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Original Article

## Educational Needs Associated with the Level of Complication and Comparative Risk Perceptions in People with Type 2 Diabetes



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### ABSTRACT

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#### Keywords:

diabetes complications, program, perception, risk, type 2 diabetes mellitus

**Objectives:** This study aimed to identify the educational needs of people with type 2 diabetes according to risk perceptions and the level of severity of complications.

**Methods:** There were 177 study participants who were outpatients of the internal medicine department at a university hospital located in the Republic of Korea, who consented to participate in the survey from December 10, 2016 to February 10, 2017. The data were analyzed using descriptive statistics, Pearson correlation, ANOVA with post-hoc comparison, and multiple regression analysis. Type 2 diabetes complications were classified into 3 groups: no complications, common complications, and severe complications.

**Results:** There were statistically significant positive correlations between educational needs and comparative risk perceptions, and the level of complication and comparative risk perception. Multiple regression analysis revealed that the factor predicting educational needs of type 2 diabetes people was their comparative risk perceptions, rather than the severity of diabetes complications or sociodemographic variables.

**Conclusion:** Since risk perception is the factor that indicates the educational needs of people with type 2 diabetes, there is a need to explore factors which increase risk perception, in order to meet educational needs. The findings suggest that a more specific and individualized educational program, which focuses on each person's risk perceptions, should be developed.

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## Introduction

Diabetes is a chronic metabolic disease that is common in Korea. There are a large number of complications associated with diabetes varying in severity [1] which may be preventable by following guidelines provided by health-care professionals [2-4]. It is therefore important for people with diabetes to implement health behaviors to manage their blood glucose levels [5,6]. However, it has been reported that most individuals with diabetes do not effectively follow the diet and

exercise guidelines provided [7], and this leads to an increasing number of complications over time [8-9].

Educational needs are subjective and vary according to the individual [10]. Educational programs need to include knowledge or skills related to health promotion, health problems, and disease prevention [10], which is the foundation of motivating individuals to perform good health behaviors [11,12]. It was reported that people without diabetes complications who had a high educational and socioeconomic status, had high educational needs [13]. Providing education

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for disease management could increase self-care behavior by enhancing self-efficacy [14].

Previous studies have examined the educational needs of people with complications in diabetes. Perceptions about the disease, their cognitive function, activities of daily living, and depression status have been reported [15,16]. However, few studies have rigorously investigated the factors associated with these needs, for example, the examination of whether educational needs were influenced by severity of complications of diabetes.

It has been argued that the way people perceive the risk of diabetes needs to be considered when planning and implementing education programs [17]. It was also reported that risk perceptions were the main concept explaining behavioral changes [18]. The perception of, and attitude towards diabetes, as well as the intellectual level of individuals should be explored in order to identify educational needs [19]. People usually accept and follow medical advice from health care professionals when they perceive themselves as being more likely to have a severe illness/condition [20-22]. However, they may ignore such advice if they think there is no possibility that they would develop a condition such as diabetes [23]. Optimism bias refers to a tendency that people believe they have a lower probability of experiencing negative events [24,25]. Yet, optimism bias is an illogical underestimation of possible risks that can happen in the life, and is a subjective judgment based on vague expectations, rather than representing a logical judgment based on objective data [25,26].

It was observed that only 14.6% of those who developed diabetic retinopathy actually perceived the actual condition affecting them [27]. It was also reported that approximately 40% of people with diabetes did not understand the importance of managing lipid levels and blood pressure, to prevent complications of diabetes [27]. Older adults with diabetes often had incorrect knowledge about diabetes and foot care [28]. Some studies have shown that compliance with foot care is low among individuals with diabetes, which could be a causal factor leading to foot amputation [29,30]. It is assumed that these findings are related to how people with diabetes perceive the risk of diabetes complications such as diabetic retinopathy, hypertension, and foot problems. This has not been previously investigated in Korea. In order to implement education or assess educational needs, it is crucial to examine comparative risk perception across a group [17,31] rather than the risk perception of an individual developed over their lifetime, which inevitably will be different to another individuals risk perception [32]. It has also been suggested that health care professionals should tailor health-related messages according to the risk perceptions of each individual [17,31]. This study focused on educational needs in terms of complications and

the comparative risk perceptions of individuals with type 2 diabetes. The study investigated the relationship between educational needs, level of type 2 diabetes complications, and comparative risk perceptions amongst a type 2 diabetes population, to identify factors associated with educational needs. The present study aimed to provide fundamental data for developing an education program for self-care by the individual with type 2 diabetes. The objectives of this study were as follows:

1. Determine the general characteristics of study participants.
2. Examine educational needs related to the level of type 2 diabetes complications
3. Examine educational needs related to comparative risk perceptions
4. Identify the relationships between educational needs, level of type 2 diabetes complication, and comparative risk perceptions.
5. Identify predicting factors of the educational needs among people with type 2 diabetes.

## Materials and Methods

### 1. Design

This was a cross-sectional descriptive study examining the relationships between educational needs, complications of diabetes, and comparative risk perception, a variety of educational needs depending on complications and comparative risk perceptions, and the factors associated with educational needs among people with type 2 diabetes.

### 2. Study participants

This study applied arbitrary sampling extraction to 177 people with type 2 diabetes who visited the endocrinology outpatient clinic of a university hospital located in the Republic of Korea from December 10, 2016 to February 10, 2017. All patients with type 2 diabetes who visited the outpatient clinic were asked to participate in the survey. There were 177 patients who agreed to complete the survey after receiving detailed information of the study. Trained researchers were available to help participants understand the questions being asked in the survey. The inclusion criteria for this study were (1) aged 19 years or older, (2) people attending clinics on a regular basis (as recommended by their doctor) after being diagnosed with type 2 diabetes, (3) those who are able to interpret written Korean and communicate in spoken Korean, and (4) those who are able to complete, understand the purpose, and agreed to participate in the study.

The sample size was calculated using the G power 3.1 program. Since the study was measuring educational needs

based on the classification of diabetes complications and comparative risk perception, there were 3 groups per the classification of complications and comparative risk perception. With a level of significance ( $\alpha$ ) set at 0.05 for ANOVA, a medium effect size of 0.25, a power of 0.80, and 3 factors, the sample size required was 158. Considering attrition rate, a total of 182 participants were recruited. After excluding 5 incomplete responses, 177 participants were included in the final analysis.

### 3. Instruments

#### 3.1. Educational needs

The educational needs of each participant were measured using a tool developed by Park [31]. This tool comprises the following 7 subscales with a total of 44 items: characteristics of disease/condition (4 items), risk factors (8 items), medication administration (4 items), diet (10 items), physical activity and exercise (4 items), consistent care (6 items), and complications (8 items). Each item is scored on a 4-point Likert scale where 1 to 4 points are assigned to an individual's answer and a total score range of 44-176 points. A higher score indicates a higher educational need: "I never want to know" (1 point), "I do not want to know" (2 points), "I want to know" (3 points), and "I desperately want to know" (4 points). Cronbach's  $\alpha$  was 0.74 in the study by Park in 2012 [31], and 0.97 in this current study.

#### 3.2. Comparative risk perceptions

Comparative risk perceptions were measured using a scale (RPS-DM) developed by Walker et al [33] and validated by Kang [34]. This survey comprised of composite risk perception and risk knowledge as the main categories. The composite risk score included a total of 26 items in 5 subscales: personal control (4 items), worry (2 items), optimistic bias (2 items), personal risk (9 items), and environmental risk (9 items). Each item in comparative risk perception had a score ranging from 1 to 4 for each item (a total score range: 26-104), a higher score indicated a greater comparative risk perception. Risk knowledge included 5 questions to measure the knowledge that individuals with diabetes had about diabetes complications. Each item in risk knowledge had a correct answer score of 1 point, and a total maximum score of 5 for all 5 questions. A higher score indicated a greater knowledge of diabetes complications. This tool was developed in both English and Spanish. Since this tool had never been used in Korea, it was translated from English to Korean by the authors of this current study, and back-translated by a Korean nurse registered in the United States for more than 20 years. Two certified medical interpreters finalized the Korean version through an in-depth review and discussion.

The Cronbach's  $\alpha$  score for the entire survey tool was 0.65, and for the subscales of personal control, worry, optimistic bias,

personal risk, environmental risk, and risk knowledge were 0.65, 0.64, 0.76, 0.86, 0.83, and 0.64, respectively in the study by Walker et al [33]; the corresponding values in this study were 0.90, 0.51, 0.73, 0.70, 0.92, 0.89, and 0.62, respectively.

### 4. Data collection

This study was approved by 2 institutional review boards: G hospital and K university. There were 177 study participants who were randomly selected from the individuals with type 2 diabetes who visited the outpatient department (endocrine clinic) of a general hospital located in G city, Republic of Korea. Data were collected from December 10, 2016 through to February 10, 2017. The researchers explained the purpose and process of the study to the participants in a diabetes education classroom before the participants signed an informed consent form. The consent form provided information about the background and methods of the study, the confidentiality of the participants, and their freedom to stop participating in the study at any time. Data collection was conducted using a structured, paper-based survey.

### 5. Data analysis

Data were analyzed using the IBM SPSS software 20.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics was used to analyze the general characteristics, educational needs, levels of complications, and comparative risk perceptions of the participants. Pearson correlation was used to analyze the relationships between educational needs, levels of complications, and comparative risk perceptions. ANOVA was used to analyze educational needs related to the level of complication, comparative risk perceptions, and general characteristics of the participants, and Scheffé's test was applied as a post-hoc test when the ANOVA indicated a significant difference. Multiple regression analysis was also used to identify predicting factors of educational needs.

## Results

### 1. General characteristics

There were 126 (71.2%) males and 51 (28.8%) females, with an average age of  $54.38 \pm 9.97$  years (mean  $\pm$  SD; Table 1). The largest proportion of participants were in their 50s ( $n = 65$ ; 36.7%), married ( $n = 153$ ; 86.4%), high-school graduates ( $n = 89$ ; 50.3%), and with a monthly income of 3,000,000 to 5,000,000 Korean Won (KRW) (approximately 3,000 to 5,000 USD) ( $n = 63$ ; 35.6%). The duration of having type 2 diabetes was  $9.03 \pm 6.40$  years, and the largest proportion of participants in the study were those diagnosed 5 to 10 years previously ( $n = 47$ ;

Table 1. General characteristics of participants.

Characteristics	Variables	N	%	M (SD)
Gender	Male	126	71.2	
	Female	51	28.8	
Age (y)	≤ 39	13	7.3	54.38 (9.97)
	40-49	48	27.1	
	50-59	65	36.7	
	60-69	42	23.7	
	≥ 70	9	5.1	
Marital status	Married	153	86.4	
	Single	10	5.6	
	Divorced/separated/widowed	14	7.9	
Educational level	≤ Elementary school	12	6.8	
	≤ High school	89	50.3	
	≥ College	76	42.9	
Occupation	No	54	30.5	
	Yes	123	69.5	
Monthly income (10,000 won)	< 100	16	9.0	
	100- <200	23	13.0	
	200- <300	32	18.1	
	300- <500	63	35.6	
	≥ 500	43	24.3	
Duration of type 2 diabetes (y)	< 1	15	8.5	9.03 (6.40)
	1- <5	43	24.3	
	5- <10	47	26.6	
	10- <15	36	20.3	
	15- <20	25	14.1	
	≥ 20	11	6.2	
Experience of diabetes education	No	104	58.8	
	Yes	73	41.2	
Experience of family participation in diabetes education	No	147	83.1	
	Yes	30	16.9	

won = Korean Won (KRW).

26.6%). Diabetes education had not previously been received in 104 (58.8%) of the participants themselves, or by the families of 147 (83.1%) of the participants.

## 2. Educational needs related to the level of type 2 diabetes complications

Diabetes complications were classified into 3 levels:

(1) none; (2) mild to moderate complications (high blood pressure, vision problems, or numbness on feet); and (3) severe complications (heart attack, foot amputation, cancer, stroke, blindness, or kidney failure). The educational needs did not statistically significantly differ with the level of type 2 diabetes complications (Table 2).

### 3. Educational needs related to comparative risk perceptions

After classifying the comparative risk perception scores into low ( $n = 44$ ; lower quartile), median ( $n = 87$ ; middle quartiles), and high ( $n = 46$ ; upper quartile), the educational needs were observed to differ with the comparative risk perceptions ( $F = 8.84$ ;  $p < 0.001$ ). Scheffé's test revealed that participants with low comparative risk perceptions had statistically significantly lower educational needs than those with high comparative risk perceptions (Table 3).

### 4. Relationship between educational needs, comparative risk perceptions, and the level of type 2 diabetes complications

Educational needs had a statistically significantly positive relationship with comparative risk perceptions ( $r = 0.241$ ;  $p = 0.001$ ). Comparative risk perceptions had statistically significant relationship with level of diabetes complications ( $r = 0.253$ ;  $p = 0.001$ ). However, educational needs were not related to the level of type 2 diabetes complications ( $r = -0.015$ ;  $p = 0.842$ ; Table 4).

### 5. Factors influencing educational needs

Using regression analysis to search for the factors predicting educational needs, the level of complication, and comparative risk perceptions were imputed as independent variables, and educational need was imputed as a dependent variable. In addition, age, marital status, and educational level were added as independent variables which were significant to educational needs in univariate analysis. Multicollinearity among independent variables was also tested, which resulted in multicollinearity not being observed.

The statistically significant factors influencing the educational needs of the participants were comparative risk perceptions ( $p = 0.007$ ), and marital status ( $p = 0.004$ ). For comparative risk perceptions, people with a high comparative risk perception had higher educational needs than those with low comparative risk perceptions. In terms of marital status, married people had a higher educational need than those who were single, divorced, or bereaved. However, the level of diabetes complications, age, and educational levels were not factors that statistically significantly influenced educational needs. This result had an explanatory power of 10.8% (Table 5).

Table 2. Educational needs according to the level of type 2 diabetes complications.

Level of type 2 diabetes complications	Educational needs			
	N	M (SD)	F	p
No complications	52	3.24 (0.36)	1.64	0.198
Mild to moderate complications *	98	3.12 (0.51)		
Severe complications <sup>†</sup>	27	3.27 (0.53)		

\* Mild to moderate complications: high blood pressure, vision problems, or numbness on feet.

<sup>†</sup> Severe complications: heart attack, foot amputation, cancer, stroke, blindness, or kidney failure.

Table 3. Educational needs according to comparative risk perceptions.

Comparative risk perceptions	Educational needs				
	N	M (SD)	F	p	Scheffe
Lower 25%	44	2.95 (0.43) <sup>a</sup>	8.84	< 0.001	a < c
Median 26-75%	87	3.19 (0.50) <sup>b</sup>			
Upper 25%	46	3.35 (0.39) <sup>c</sup>			

Table 4. Correlations between variables ( $N = 177$ ).

	Educational needs	Comparative risk perceptions	Level of type 2 diabetes complications
Educational needs	1		
Comparative risk perceptions	0.241 (0.001)	1	
Level of type 2 diabetes complications	-0.015 (0.842)	0.253 (0.001)	1

Table 5. Predicting factors of educational needs (N = 177).

Variables	B	SE	$\beta$	t	p	Adj R <sup>2</sup>	F	p
Level of diabetes complications	-0.007	0.055	-0.010	-1.131	0.896	0.108	5.268	<0.001
Comparative risk Perceptions	0.007	0.003	0.204	2.707	0.007			
Age	-0.007	0.004	-0.144	-1.910	0.057			
Marital status	-0.291	0.101	-0.209	-2.890	0.004			
Educational level	0.039	0.038	0.077	1.028	0.305			

## Discussion

This study examined which factors were significant to the educational needs among people with type 2 diabetes, focusing on the level of diabetes complications, and comparative risk perceptions. There was a statistically significant correlation between educational needs and comparative risk perceptions, whereas no significant correlation was observed between educational needs and the level of diabetes complications. This indicates that people with higher comparative risk perceptions have greater educational needs, which suggests that their comparative risk perceptions should be considered when the individual's educational needs are assessed.

A previous study showed that the patient's perception of diabetes differed according to the presence of complications [15]. Another study observed that individuals with severe complications of diabetes had a tendency to become more depressed [16]. However, in the present study there was no significant difference in educational needs when the level of complication was considered as a factor, but there was a statistically significant difference in educational needs factoring for the level of risk perception. This result may be due to the fact that people do not realize the severity of their health condition in type 2 diabetes as it progresses gradually. Several studies have indicated that people with type 2 diabetes had a low level of awareness about complications such as problems with vision, foot numbness, and hypertension [27,28]. It was reported that they did not perceive managing hypertension and dyslipidemia as important in the prevention of complications in type 2 diabetes [27]. Many people with diabetes often receive misinformation or have incorrect knowledge about the value of diabetes foot care [28]. These studies imply that complications experienced by people with type 2 diabetes do not directly influence their educational needs, except when the complications are perceived as a risk.

This current study showed that married people with type 2 diabetes had higher educational needs than those who were single, divorced, or bereaved. Unfortunately, there is no

previous study investigating marital status and educational needs but 1 previous study showed that married people with diabetes had higher compliance with the treatment of diabetes, compared with those that were unmarried [35]. A study of the relationship between marital status and educational needs is necessary in the future.

Diabetes education programs should consider the educational needs, intellectual level, awareness, attitude, and risk perceptions of individuals [17,19-23,36,37]. None of the previous studies investigated the association between educational needs and comparative risk perceptions, or how risk perceptions influenced the health behaviors of individuals with diabetes. However, the findings of this current study suggest that health-care professionals should focus on identifying individuals' comparative risk perceptions, rather than only objectively assessing the condition when planning and implementing education. This will ensure that they receive an optimal education.

This study identified comparative risk perceptions as an important factor associated with educational needs, a finding not previously identified [31,37,38]. However, this study was conducted at 1 local hospital in South Korea and therefore generalizations cannot be made. Further robust studies are necessary to examine factors influencing educational needs in addition to comparative risk perceptions.

## Conclusion

This study was conducted to identify the relationships between the educational needs, levels of diabetes complications, and comparative risk perceptions among people with type 2 diabetes, with the aim of providing fundamental data for enhancing the self-care abilities of people with diabetes. This study showed that comparative risk perceptions and marital status were significant factors in predicting a diabetes patient's educational needs, whilst the level of type 2 diabetes complication was not significant: High comparative risk

perceptions and being married were associated with high educational needs. Thus, to assess the educational needs of type 2 diabetic patients, comparative risk perceptions should be considered rather than just objective complications. However, the relationship between educational needs and comparative risk perceptions was not particularly strong, and so it is difficult to conclude that comparative risk perceptions were the main factor contributing to increased educational needs. Therefore, further studies are needed to thoroughly investigate the factors influencing educational needs and risk perceptions among people with type 2 diabetes for the purpose of developing optimal programs for individualized interventions and education.

## Conflicts of Interest

The authors have no conflicts of interest to declare.

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