



Determination of Type 2 Diabetes Risk by Using of Diabetes Risk Questionnaire Prepared by Turkish Diabetes Association in People Living in the District of Zeytinburnu, Istanbul

Gulay Karakas¹, Neda Taner^{2*}, Caglar Macit³

¹Department of Clinical Pharmacy, Institute of Health Science, Istanbul Medipol University, Istanbul, Turkey.

²Department of Clinical Pharmacy, School of Pharmacy, Istanbul Medipol University, Istanbul, Turkey.

³Department of Pharmacology, School of Pharmacy, Istanbul Medipol University, Istanbul, Turkey.

Received: 2021-01-16, Revised: 2021-03-31, Accepted: 2021-04-01, Published: 2021-06-30

ARTICLE INFO

Article type:

Original article

Keywords:

Type 2 Diabetes;
Questionnaire;
Lifestyle

ABSTRACT

Background: Type 2 diabetes is a serious condition that is rapidly increasing all over the world and can cause other metabolic diseases. In our study, we aimed to evaluate the probability of the participants having Type 2 diabetes by using diabetes risk questionnaire.

Methods: During the month of March 2019, a validated questionnaire prepared by the Turkish Diabetes Association was administered to 500 patients (M= 223, (44.6%); (F= 277), (55.4%)) who were applying to a pharmacy in Zeytinburnu, Istanbul. Statistical analyzes were performed using SPSS version 21. Data were expressed as mean, standard deviation (SD) and percentage (%). In this respect, the normality of data distribution was determined by the Shapiro-Wilk test.

Results: The scale total scores of women were significantly lower than the total scale scores of men ($p < 0.001$). It was found that the risk of developing diabetes increased significantly with age ($p < 0.001$). Patients aged 60 and over were at the highest risk of Type 2 diabetes. It was determined that the risk of developing Type 2 diabetes was significantly higher in patients with high blood pressure ($n = 111$), ($p < 0.001$). One hundred and thirty-seven physically inactive participants had a significantly higher risk of Type 2 diabetes ($p < 0.001$). Finally, the risk of diabetes increased with increasing weight ($p < 0.001$).

Conclusion: In conclusion, increasing age, high blood pressure, physical inactivity can increase the risk of Type 2 diabetes. To prevent the risk, people should be physically active and they should consume healthy and balanced diet.

J Pharm Care 2021; 9(2): 55-60.

► Please cite this paper as:

Karakas G, Taner N, Macit C. Determination of Type 2 Diabetes Risk by Using of Diabetes Risk Questionnaire Prepared by Turkish Diabetes Association in People Living in the District of Zeytinburnu, Istanbul. J Pharm Care 2021; 9(2): 55-60.

Introduction

Diabetes is one of the most important diseases that continue to increase rapidly, not only in our country but also in the world. Hyperglycemia and hyperinsulinemia that come together with Type 2 Diabetes (T2D) are accepted risk factors for cardiovascular diseases. Obesity is another important risk factor for cardiovascular diseases and T2D (1).

Patients with T2D also have hypertension, dyslipidemia and obesity and they are under risk for microvascular and macrovascular complications like myocardial infarction,

stroke, microalbuminuria and retinopathy. To optimize the cardiovascular health problems, patients with T2D need strategies to reduce risks (2).

It is considered T2D has begun 9-12 years before its diagnosis. In preclinical term, only microvascular changes occur and when patients are diagnosed, they are detected to have proteinuria and retinopathy at rate of 5-10% and 15-20%, respectively. These patients have 2-4 times greater cardiovascular diseases, hypertension, dyslipidemia and obesity than from normal population (3). Diabetes Mellitus

*Corresponding Author: Dr Neda Taner

Address: Department of Clinical Pharmacy, School of Pharmacy, Istanbul Medipol University, Istanbul, Turkey.

Email: ntaner@medipol.edu.tr

is a disease with its high morbidity and mortality rates, leads to far-organ damage, complications. Because it affects individuals and their families, it is required a multidisciplinary approach both in the therapy and in the pharmaceutical care processes (4).

Some of the scientists stated that congestive heart failure (CHF) and diabetes develop on a common ground. On the other hand, it is known that diabetes is accepted equivalent of CHF by American Heart Association (AHA). Diabetes leads to a very high mortality in adults and frequency is rapidly increasing in our society (5). Because of this, it is a task to work on people who are examined and annually scanned, and it will be beneficial for better planning of subsequent scans (6).

To prevent or delay the onset of T2D, it is necessary to identify high-risk populations and to change behavior on this issue immediately. One of the most accurate tests of diabetes goes through fasting blood sugar analysis; however, it is invasive and costly.

The prevalence of the disease has been increasing in the last decade and will continue to increase due to growth in the aging population, urbanization, high obesity and sedentary lifestyle (7).

Although diabetes is an important health problem for both patients and their families, complications caused by diabetes have a negative effect than quality of life (8). It is predicted that diabetic population will be 380 million in 2025. Beside this, it is stated sedentary life will become more common in young people with the increase of obesity. Although diabetes is a physical illness, it causes the patient to experience a series of psychosocial, psychosexual, emotional and spiritual problems and conflicts (9).

Because of its negative results, analyzing of T2D risk is very important in terms of early diagnosis and treatment of disease, improving quality of life of patients, rising awareness of public and not lead other illnesses. It will also be beneficial in terms of reducing the burden it puts on the health and social care system in the long run. In the light of known information, the aim of this study is to evaluate the Type 2 Diabetes risk of participants by using diabetes risk questionnaire.

Methods

This cross-sectional study was conducted with 500 participants (F=277, 55.4%; M= 223, 44.6%) at 01-30 March 2019 in Zeytinburnu, Istanbul. Data was collected by using Type 2 Diabetes Risk Questionnaire that has been prepared by Turkish Diabetes Society. Questionnaire was applied to the patients with face-to-face meetings in the pharmacy. The study was approved by Istanbul Medipol University Local Ethical Committee (2019/199).

The inclusion criteria of the study are 1) age 18-90 years; 2) haven't been previously diagnosed with diabetes and exclusion criteria are 1) age under 18 and age over 90; 2) have been previously diagnosed with diabetes.

Because study was completed in one month, sampling was done capability of the pharmacy. In preliminary studies, it has been detected that an average of 15 questionnaires were applied at the pharmacy, per day. That meant 15x30=450 questionnaires were required for this study. This sampling method was determined according to Arkan, 2004 (10).

Type 2 Diabetes Risk Questionnaire includes seven questions. By these questions, age interval, gender and weight status of participants were determined. In addition, how old the participants were, whether they were doing physical activity, whether participants have been previously diagnosed with hypertension or with gestational diabetes (if they were women), and whether participants' mother, father, sister or brother have diabetes were determined. Each question has unique score. According to total score, Diabetes risk was assessed for each participant. If total score is 5 and over, participant is considered as high-risk person. However, only a physician can make a diagnosis that participant has prediabetes or Type 2 Diabetes.

The primary and secondary outcomes of the study are expected changes in the corresponding variables listed in Table 1.

Table 1. The primary and secondary outcomes of the study

Primary outcomes	Secondary outcomes
Body weight	Awareness of waist circumference
Physical activity score	Sedentary behavior
Previously diagnosed with hypertension	Attribution to the risk
Gestational diabetes diagnosis	Increased risk for Diabetes

Statistical analysis was conducted using SPSS statistics for Windows version 21 (SPSS Inc, Chicago, IL). Shapiro-Wilks test was applied to see if the data showed normal distribution. First, descriptive tests were performed in order to evaluate the data. Mann-Whitney and Kruskal-Wallis tests were used to evaluate the quantitative data together. When comparing qualitative data, Chi-square test was used. The confidence interval and significance level of the obtained results were considered as 95% and 0.05, respectively.

Results

Five hundred participants were recruited from Zeytinburnu district of Istanbul. Total point of the participants changed between 0 and 10. The mean risk score was 4.04 (SD=2.20).

Demographic and familial characteristics, health (disease) problems, physical activity conditions and weights of participants were given in Table 2.

Table 2. Descriptive characteristics of participants.

		N	%
How old are you?	<40	145	29.0
	40-49	114	22.8
	50-59	99	19.8
	=>60	142	28.4
Are you a man or a woman?	Woman	277	55.4
	Man	223	44.6
If you are a woman, have you ever been diagnosed with gestational diabetes?	No	489	97.8
	Yes	11	2.2
Do you have mother, father, sister or brother with diabetes?	No	335	67.0
	Yes	165	33.0
Have you been diagnosed with hypertension before?	No	368	73.6
	Yes	132	26.4
Are you physically active?	No	392	78.4
	Yes	108	21.6
What is your weight status?	0	52	10.4
	1	291	58.2
	2	118	23.6
	3	39	7.8
Type 2 Diabetes	No high risk	302	60.4
	High risk	198	39.6

Table 3. Findings of comparison Type 2 diabetes with other variables.¹ Spearman Correlation Test

No high risk N, (%)		Type 2 Diabetes		p value
		High risk		
		N, (%)		
How old are you?	<40	142 (47.0%)	3 (1.5%)	0,001**
	40-49	101 (33.4%)	13 (6.6%)	
	50-59	38 (12.6%)	61 (30.8%)	
	=>60	21 (7.0%)	121 (61.1%)	
Are you a man or a woman?	Woman	188 (62.3%)	89 (44.9%)	0,001**
	Man	114 (37.7%)	109 (55.1%)	
If you are a woman, have you ever been diagnosed with gestational diabetes?	No	297 (98.3%)	192 (97.0%)	0,357
	Yes	5 (1.7%)	6 (3.0%)	
Do you have mother, father, sister or brother with diabetes?	No	229 (75.8%)	106 (53.5%)	0,001**
	Yes	73 (24.2%)	92 (46.5%)	
Have you been diagnosed with hypertension before?	No	281 (93.0%)	87 (43.9%)	0,001**
	Yes	21 (7.0%)	111 (56.1%)	
Are you physically active?	No	255 (84.4%)	137 (69.2%)	0,001**
	Yes	47 (15.6%)	61 (30.8%)	
What is your weight status?	0	49 (16.2%)	3 (1.5%)	0,001**
	1	224 (74.2%)	67 (33.8%)	
	2	28 (9.3%)	90 (45.5%)	
	3	1 (0.3%)	38 (19.2%)	

Chi-square test was performed. **: p<0.001

Findings on the comparison of variables according to the Type 2 diabetes status of the participants are given in Table 3. When all variables were compared according to having Type 2 diabetes of participants, results showed significance in all variables ($p < 0.001$). However, the most significant variable was age. Results showed that the risk of getting

diabetes increased as the age got older. Participants aged 60 or over have the highest risk of Type 2 diabetes ($p < 0.001$).

To analyze the differences in scores of participants according to the variables, Mann-Whitney U test was used and results were given in Table 4.

Table 4. Scores related to variables of participants.

	Groups	N	Xrank	Σ rank	U	Z	P
Are you a man or a woman?	Woman	277	223.13	61806.50	23303.500	-4.768	0.001**
	Man	223	284.50	63443.50			
	Total	500					
If you are a woman, have you ever been diagnosed with gestational diabetes?	No	489	249.11	121816.00	2011.000	-1.446	0.148
	Yes	11	312.18	3434.00			
	Total	500					
Do you have mother, father, sister or brother with diabetes?	No	335	216.47	72518.50	16238.500	-7.579	0.001**
	Yes	165	319.58	52731.50			
	Total	500					
Have you been diagnosed with hypertension before?	No	368	198.82	73164.50	5268.500	-13.489	0.001**
	Yes	132	394.59	52085.50			
	Total	500					
Are you physically active?	No	392	228.05	89395.00	12367.000	-6.686	0.001**
	Yes	108	331.99	35855.00			
	Total	500					

Mann-Whitney U test was done. **: $p < 0.001$

Results showed significance according to sex; total scores of women were lower than scores of men significantly ($z = -4.768$; $p < 0.001$).

In addition to this, if participant had any diabetic person in the family (mother, father, sister or brother), or if participant was diagnosed with hypertension, score was significantly higher total score was significantly higher than other participants ($z = -7.579$; $p < 0.001$) and ($z = -13.489$; $p < 0.001$), respectively. Finally, being physically active was also important variable for scoring that active participants had significantly higher score than other ones ($z = -6.686$; $p < 0.001$).

Last, total scores were compared in accordance with age by nonparametric Kruskal Wallis test and results were significant ($X^2 = 330.833$; $p < 0.001$). Total scores of participants under the age of 40 were significantly lower than the total scores of those aged between 40 and 49, between 50 and 59, and 60 and over.

Discussion

Diabetes is an endocrine system disease characterized by hyperglycemia caused by decreased insulin secretion or decreased insulin effect (hepatic and peripheral glucose uptake) or problems in both mechanisms.

Type 2 form of diabetes is related with obesity and physical inactivity. Prevalence of Type 2 diabetes has been increasing rapidly in western countries due to their sedentary life style and nutrition habits (11).

The most appropriate first line strategies are improving insulin resistance, decreasing hypertension, improve dyslipidemia and loss of weight by diet, physical activity and life style changes. People with high risk of Type 2 diabetes and patient's resistant to changes in their life style, should be treated with OAD agents and insulin. In the current study, the validated Diabetes Risk Questionnaire was used for to evaluate risk of developing Type 2 diabetes in participants. The questionnaire was done face-to-face with 500 voluntary people, totally. Finally, obtained data was evaluated.

Bellany et al., performed systematical studies and meta-analysis on women with gestational diabetes that whether they have high or low risk to develop Type 2 diabetes. They also examined factors that can change this risk. The study showed if a woman has gestational diabetes, risk of Type 2 diabetes development becomes higher. Our study showed similar results like this study. Thus, in a woman with gestational diabetes, to prevent or to delay developing of Type 2 diabetes after giving birth, both patients and physicians were aware of severity of the risk

and took nonpharmacological (diet, life style changes) and pharmacological (oral antidiabetic agents) precautions (12). Grontved and Hu performed a meta-analysis of all cohort studies (2011) and examined the relationship watching television and risk of Type 2 diabetes, mortal or immortal cardiovascular diseases. This study included scanning of nearly 40 years of studies found in MEDLINE and EMBASE databases. As a result, long-term inactivity was associated with increased Type 2 diabetes, cardiovascular diseases, and related to all these reasons, it was associated to increased risk of mortality (13). Physical inactivity, different diet factors, and smoking were stated as the best known independent risk factors of mortality related to Type 2 diabetes, cardiovascular diseases.

Similar to this study, Snowling and Hopkins (2006) investigated how different exercise models changed glucose levels and affected other risk factors for diabetes complications during 104 weeks. Results showed all different exercise models kept glucose under control (A1C), and effects were similar to diet, drug, and insulin. Researchers noted that more studies needed for its clinical significance (14). Physical activity can be sufficient to prevent Type 2 diabetes in people who have risk Type 2 diabetes but not diagnosed with Type 2 diabetes. However, combination of physical activity, diet and pharmacological treatment should be recommended in patients with Type 2 diabetes.

Gress et al., conducted a prospective study in 2000 on 12,550 adults aged 45-64 without diabetes. A comprehensive health assessment on the baseline; It included assessment of drug use and measurement of blood pressure with a random sphygmomanometer. The incidence of new diabetes cases was assessed by measuring fasting serum glucose concentrations after three years and six years later. According to the results, in later times, diabetes development was greater than in hypertensive subjects who did not receive any antihypertensive therapy (RH=0.91; 95% CI= 0.73, 1.13). Likewise, subjects who took angiotensin-converting enzyme inhibitors and calcium channel antagonists were not at higher risk than those who did not take the medication. In contrast, subjects with hypertension who took beta-blockers had a 28 percent higher risk of diabetes (RH= 1.28; 95% CI= 1.04, 1.57). As a result, according to this study, it has been observed that hypertension increases the risk of Type 2 diabetes (15).

Bishay et al., (2013) followed a small obese patient population with Type 2 diabetes who applied to MRP (non-surgical metabolic rehabilitation program). They examined the patient records from 2004 to 2007, retrospectively. Inclusion criteria were i: BMI> 30 kg / m², ii: have been diagnosed with Type 2 diabetes, iii: applying of patient to general physician or endocrinology doctor for his/her treatment. At the end of the study, results showed

that weight loss, intense physical activity, dietary change in a non-surgical intervention program, and a focus on psychosocial support in 30 months have shown significant improvements in weight, waist circumference, physical activity and glycemic control in obese diabetic patients with cardio-metabolic risk factors who received the best standard therapy (16).

Peters et al., (2015) conducted a study whether the impact of Type 2 diabetes on cardiovascular diseases risks differs by gender. As a result, they stated that there was a significant difference between the sexes and there were evidences that diabetes was more dangerous in women than in men (17). In our study, there was a statistically significant difference between having a high risk of type 2 diabetes by gender variable ($p= 0.001$; $p<0.01$). Having a high risk of Type 2 diabetes in men (55.1%) was significantly higher than women (44.9%).

In a study conducted with 210 patients aged 18-82 years (F=139, (66.2%); M=71, (33.8%)), FINDRISK scale was applied to all patients. It was found that the mean FINDRISK scores of subjects aged 18-29 were significantly lower than those of all other age groups ($p1:0.010$; $p2:0.000$; $p3:0.000$; $p4:0.000$; $p5:0.000$; $p<0.05$). In addition, the mean scores of patients aged 30-39 were significantly lower than those of all other four groups over the age of 40 ($p1:0.010$; $p2:0.004$; $p3:0.000$; $p4:0.013$; $p<0.05$) (18).

Finally, a cross-sectional study was performed with 490 patients whose first-degree relatives has diabetes (n=245) and has not (n=245). Results showed that while 121 of the patients (24.64%) whose first-degree relatives had diabetes had a high risk of diabetes, this number was 116 (23.96%) in the other group ($p>0.05$). Blood glucose level was randomly measured and results between 140-199 mg/dL were evaluated as impaired glucose tolerance (IGT) and oral glucose tolerance test (OGTT) was done. The proportion of patients with a first-degree relative with diabetes whose blood glucose levels were between 140-199 mg / dl and 200 mg / dl and above were 7.7% and 4.08%, respectively. On the other hand, the proportion of patients with a first-degree relative without diabetes whose blood glucose levels were between 140-199 mg / dl and 200 mg / dl and above were 2.4% and 1.16%, respectively. Randomly measured blood glucose levels of patients with a first-degree relative with diabetes were significantly more than those of other groups ($t=3.238$, $p=0.001$). Moreover, in both group, as age progressed, the rate of IBT increased significantly ($p<0.001$) (19).

The present study demonstrates a high risk of developing T2D in the study population, living in Zeytinburnu. Participants with higher scores in all risk factors for developing T2D including sex, age, BMI, having first-degree relatives diagnosed with T2D, waist circumference, high blood pressure, high blood glucose, high weight and

gestational diabetes, had higher total risk scores. Participants with higher scores in protective factors from developing T2D including regular physical activity and lower weight circumference, normal blood glucose and blood pressure level had lower total scores.

References

1. American Diabetes Association (ADA). Standards of Medical Care in Diabetes-2017 Abridged for Primary Care Providers. Clin Diabetes 2017; 35(1): 5-26.
2. Stolar MW, Chilton RJ. Type 2 Diabetes, Cardiovascular Risk and The Link to Insulin Resistance. Clin Ther 2003;25:B4-31.
3. Ersoy C, Tuncel E, Özdemir B, Ertürk C, İmamoğlu Ş. Diabetes education and metabolic control in patients with type 2 diabetes mellitus using insulin. Journal of Uludağ University Faculty of Medicine 2006;32(2):43-47.
4. Erdem S, Bayrak B, Uğur MC, Orman M, Akar H. Adaptation to lifestyle changes in patients with type 2 diabetes mellitus. FNG & Science Medical Journal 2016;2(4):243-246.
5. Onat A, Can G, Yüksel H, Ademoğlu E, Erginel-Ünaltuna N, Sansoy V. Prediabetes and Diabetes in Turkish Adults: Identification of New Pathogenesis. İstanbul : Logos Publishing (TEKHARF), 2013.
6. Onat A, Çakır H, Karadeniz Y, et al. Turkish adult risk factor survey 2013: rapid rise in the prevalence of diabetes. Turk Kardiyol Dern Ars 2014;42(6):511-6.
7. Songthung P, Sripanidkulchai K. Improving type 2 diabetes mellitus risk prediction using classification," 2016 13th International Joint Conference on Computer Science and Software Engineering (JCSSE), 2016, pp. 1-6,
8. Felea MG, Covrig M, Mircea I, Naghi L. Socioeconomic status and risk of type 2 diabetes mellitus among an elderly group population in Romania. Procedia Economics and Finance 2014;10: 61-62.
9. Orhan B, Karabacak BG. The relationship between diabetes-related cognitive and social factors and metabolic control parameters in type 2 diabetics. Clinical Experimental Health Sciences 2016;6(1):1-8.
10. Arıkan R. Research techniques and report preparation. Ankara: Asil Publication 2004:152.
11. Savaş HB, Gültekin F. Insulin resistance and its clinical significance. Journal of SDU Faculty of Medicine 2017 24(3):116-125.
12. Bellany L, Casas JP, Hingorini AD, Williams D. Type 2 diabetes mellitus after gestational diabetes: a systematic review and meta-analysis. Lancet 2009;373(9677):1773-1779.
13. Grontverd A, Hu FB. Television viewing and risk of type 2 diabetes, cardiovascular disease, and all-cause mortality. JAMA 2011;305(23): 2448-2455.
14. Snowling NJ and Hopkins WG. The effects of different exercise training modes on glucose control and complication risk factors in type 2 diabetic patients: a meta-analysis. Diabetes Care 2006;20(11):2518-2527.
15. Gress TW, Nieto JN, Shahar DE, Wofford MR, Brancati FL. Hypertension and antihypertensive treatment as risk factors for type 2 diabetes mellitus. New Engl J Med 2000;342:905-912.
16. Bishay RH, Omari A, Zang J, Lih A, Kormas N. Divide and conquer: the multidisciplinary approach to achieving significant long-term weight loss and improved glycemic control in obese patients with type 2 diabetes. Clin Diabetes 2013;31(1): 14-20.
17. Peters SAE, Huxley RR, Woodward M. Sex differences in the excess risk of cardiovascular diseases associated with type 2 diabetes: potential explanations and clinical implication. Curr Cardiovasc Risk Rep 2015;9(7): 36.
18. Acar H. Type 2 diabetes mellitus risk evaluation in population registered to okmeydanı training and research hospital hürriyet education family health center. Specialization Thesis in Medicine. İstanbul 2018:31.
19. Uludağ H. comparison of cardiovascular disease risk factors of nondiabetic individuals with and without type 2 diabetes in first degree relatives. Süleyman Demirel University Specialization Thesis in Medicine. Isparta 2009:43-44.