
The Psychological Effects of Diabetes Patients' Educational Experience on Health and Food Literacies in Korean

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ABSTRACT

This study aimed to provide basic data and policy suggestions to improve the health and nutrition level of diabetic patients by identifying the influencing factors on health literacy and food literacy according to diabetes management education experience. This study selected 28,477 (12.4 %) of the 229,242 2021 Community Health Survey subjects diagnosed with diabetes by a doctor. Data were analyzed using the SPSS 26.0 program. In the diabetes management education group (experienced group), there were 11% more males than females. The experienced group was younger and had a higher education level. Having a spouse or a higher BMI value resulted in a higher distribution. The experienced group had a high understanding of nutrition labels and a high food literacy reading comprehension, while the non-experienced group lacked food literacy understanding. The experienced group had a high experience of funduscopy, while the non-experienced group did not. Diabetes management education experience positively correlated with diabetes treatment methods, health literacy, and food literacy. Weight control experience negatively correlated with diabetes treatment methods, health literacy, and food literacy. Age, education level, occupation, weight control experience, health literacy, food literacy, and diabetes treatment methods were found to be influential factors in the educational experience of diabetic patients. The educational experience of the diabetic patients with an understanding of health literacy was 1.295 times higher than the educational experience of the diabetic patients that lacked an understanding of health literacy. The educational experience of the diabetic patients with an understanding of food literacy was 1.341 times higher than the educational experience of the diabetic patients that lacked an understanding of food literacy. Regarding the diabetes treatment methods, the educational experience of the diabetic patients with 3–6 methods was 2.576 times higher than the educational experience of the diabetic patients with 0–2 methods. Therefore, managing diabetic patients can mitigate the disease and prevent progression to complications by actively implementing relevant education and increasing the understanding of health literacy and food literacy

Keywords: Diabetes management education, Health literacy, Food literacy, Community Health Survey

1. INTRODUCTION

Diabetes is a chronic disease that causes hyperglycemia due to a defect in insulin secretion and function. If hyperglycemia due to diabetes persists, chronic complications occur in various organs such as the kidneys, eyes, nerves, heart, and blood vessels. Therefore, it is very important for diabetic patients to regularly manage their diabetes through diet, exercise, and drug therapy [1].

The number of diabetic patients continues to increase worldwide, and the age of diagnosis is decreasing [2]. According to the Korean diabetes fact sheet published by the Korean Diabetes Association, in 2020, 1 out of 6 Korean adults aged 30 years or older (16.7%) are diabetic [3]. When diagnosed only by fasting blood sugar, the prevalence of diabetes is 1 out of 7 adults aged 30 years or older (14.5%) [3]. In particular, the prevalence in adults over 65 is 3 out of 10 (30.1%) [3]. Therefore, it is necessary to suggest active health management plans for people with diabetes in Korea since the number of people with diabetes is increasing yearly. Healthcare approaches for diabetes management require appropriate exercise and dietary management. In order to practice exercise and eating habits in daily life, it is very important to acquire accurate information on nutrition and health management strategies.

Nutrition management for diabetic patients is a very important part of health management, but it is difficult to practice successfully. In the past century, nutritional guidelines for diabetic patients based on scientific evidence have been proposed. According to these guidelines, proper blood sugar and blood lipid levels, growth and development with balanced nutrition, pregnancy and lactation, aging, prevention of complications, and optimal

health conditions are important for the maintenance of diabetes [1]. Clinically, nutrition management aims to improve the metabolism by inducing changes in the nutrition and exercise habits of diabetic patients [1]. Health literacy, defined as the ability to obtain, understand, and appropriately utilize health-related information in daily life, is important in securing knowledge about one's disease as a factor influencing self-management ability [4]. Diabetic patients require constant self-management skills such as appropriate medication, exercise, and stress management to prevent complications [5]. It is known that the higher the level of self-management, the better the control of performance indicators such as HbA1c [6]. In addition, nutrition management related to dietary life is referred to as food literacy, which emerged as a concept related to food and nutritional intake derived from health literacy [7]. In Korea, the term food literacy is used in various ways, such as food literacy, food comprehension, food information comprehension, and dietary life ability [8-10]. Studies related to food literacy have been actively discussed since 2010, and it has been reported that low food literacy can have a negative impact on individual health outcomes [11].

Therefore, this study aimed to examine the relationships between health and food literacies and the diabetes management education experience of diabetic patients and to analyze the influencing factors on the diabetes management education experience to provide basic data and policy suggestions to improve the health and nutritional level of diabetic patients in Korea. The specific purposes of this study are:

First, the general characteristics of the educational experiences of diabetic patients were identified.

Second, the level of literacy according to the education experience of diabetic patients was identified.

Third, the frequency of diabetic treatment methods according to the educational experience of diabetic patients was identified.

Fourth, a correlation analysis was conducted among the education experience, weight control experience, literacy level, and frequency of diabetic treatment methods.

Fifth, the factors that affected the education experience of diabetic patients according to the health and food literacies were identified.

2. METHODS

2.1 Research Design

This secondary data analysis study used data from the 2021 Community Health Survey. Samples from the Community Health Survey were extracted under a complex sampling design and were calculated by considering weights, stratification variables, and clustering variables when estimating the mean and variance.

2.2 Research Subjects

This study included 28,477 (12.4%) of the total 229,242 subjects of the 2021 Community Health Survey diagnosed with diabetes by a doctor. Among them, those who answered 'yes' to the question "Have you ever received education on how to manage your diabetes" were classified as the diabetes education experience group (experienced group), and those who answered 'no' were classified as the non-diabetes education experience group (non-experienced group). As a result of the classification, there were 8,678 (30.5%) subjects in the experienced group and 19,799 (69.5%) subjects in the non-experienced group.

The model of this study divided diabetic patients into education experience group and non-education experience group. Subsequently, binary logistic regression analysis was performed by applying general characteristics, literacy characteristics, and frequency of diabetes treatment methods as variables. Then, I tried to confirm the influence of educational experience group due to diabetes [Figure 1].

2.3 Research Tools

2.3.1 Clinical Characteristics

The general characteristics included in this study were sex, age, education level, occupation, marital status, body mass index (BMI), and weight control experience. Age was classified into the following groups: 19–44, 45–64, 65–74, and 75 years and older. The education level was classified into the following groups: elementary school graduation, middle school graduation, high school graduation, or university and higher. Occupations were

classified as professional, administrative office, sales service, agriculture, forestry and fishery, simple functional labor, or other. The BMI was defined as underweight ($< 18.5 \text{ kg/m}^2$), normal weight ($18.5\text{--}22.9 \text{ kg/m}^2$), overweight ($23.0\text{--}24.9 \text{ kg/m}^2$), and obese ($> 25.0 \text{ kg/m}^2$). The World Health Organization Asia-Pacific BMI standard $18.5\text{--}22.9 \text{ kg/m}^2$.

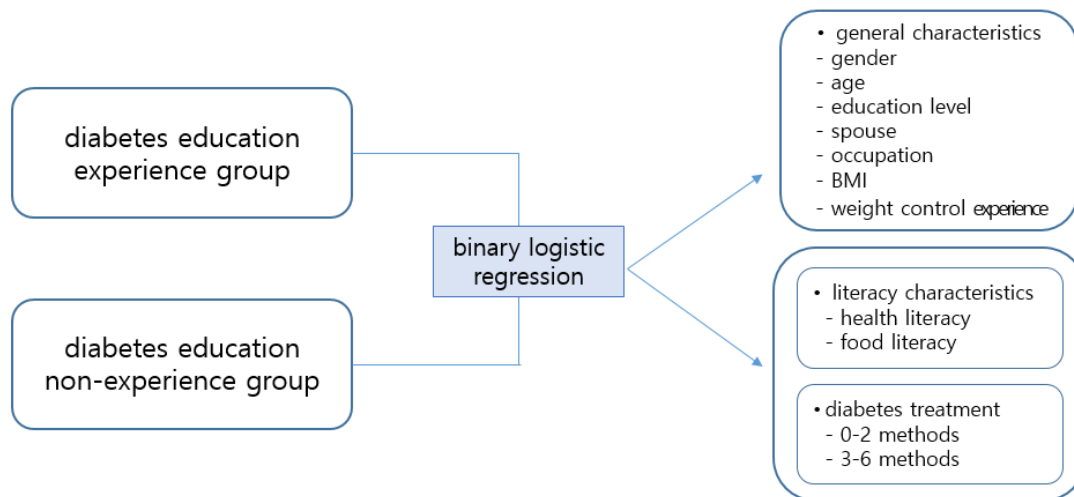


Figure 1. Research model

2.3.2 Literacy Level

The literacy level was analyzed by dividing it into health and food literacies. In the health literacy question, “How difficult is it to understand what doctors, nurses, oriental doctors, and other medical staff explain verbally?” ‘Very easy’ and ‘somewhat easy’ were classified as understanding, ‘Somewhat difficult’ and ‘very difficult’ were classified as lack of understanding. In addition, “How difficult is it to understand newspapers, Internet, information materials, etc. (text information)?” ‘Very easy’ and ‘somewhat easy’ were classified as understanding, ‘somewhat difficult’ and ‘very difficult’ as lack of understanding, and ‘not interested in written health information’ was classified as indifferent. In the food literacy question, the ability to read and understand nutrition labels was classified as comprehension when information can be easily understood, and lack of understanding when information is not easily understood. In addition, the degree of use of nutrition labeling was divided into used and not used.

2.3.3 Diabetes Mellitus Treatments

The question on diabetes treatment, “Are you currently receiving treatment for blood sugar control?”, was classified into non-drug treatment, drug treatment, insulin injection, and number of HbA1c tests. Also, “Have you ever had a funduscopy to check for eye complications from diabetes?” and “Have you ever had a microalbuminuria test to check for kidney complications due to diabetes?” The questions were classified as ‘yes’ or ‘no’.

2.4 Ethical Considerations

Data for this study were used after providing a written oath for the use of community health survey data on the Korea Centers for Disease Control and Prevention website, writing a data use plan, going through the data request process, and receiving approval for data use (receipt number 75712).

2.5 Data Analysis

Data used in this study were analyzed using the SPSS 26.0 program. Cross-analysis, correlation analyses, and logistic regression analyses were performed to test the statistical significance of the general characteristics, literacy level, and diabetes treatment according to the educational experience of diabetic patients.

3. CROSS-ANALYSIS OF INDEPENDENT VARIABLES ACCORDING TO THE EDUCATIONAL EXPERIENCE

3.1 Cross-analysis of the general characteristics according to the educational experience

Table 1 shows the cross-analysis of the general characteristics according to the educational experiences of diabetic patients.

Out of the 28,477 subjects, 8,678 (30.5%) were classified into the experienced group, and 19,799 (69.5%) were classified into the non-experienced group. There were 4,816 males (55.5%) and 3,862 females (44.5%) in the experienced group. Regarding age, in the experienced group, most of the subjects (3,789 [43.7%]) were aged 45–65 years old, and in the non-experienced group, most of the subjects (6,618 [33.4%]) were aged 65–74 years old. In terms of education level, 2,830 (32.6%) subjects in the experienced group graduated from high school, followed by 2,422 (27.9%) subjects with a college degree or higher, and in the non-experienced group, 8,847 (44.8%) subjects had an elementary school education or less. In terms of occupations, in the experienced and non-experienced groups, 1,677 (19.3%) and 4,046 (20.4%) subjects had simple functional labor positions, respectively. In terms of having a spouse, 6,123 (70.6%) and 12,674 (64.0%) subjects had a spouse in the experienced and non-experienced groups, respectively. Regarding the BMI, most of the subjects in the experienced group and the non-experience group (3,590 [42.9%] and 7,206 [38.9%], respectively) were obese. In terms of weight control experiences, in the experienced group, most of the subjects had weight control experience (5,540 [63.8%]), and in the non-experienced group, most of the subjects also had weight control experience (10,278 [51.9%]). All of the general characteristics were statistically significant ($p < 0.001$).

Table 1. Cross-analysis of the general characteristics according to the educational experience

Characteristics	DM education experience		Total n=28,477(%)	X ² (p)
	Yes n=8,678(%)	No n=19,799(%)		
Gender				
Male	4,816(55.5)	9,469(47.8)	14,285(50.2)	142.016***
Female	3,862(44.5)	10,330(52.2)	14,192(49.8)	
Age				
19-44 years	667(7.7)	528(2.7)	1,195(4.2)	1008.363***
45-65 years	3,789(43.7)	6,261(31.6)	10,050(35.3)	
65-74 years	2,563(29.5)	6,618(33.4)	9,181(32.2)	
≥ 75 years	1,659(19.1)	6392(32.3)	8,051(28.3)	
Education level				
≤ Elementary school	2,066(23.8)	8,867(44.8)	10,933(38.4)	1652.420***
Middle school	1,353(15.6)	3,493(17.7)	4,846(17.0)	
High school	2,830(32.6)	4,921(24.9)	7,751(27.2)	
> College graduate	2,422(27.9)	2,504(12.7)	4,926(17.3)	
Occupation				
Professional, administrative office	1,211(14.0)	1,147(5.8)	2,358(8.3)	686.387***
Sales service	902(10.4)	1,583(8.0)	2,485(8.7)	
Agriculture, forestry and fishery	821(9.5)	2,969(15.0)	3,790(13.3)	
Simple functional labor	1,677(19.3)	4,046(20.4)	5,723(20.1)	
Other	4,067(46.9)	10,054(50.8)	14,121(49.6)	
Spouse				
Yes	6,123(70.6)	12,674(64.0)	18,797(66.0)	114.612***

No	2,553(29.4)	7,115(36.0)	9,668(34.0)	
BMI				
underweight	165(2.0)	504(2.7)	669(2.5)	52.885***
Normal weight	2,500(29.9)	6,100(32.9)	8,600(32.0)	
overweight	2,112(25.2)	4,712(25.4)	6,824(25.4)	
obese	3,590(42.9)	7,206(38.9)	10,796(40.2)	
Weight control experience				
Yes	5,540(63.80)	9,521(48.1)	15,061(52.9)	600.777***
No	3,139(36.2)	10,278(51.9)	13,416(47.1)	
*p<.05, **p<.01, ***p<.001				

3.2 Cross-analysis of the literacy levels according to the educational experience

Table 2 shows the cross-analysis of the literacy levels according to the educational experiences of diabetic patients.

The literacy level was analyzed by dividing it into health literacy and food literacy. Regarding health literacy, most of the subjects in the experienced and non-experienced groups understood the medical staff's explanations (6,649 [76.6%] and 13,362 [67.5%], respectively). In terms of the degree of understanding of information from newspapers, the Internet, and guide materials (text information), most of the subjects in the experienced and non-experienced groups understood (5,537 [63.8%] and 8,913 [45.1%], respectively).

In terms of food literacy, most of the subjects in the experienced group understood (4,441 [51.3%]); however, most of the subjects in the non-experienced group lacked understanding (12,485 [63.2%]). Regarding the reading comprehension of nutrition labels, most of the subjects in the experienced group had an understanding (2,081 [46.9%]); however, most of the subjects in the non-experienced group lacked understanding (4,802 [66.2%]). As to whether the subject used nutrition labels, most of the subjects in the experienced and non-experienced groups used nutrition labels (1,722 [82.8%] and 1,960 [79.8%], respectively). All of the literacy level statistics in the experienced and non-experienced groups were statistically significant ($p < 0.001$ and $p < 0.05$, respectively)

Table 2. Cross-analysis of the literacy levels according to the educational experiences

Health & Food Literacy	DM Education Experience		Total n=28,477(%)	X ² (p)
	Yes	No		
Understanding of the doctor's explanation				
Understanding	6,649(76.6)	13,362(67.5)	20,011(70.3)	239.121***
Lack of understanding	2,027(23.4)	6,422(32.5)	8,449(29.7)	
Level of comprehension of text information				
Understanding	5,537(63.8)	8,913(45.1)	14,450(50.8)	1036.675***
Lack of understanding	1,947(22.4)	5,089(25.7)	7,036(24.7)	
Not interested	1,190(13.7)	5,781(29.2)	6,971(24.5)	
Understanding nutrition labeling				
Yes	4,441(51.3)	7,258(36.8)	11,699(41.2)	523.867***
No	4,219(48.7)	12,485(63.2)	16,704(58.8)	
Nutrition label reading				
Yes	2,081(46.9)	2,456(33.8)	4,537(38.8)	196.736***
No	2,360(53.1)	4,802(66.2)	7,162(61.2)	
Utilize nutrition labeling				
Yes	1,722(82.8)	1,960(79.8)	3682(81.2)	6.423*

No	358(17.2)	495(20.2)	853(18.8)	
*p<.05, **p<.01, ***p<.001				

3.3 Cross-analysis of the diabetes treatment methods according to the educational experience

Table 3 shows the cross-analysis of the frequency of diabetes treatment methods according to the educational experience of diabetic patients.

Six diabetes treatment methods were suggested, and all were statistically significant ($p < 0.001$). Regarding non-drug treatments, no treatment was the most frequent in the experienced and non-experienced groups, with 4,800 (55.3%) and 14,881 (75.2%) subjects, respectively. Regarding drug treatments, most of the subjects in the experienced and non-experienced groups were treated (7,726 [89%] and 18,221 [92.0%], respectively). Regarding insulin injection treatments, no treatment was the most frequent in the experienced and non-experienced groups, with 7,575 (87.3%) and 18,865 (95.3%) subjects, respectively.

Regarding funduscopy, most of the subjects in the experienced group had an examination (4,588 [52.9%]); however, most of the subjects in the non-experienced group had no examination (13,130 [66.5%]). Regarding microalbuminuria tests, most of the subjects in the experienced and non-experienced groups were tested (6,831 [78.7%] and 11,975 [60.5%], respectively).

Table 3. Cross-analysis of the diabetes treatment methods according to the educational experience

Characteristics	DM education experience		Total n=28,477(%)	X ² (p)
	Yes	No		
Non-drug treatment				
Yes	3,878(44.7)	4,918(24.8)	8,796(30.9)	1113.427***
No	4,800(55.3)	14,881(75.2)	19,681(69.1)	
Drug treatment				
Yes	7,726(89.0)	18,221(92.0)	25,947(91.1)	67.087***
No	952(11.0)	1,578(8.0)	2,530(8.9)	
Insulin treatment				
Yes	1,103(12.7)	934(4.7)	2,037(7.2)	580.380***
No	7,575(87.3)	18,865(95.3)	26,440(92.8)	
Fundoscopy				
Yes	4,588(52.9)	6,605(33.5)	11,193(39.4)	951.775***
No	4,087(47.1)	13,130(66.5)	17,217(60.6)	
Microalbuminuria test				
Yes	5,246(60.5)	7,764(39.4)	13,010(45.8)	1084.162***
No	3,420(39.5)	11,947(60.6)	15,367(54.2)	
HbA1c				
Yes	6,831(78.7)	11,975(60.5)	18,806(66.0)	894.389***
No	1,847(21.3)	7,824(39.5)	9,671(34.0)	
*p<.05, **p<.01, ***p<.001				

4. CORRELATION ANALYSIS BETWEEN VARIABLES ACCORDING TO THE EDUCATIONAL EXPERIENCE

Table 4 shows the correlation analysis between the variables according to the educational experiences of diabetic patients.

The correlation analyses among the diabetes management education experience, weight control experience, health literacy, food literacy, and diabetes treatment methods were all statistically significant ($p < 0.001$). Diabetes education

experience positively correlated with diabetes treatment methods ($r = .292, p < 0.001$), health literacy ($r = .194, p < 0.001$), and food literacy ($r = .162, p < 0.001$). However, diabetes education experience negatively correlated with weight control experience ($r = -.145, p < 0.001$). Weight control experience negatively correlated with food literacy ($r = -.231, p < 0.001$), health literacy ($r = -.225, p < 0.001$), and diabetes treatment methods ($r = -.163, p < 0.001$). Health literacy positively correlated with food literacy ($r = .301, p < 0.001$) and diabetes treatment methods ($r = .190, p < 0.001$). Food literacy positively correlated with diabetes treatment methods ($r = .170, p < 0.001$).

Table 4. Correlation analysis between variables according to the educational experience

Variables	1	2	3	4	5
1. Diabetes education experience	1				
2. Weight control experience	-.145***	1			
3. Health literacy	.194***	-.225***	1		
4. Food literacy	.162***	-.231***	.301***	1	
5. Diabetes treatment	.292***	-.163**	.190***	.170***	1

* $p < .05$, ** $p < .01$, *** $p < .001$

5. INFLUENCING FACTORS ACCORDING TO THE EDUCATIONAL EXPERIENCE

Table 5 shows the results of the binary logistic regression analysis to confirm the influencing factors according to the educational experience of diabetic patients.

A hierarchical regression analysis was performed according to the educational experience of diabetic patients, model 1. The general characteristics of age, education level, marital presence, occupation, and weight control experience were found to be influential factors ($p < 0.001, p < 0.01$). Compared with diabetic subjects aged 19–44, the educational experience of diabetic subjects aged 45–65, 65–74, and those aged 75 years or older was 0.661, 0.582, and 0.473 times higher, respectively. Regarding the level of education, compared with diabetic subjects that graduated elementary school, the educational experience of diabetic subjects that graduated middle school, graduated high school, and graduated university or higher was 1.403, 1.872, and 2.708 times higher. When comparing the presence of a spouse, the educational experience of diabetic subjects with a spouse was 1.102 times higher than the educational experience of diabetic subjects without a spouse. Compared with diabetic subjects with an occupation of other, the educational experience of diabetic subjects that were professional administrative office workers was 1.170 times higher, that worked in agriculture, forestry, or fisheries was 0.697 times higher, and those with a simple functional labor job was 0.821 times higher. The educational experience of diabetic subjects that had weight control experience was 1.432 times higher than the educational experience of diabetic subjects that had no weight control experience.

In the hierarchical regression analysis model 2, age, education level, occupation, and weight control experience were identified as influencing factors ($p < 0.001, p < 0.05$). In addition, health literacy, food literacy, and diabetes treatment methods were also influencing factors ($p < 0.001$). The educational experience of diabetic subjects that understood health literacy was 1.295 times higher than the educational experience of diabetic subjects that did not understand health literacy. The educational experience of diabetic subjects that understood food literacy was 1.341 times higher than the educational experience of diabetic subjects that did not understand food literacy. The educational experience of diabetic subjects with 3–6 diabetes treatment methods was 2.576 times higher than the educational experience of diabetic subjects with 0–2 diabetes treatment methods.

Table 5. Analysis of hierarchical influencing factors according to the educational experience

Classification		Model 1		Model 2	
		OR	CI 95%	OR	CI 95%
Gender	Male	ref			
	female	1.020	.960 - 1.083	.959	.901 - 1.021
Age					

	19-44 years	ref			
	45-65 years	.661***	.581 - .751	.590***	.517 - .673
	65-74 years	.582***	.508 - .668	.523***	.454 - .602
	≥ 75 years	.473***	.409 - .546	.475***	.409 - .551
Education level					
	≤Elementary school	ref			
	Middle school	1.403***	1.289 - 1.528	1.212***	1.110 - 1.323
	High school	1.872***	1.730 - 2.027	1.509***	1.389 - 1.640
	> College graduate	2.708***	2.463 - 2.977	1.994***	1.803 - 2.206
Spouse					
	No	ref			
	Yes	1.102**	1.037 - 1.171	1.047	.983 - 1.115
Occupation					
	Other	ref			
	Professional, administrative office	1.170**	1.053 - 1.299	1.148*	1.031 - 1.278
	Sales service	.924	.838 - 1.019	.934	.844 - 1.032
	Agriculture, forestry and fishery	.697***	.635 - .764	.739***	.672 - .812
	Simple functional labor	.821***	.762 - .885	.855***	.792 - .924
BMI					
	Underweight	ref			
	Normal weight	1.039	.860 - 1.254	.978	.806 - 1.187
	Overweight	1.035	.855 - 1.251	.982	.808 - 1.194
	Obese	.997	.826 - 1.204	.969	.799 - 1.175
Weight control experience					
	No	ref			
	Yes	1.432***	1.351 - 1.517	1.288***	1.214 - 1.368
Health literacy					
	Lack of understanding			ref	
	Understanding			1.295***	1.220 - 1.376
Food literacy					
	Lack of understanding			ref	
	Understanding			1.341***	1.245 - 1.444
Diabetes treatment					
	0-2 methods			ref	
	3-6 methods			2.576***	2.428 - 2.733
*p<.05, **p<.01, ***p<.001					

6. DISCUSSIONS

This study is a basis for improving the health and nutritional level of diabetic patients by identifying the influencing factors on health literacy and food literacy depending on diabetes management education experience. This study used the raw data from the Korea Centers for Disease Control and Prevention Community Health

Survey. It was conducted to provide data and policy suggestions to improve the diabetes management education experience.

In the experienced group, there were 11% more males than females, and the subjects were younger, had higher educational levels, had a higher frequency in the presence of a spouse, and had higher BMI values than the non-experienced group. It was confirmed that diabetic patients had an active attitude toward health management as they became aware of their disease risk. The experienced group had a high level of health inspections, and the non-experienced group did not test. Since funduscopy is related to the occurrence of retinal complications, one of the three major complications of diabetes, the awareness of the risk of diabetes seems to increase the educational experience. In particular, in type 2 diabetes, it is known that the younger age group has a higher risk of microvascular and macrovascular complications and exacerbation than the elderly, and the morbidity and mortality of cardiovascular disease increases significantly [12-13]. Accordingly, social support for the younger age group is a major factor in improving diabetes management and the education experience, and affects the recovery and survival of diabetic patients [14][22]. In addition, social support has a positive effect on medication adherence and dietary management and maintenance [15]. Therefore, the lack of social support for diabetic patients can negatively affect their self-management [16]. Annual diabetes screening is recommended for adults over 40 years of age who have risk factors for developing type 2 diabetes [17]. Risk factors for the development of diabetes include overweight or obesity, and mothers diagnosed with gestational diabetes [18]. This case was accompanied by a family history of type 2 diabetes and symptoms and diseases related to insulin resistance [18].

The experienced group had a high understanding of nutrition label recognition and reading comprehension for food literacy, and the non-experienced group lacked the understanding. Patients with pre-diabetes or diabetes require clinical nutrition therapy consisting of a healthy diet that includes whole grains, fruits, vegetables, and low-fat milk to reach their target blood sugar levels. The use of glycemic load provides additional help in glycemic control [19]. Therefore, food literacy education should be a priority in diabetes treatment, and it is an opportunity to increase food literacy by understanding and reading food labels and checking nutritional components. In addition, after diabetes diagnosis, participation in education to improve dietary life, active lifestyle improvement, weight loss through drug treatment, stabilization of blood sugar control, and regular evaluation and management of accompanying diseases and complications are necessary.

Age, education level, occupation, weight control experience, health literacy, food literacy, and diabetes treatment methods were found to be influencing factors in the educational experience of diabetic patients. The educational experience of diabetic patients with an understanding of health literacy was 1.295 times higher than the educational experience of diabetic patients that lacked an understanding of health literacy. The educational experience of diabetic patients with an understanding of food literacy was 1.341 times higher than the educational experience of diabetic patients that lacked an understanding of food literacy. The educational experience of diabetic patients with 3–6 diabetes treatment methods was 2.576 times higher than the educational experience of diabetic patients with 0–2 diabetes treatment methods. Health literacy affects an individual's reading and numeracy abilities according to personal factors, such as cognitive ability, age-related cognitive decline, and level of knowledge, and external factors, such as environmental factors corresponding to educational and learning opportunities [20]. Patients with low health literacy may not understand disease prevention or use necessary medical services because they do not know the signs or symptoms of the disease [21]. Likewise, patients with low food literacy lack the understanding of the relationships between food and nutrition, and reading nutritional information displayed on food labels is an obstacle to proper food intake. Therefore, securing information and understanding health and food literacies will be a driving force for active diabetes management.

7. CONCLUSION

This study identified the general characteristics and literacy level of diabetic patients and, through this, proposed health promotion plans. Therefore, based on the results of this study, I would like to make the following suggestions.

First, preventive health care and health and food literacy education should be conducted in the community before diabetes is diagnosed. Second, the national health checkup service should be provided for patients between the ages of 45 and 64, when diabetes diagnosis is the highest. Third, health and food literacy education and health

promotion education programs that can prevent additional complications and slow down the progression of diabetes should be implemented, focusing on diabetic patients. Fourth, literacy education should be systematically planned and promoted in Korea for chronic diseases similar to diabetes, and the application of digital therapeutics should be activated.

The results of this study are limited since this study used national raw data and did not include more diverse variables related to diabetes. More in-depth studies using various additional variables are required in the future

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