CONCLUSION

Since caution should be exercised in generalizing the results of this study, as this study only included some old adult patients with diabetes. Additionally, details such as comorbidities and complications of diabetes patients were not considered during the research process. Nevertheless, the relationship between diabetes distress, self-stigma, and acceptance action was investigated in diabetes patients, and it was confirmed that diabetes distress had a direct effect on self-stigma, and that acceptance action had a partial mediating effect on these relationships. The results of this study are meaningful. Based on the results of this study, we suggest the following: in terms of nursing research, this study was conducted with a limited number of old adult patients with diabetes, and there is a limitation in generalization of the study results. Therefore, in further studies, it is necessary to apply a variety of study participants in consideration of comorbidities and complications of older patients with diabetes. To reduce self-stigma of old adult diabetes patients in terms of nursing practice, it is suggested to develop and apply a nursing intervention program focusing on old adult diabetes patients by assessing diabetes distress and acceptance action. In terms of nursing education, it is suggested that education on the need for assessment of diabetes distress, self-stigma, and disease acceptance suitable for old adult diabetes patients is necessary for nursing patients with diabetes.

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