




Perceived diabetes risk and actual risk level in relatives of individuals with type 2 diabetes: Its relationship with promotive and protective health behaviors

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ABSTRACT

It is a known fact that diabetes can mostly be prevented or delayed with health-promoting and protective lifestyle changes in people at high risk of diabetes. In addition, awareness of the risk of diabetes in the relatives of individuals with diabetes may also contribute to the prevention of the disease. This study was carried out to determine the relationship between perceived and actual diabetes risk level with promotive and protective health behaviors in relatives of individuals with type 2 diabetes. This cross-sectional study included 596 individuals. Of the participants, 62.7% stated that they perceive their risk of developing diabetes at a high-very high level in the next 10 years. The participants had promotive and protective health behaviors at a moderate level. No significant difference was found between the perceived diabetes risk level and promotive and protective health behaviors. Health professionals should take more responsibility for risk identification and risk management.

Keywords: type 2 diabetes, perceived risk, promotive health, protective health, behaviors

INTRODUCTION

Diabetes is an important health problem both in Turkey and in the world. Turkey has the highest prevalence of diabetes in people aged between 20-79 (11.1%) among countries in the European region [1]. Diabetes is a disease that is often addressed and tried to be solved in recent years due to its increasing frequency, high mortality, and morbidity, increasing socioeconomic burden [2], and it is considered as the epidemic of the 21st century [3]. Diabetes will affect more and more people every day unless necessary precautions are taken and will continue to threaten the sustainability of health systems along with other chronic diseases [4].

Family history is a known fact for the development of type 2 diabetes (T2DM) and is considered a strong risk factor, and it is reported that as the number of relatives with diabetes in the family increases [5, 6], the risk of lifelong diabetes will also increase [7]. A study found that people with a history of diabetes in their first-degree relatives had a 2.5 times greater risk of T2DM than people without a family history and that the presence of T2DM in both parents increased the risk 5-6 times higher [5].

Screening individuals at risk and early recognition of the disease are essential to reduce the social burden of diabetes [8,9]. Additionally, the assessment of the risk perception of diabetes in family and close relatives of individuals with diabetes can contribute to disease prevention [10]. Risk

perception is an individual's perceived sensitivity to a threat and is considered a fundamental component of many health behavior changes [11-13]. A high level and accurate risk perception might affect individuals' willingness to engage in protective behaviors [14,15], and promote a healthy lifestyle such as healthy nutrition and sufficient physical activity [16,17]. The studies that evaluated the perceived risk of T2DM determined that individuals who were detected to be at high risk based on the presence of a family history of diabetes were often unaware of their increased risk [13,18].

There was no study that compared the actual risk with the risk perception of diabetes of the first- and second-degree relatives of individuals with diabetes and examined the healthy lifestyle behaviors of these individuals in the literature. Thus, this study was carried out to determine the perceived risk of diabetes and the actual risk level and promotive and protective health behaviors of first- and second-degree relatives of individuals with diabetes. In this study, the following questions were sought:

- What is the perceived diabetes risk level in the relatives of individuals with diabetes?
- What is the actual diabetes risk level in the relatives of individuals with diabetes?
- Is there a relationship between the perceived risk level and the actual risk level for diabetes in the relatives of individuals with diabetes?

- What is the promotive and protective health behaviors level of the relatives of individuals with diabetes?
- Is there a relationship between the perceived risk level and the promotive and protective health behaviors in the relatives of individuals with diabetes?

METHODS

Study Design and Aim

This cross-sectional study was included the first-degree (mother, father, sibling, and children) and second-degree (uncle, aunt, cousin, or niece (nephew or half-sibling) relatives of individuals who applied to the public hospital, internal and endocrinology and metabolic diseases outpatient clinics in Istanbul, Turkey between January and August 2020. This study aimed to reach the entire population at the specified time without sampling. The sample size was determined as 280 using power analysis at an error rate of $\alpha=0.05$ error and a moderate effect size of 0.25, and the power of the targeted test as 0.80 (80%). Thus, 596 individuals who were the first- and second-degree relatives of individuals with a diagnosis of T2DM for at least six months, who had not been diagnosed with diabetes before, who were not pregnant, who had no problems in speaking, hearing, and perception, whose standing weight and height measurements could be made, and who agreed to participate were included in the study.

Data Collection

Personal information form includes 31 questions about individuals' sociodemographic characteristics, anthropometric measurement information, the featured of their relatives with diabetes regarding the illness and the information about the diabetes risk of the individuals and that aim to determine the perceived risk of diabetes. The level of perceived diabetes risk of the individuals was evaluated with the question of "What is your risk of developing diabetes in the next 10 years? (the answer options: "no risk at all", "very low", "low", "moderate", "high" and "very high").

The Finnish type T2DM risk assessment scale (FINDRISC) is one of the tools that assess the risk of diabetes in adults and was developed in Finland in 2003 as a result of a community-based cohort study. FINDRISC, which is used by the International Diabetes Federation (IDF) for community-based diabetes screening, has been translated into Turkish by the Turkish Society of Endocrinology and Metabolism (TEM) and is recommended for diabetes screening in Turkey. FINDRISC determines a person's risk of developing diabetes in the next 10 years; thus, it identifies individuals at high-risk and allows them to move to the next step for diagnosis. FINDRISC is simple, easy, and understandable and consists of eight questions. The total score is obtained from the sum of the scores for the answers to the questions, and the total score that can be obtained ranges from 0-26. The degree of risk of individuals in terms of developing T2DM within the next 10 years can be determined based on the scores obtained. Accordingly, the rating based on the scores obtained is made, as follows: a total score of <7 as low risk of diabetes (1% of the 10-year-long risk of diabetes), 7-11 as mild risk of diabetes (4% of the 10-year-long risk of diabetes) 12-14 as moderate risk of diabetes (16% of the 10-year-long risk of diabetes), 15-20 as high risk of diabetes (33% of the 10-year-long risk of diabetes)

and over 20 points as very high risk of diabetes (50% of the 10-year-long risk of diabetes) [19].

The promotive and protective health behaviors scale was developed by [20] and includes 24 items. It has three subdimensions as physical, psychosocial, and protection. The physical sub-dimension evaluates to what extent the individual is active in daily life, regular exercising behaviors, and behaviors related to meeting physiological needs such as eating and drinking while the psychosocial sub-dimension evaluates psychosocial skills such as interpersonal relationships, coping with stress, and behaviors such as spending time for oneself and one's close circle and the protection sub-dimension evaluates the behaviors that the individual should do to protect their current health. The five-point Likert type scale is scored as "never 1", "very rarely 2", "sometimes 3", "mostly 4", "always 5". The highest possible score obtained from the scale is 120 and the lowest score is 24. Low scores indicate that the person does not exhibit promotive and protective health behaviors. The Cronbach's alpha value was found as 0.83 for the overall scale developed [20]. Cronbach's alpha coefficient of the scale was found to be 0.85 in this study.

Data were collected by the researchers in the patient's examination room using the technique of one-on-one interviews. Weight measurements of individuals were made in an empty room without removing their clothes and before breakfast using a classic scale calibrated by the hospital. Height measurement was made using an inelastic tape measure on foot without shoes. Waist circumference was measured by the narrowest diameter rigid tape measure between the arcus costarum and the processus spina iliaca anterior superior. The individual's height was recorded in cm, weight in kilograms (kg), and the body mass index (BMI) was calculated using the formula of kg/m^2 . Anthropometric measurements of the individuals were made by the same researcher to reduce the error rate. The data forms took about 15-20 minutes to complete by the researchers.

Statistical Analysis

The data of the study were analyzed using the SPSS 22.0 program. The Kolmogorov-Smirnov test was used to evaluate the conformity of the data to normal distribution. The distribution of socio-demographic characteristics of participants and their opinions on diabetes risk and their mean scores on the FINDRISC and the promotive and protective health behaviors scale were evaluated using the percentile and average test. The Kappa consistency measurement was used to examine the compliance between the perceived risk level of diabetes of individuals and their diabetes risk level according to FINDRISC. The Kruskal-Wallis test was used to evaluate the correlation between the perceived risk level of diabetes and the mean scores on the Promotive and Protective Health Behaviors Scale. The significance level of the data analysis was found to be 0.05.

Ethical Dimension

Written permission was obtained from a university's Clinical Research Ethics Board prior to conducting the study (Decision No:2020/36). In addition, the individuals were explained that the data to be obtained will only be used within the scope of the study and that confidentiality will be strictly ensured, and the written and verbal consent has been obtained from individuals who have agreed to participate in the study.

Table 1. Distribution of the opinions of the relatives of individuals with diabetes about the risk of diabetes

Statements	n	%
What do you think is the most important factor that causes diabetes?		
Malnutrition	338	56.7
Stress	152	25.5
Genetic susceptibility	81	13.6
Alcohol	19	3.2
Other (smoking, lack of physical activity, and obesity)	6	1.0
Do you think risk factors that can cause diabetes can be controlled?		
Yes	220	36.9
No	65	10.9
I do not know	311	52.2
Do you think you have enough information about dealing with diabetes?		
Yes	204	34.2
Partly	187	31.4
No	205	34.4
Do you want to get information about diabetes and screening tests from a physician or nurse?		
Yes	496	83.2
No	100	16.8
Have you been informed about getting a diabetes screening test by a physician or nurse?		
Yes	274	46.0
No	322	54.0
Have you got a diabetes screening test since you have a relative diagnosed with diabetes?		
Yes	139	23.3
No	457	76.7
Does thinking about diabetes bother you?		
Does not bother at all	84	14.1
It bothers a little	333	55.9
Very disturbing	179	30.0
What is your risk of developing diabetes in the next 10 years?		
Low	18	3.0
Slightly	82	13.8
Moderate	122	20.5
High	226	37.9
Very high	148	24.8
Considering your current lifestyle, what are your chances of developing diabetes in the future compared to other people?		
My chances of getting diabetes are the same as most people	128	21.5
My chances of getting diabetes are higher than most people	297	49.8
My chances of getting diabetes are lower than most people	171	28.7

RESULTS

The mean age of the participants was 39.78±7.93 and 55.9% were female while 15.8% were male. Of the participants, 22.3% were still smoking and 9.6% consumed alcohol. The study determined that 16.4% of participants had a chronic disease, and the majority of people with chronic disease (48.9%) had high blood pressure. Of 88.4% of the participants who were first-degree relatives of a person with diabetes, 37.9% rated their overall health status at a moderate level.

The participants stated that the most important factors that cause diabetes were malnutrition (56.7%), stress (25.5%) and genetic predisposition (13.6%). While 36.9% of the participants said that risk factors that can cause diabetes can be controlled, 52.2% said they have no knowledge about this.

of the participants, 37.9% stated that they have a high risk of developing diabetes over the next 10 years while 24.8% stated that they have a very high risk of developing diabetes over the next 10 years. In addition, 49.8% of the participants stated that they are more likely to develop diabetes than most people considering their current lifestyle (**Table 1**).

When T2DM risk was evaluated according to the FINDRISC score results of the participants, it was determined that 5.5% were in the high-risk group and 0.3% were in the very high-risk group. In addition, the mean score of participants on FINDRISC was 10.48±2.85 (min:3 points, max:22 points) (**Table 2**).

The study found no statistically significant consistent between the real diabetes risk and perceived diabetes risk of the individuals ($K=0.013$, $p=0.395$). In general, the ratio of people who stated to have a very high risk of diabetes (24.8%)

Table 2. Distribution of the FINDRISC scores of the relatives of individuals with diabetes

Variables	Category	Point	n	%
Age (years)	<45	0	440	73.8
	45-54	2	149	25.0
	55-64	3	5	0.8
	>64	4	2	0.3
Body-mass index-BMI (kg/m ²)	<25	0	263	44.1
	25-30	1	256	43.0
	>30	3	77	12.9

Table 2 (Continued).

Variables	Category		Point	n	%
	Men	Women			
Waist circumference (cm)	<94 <80		0	163	27.3
	94-102 80-88		3	187	31.4
	>102 >88		4	246	41.3
Daily physical activity	Yes		0	350	58.7
	No		2	246	41.3
Vegetables, fruit, or berries consumption	Every day		0	167	28.0
	Not every day		1	429	72.0
Hypertension or use of antihypertensive medicine	No		0	548	91.9
	Yes		2	48	8.1
History of high blood glucose	No		0	590	99.0
	Yes		5	6	1.0
Family history of diabetes	Yes: non-first-degree relative		3	73	12.3
	Yes: first-degree relative		5	523	87.8
FINDRISK	Low		<7	71	11.9
	Slightly		7-11	297	49.8
	Moderate		12-14	193	32.4
	High		15-20	33	5.5
	Very high		>20	2	0.3
FINDRISK total score	10.48±2.85 (min=3, max=22)				

Table 3. Comparison of the perceived risk of diabetes with the FINDRISK score of the relatives of people with diabetes

Perceived risk of diabetes	T2DM risk level according to FINDRISK											
	Low		Slightly		Moderate		High		Very high		Total	
	n	%	n	%	n	%	n	%	n	%	n	%
Low	1	1.4	7	2.4	10	5.2	1	1.4	7	2.4	10	5.2
Slightly	9	12.7	39	13.1	27	14.0	9	12.7	39	13.1	27	14.0
Moderate	14	19.7	56	18.9	50	25.6	14	19.7	56	18.9	50	25.6
High	39	54.9	113	38.0	62	32.1	39	54.9	113	38.0	62	32.1
Very high	8	11.3	82	27.6	44	22.8	8	11.3	82	27.6	44	22.8
K=0.013, p=0.395												

Table 4. Distribution of the mean score of the relatives of individuals with diabetes on the promotive and protective health behaviors scale

The promotive and protective health behaviors scale	Possible min-max scores	Received min-max scores	M±SD
General	24-120	56-97	75.97±12.64
Physical	10-50	24-44	30.75±3.81
Psychosocial	6-30	14-28	18.11±3.65
Protection	8-40	13-40	27.10±7.68

Table 5. Distribution of the mean scores of the relatives of individuals with diabetes on the promotive and protective health behaviors scale and their perceived risk of diabetes

Perceived risk of diabetes	The promotive and protective health behaviors scale			
	General	Physical	Psychosocial	Protection
Low	76.55±12.22	31.05±3.88	17.77±3.94	27.72±6.41
Slightly	75.40±12.60	30.21±3.52	17.69±3.35	26.48±8.02
Moderate	76.80±12.66	30.94±4.00	18.20±3.93	27.65±7.31
High	76.03±12.88	30.73±3.69	18.11±3.53	27.18±8.06
Very high	76.56±12.32	30.90±4.01	18.30±3.76	27.35±7.28
Test, p	KW=8.493/0.076	KW=4.407/0.354	KW=6.525/0.163	KW=7.393/0.117

is significantly higher than the ratio of people who had a very high level of actual diabetes risk (0.3%) (Table 3).

According to the mean score of participants on the Promotive and Protective Health Behaviors Scale (75.97±12.64), it was determined that the level of promotive and protective health behavior was moderate (Table 4).

No significance was found in the comparison of the perceived diabetes risk of the participants and their mean score on the promotive and protective health behaviors scale (p>0.05) (Table 5).

DISCUSSION

The risk perception for developing diabetes is considered as a key concept in screening behaviors and improving individual lifestyle [10]. About two-thirds (62.7%) of the individuals in the study stated that they perceived themselves to have a high and very high risk of developing diabetes over the next 10 years.

A study conducted with individuals who received primary healthcare services and who have genetic traits including patients with diabetes found that family history explained 10%

of the variance in the perceived risk of diabetes [21]. A study conducted with Caucasian, Filipino, Korean, and Latin American people without diabetes found that 46.5% of the participants considered themselves at risk for lifelong development of diabetes [10]. Other studies found that people with a family history of diabetes had higher perceived risk levels than those without [6,12,18,22-24]. The perceived risk of an individual regarding a specific health condition such as diabetes is probably based on numerous factors such as personal health beliefs, past experiences, culture, and interactions with health care professionals [14]. The finding obtained in this study shows that more than half of the individuals included in the study are aware of their genetic predisposition to the risk of diabetes.

Risk assessment for adults can be done with FINDRISC, an easy, practical, non-invasive, and low-cost screening tool for individuals at high risk of diabetes [19,25]. Considering the risk of T2DM according to FINDRISC, 35 (5.8%) participants had a high risk of being diagnosed with diabetes within ten years. A study, which was conducted to assess the risk of diabetes in first-degree relatives of people with T2DM who were treated in hospital, found that 41.5% of individuals had a high and very high risk according to FINDRISC [8]. In [26], it was conducted a study with individuals aged between 35-75 in Sweden and found that 9.6% of the participants had a high-to-very high risk of diabetes, and 88.2% of these individuals had a family history of diabetes. Many studies have found that people with a family history of diabetes have a high risk of developing diabetes [5,9,27,28]. The lower rate of high risk in this study may be due to the fact that participants were in the 28-56 age group.

The study determined that there was no compliance between the participants' perceived risk of diabetes and the actual risk levels of diabetes and that the ratio of people who had a high perceived risk was higher than those who had an actual high risk. There are studies with different results in the literature. Some studies have determined that individuals with high-risk levels also had a high perception of risk [13,17,29]. However, a study carried out on individuals with an actual high risk of diabetes found that the perceived risk of diabetes was low and the ratio of those who had a perception of no risk and low risk was high (85.9%) [30]. A study that examined the perceived risk and the actual risk of high blood pressure and diabetes in the African American community found that almost one-third of those at real risk believed that there is no risk of developing diabetes [31]. Another community-based study that examined risk perception in adults with low and high-risk levels of T2DM found that 81.2% of individuals at high-risk perceived diabetes as a moderate to very serious disease although almost half of the participants reported that they did not know the risk of diabetes [32]. However, some of the studies that evaluated the perceived risk of T2DM focused on the differences in family history and reported that individuals who were identified as being at high risk based on the positive family history were often unaware of their increased risk [13,18].

Promotive and protective health behaviors affect a person's current health and productivity, as well as their protection from many possible metabolic diseases in later life [33]. This study determined that individuals who had close relatives with diabetes had moderate promotive and protective health behaviors. Some studies have found that individuals with a family history of diabetes have a higher level of health behaviors that prevent diabetes such as healthy

eating and diabetes screening than those who do not have a family history of diabetes [33-35]. Another study also found that participants in the high familial risk group had a high level of approach to engaging in behaviors such as making lifestyle changes to prevent diabetes [24]. Considering the findings of this study, it is remarkable that the level of promotive and protective health behavior of individuals who had relatives with diabetes was not at the intended level. Considering the genetic predisposition in the development of diabetes, it is extremely important to raise individuals' awareness about behaviors that promote health and support a protective lifestyle.

People believe that they are healthier than others not because they have false information about the causes of diseases but because they do not apply that information to themselves properly. They may especially believe that their actions that contribute to risk (e.g., smoking) outweigh actions to prevent risk (e.g., engaging in adequate physical activity) [36]. This study determined that the levels of promotive and protective health behavior levels of those who perceived a low or high risk were similar. A study, which was conducted with Arab-Americans aged 30 and older and a BMI value of 27 kg/m² determined that those who considered themselves at high risk of developing diabetes had a higher level of engaging in lifestyle changes that prevent diabetes such as a healthy diet than those who considered themselves at low risk of developing diabetes (26% vs. 9%) [14]. Another relevant study found that the perceived risk level of diabetes was positively correlated with the behavior of participating in blood glucose screening, which was considered among the protective health behaviors [15]. Unlike these studies, a study, which was conducted to understand the perceived risk of T2DM in healthy middle-aged adults, found that the compliance level of those with a perception of high-risk with risk-reducing health behaviors such as diet and physical activity [13]. Additionally, some studies have shown that there was no correlation between risk perception and healthy lifestyle changes [17,23,30,37]. The perceived risk of illness is often not enough to succeed in difficult lifestyle changes such as weight loss or maintaining regular physical activity. Only knowledge and risk perception do not guarantee the intention to change lifestyle [17]. The finding obtained in this study indicates that individuals' beliefs about genetic predisposition as the cause of diabetes are stronger than the importance of preventive approaches such as a healthy lifestyle.

This study has some limitations. The most important limitation of the study is that the results cannot be generalized because a probabilistic sampling was not selected, and the participants consisted of only the relatives of individuals with diabetes in one center. Additionally, the study presents cross-sectional data since it was conducted in a certain period of time. Moreover, the perceived level of risk and the level of promotive and protective health behaviors are based on self-notification. However, individuals were not screened for diabetes using diagnostic methods such as fasting blood glucose, and HbA1C. Despite these limitations, this study is the first to reveal the perceived and actual risk levels of the relatives of individuals with diabetes and to examine the correlation between the perceived risk level and the level of promotive and protective health behaviors.

CONCLUSION

This study found that almost two-thirds of the relatives of individuals with diabetes perceived themselves at high risk for diabetes while their actual risk level was low. Although the perceived risk level was high in the study, it is interesting that this level did not affect the level of promotive and protective health behaviors.

The findings of this study highlight the need to increase awareness of diabetes risk and promotive and protective health behaviors. Especially health professionals who provide primary healthcare services and care for individuals with diabetes should take more responsibility for risk identification and risk management. In this regard, health professionals should inform individuals at risk genetically through visual, auditory, and written materials in terms of risk factors and protective lifestyle, should calculate the risk levels of individuals, should evaluate the adaptation of individuals to the desired behavior change after training, and should advise those at high risk on how to control the risk factors. Additionally, it should be ensured that informative training is provided on online medium considering that social media also plays an important role in raising awareness in today's world. It is recommended that more long-term studies that will reveal the relationship between perceived risk and promotive and protective health behaviors in individuals at risk due to genetic predisposition should be carried out.

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Declaration of interest: No conflict of interest is declared by authors.

Data sharing statement: Data supporting the findings and conclusions are available upon request from the corresponding author.

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