MEHES JOURNAL (MEDICAL AND HEALTH SCIENCES JOURNAL) | ISSN:3023-5804
Arrival Date: 22/05/2024 | Published Date: 30/06/2024 | 2024 Vol: 2 Issue: 2 pp: 1-10 |
DOI: https://doi.org/10.5281/zenodo.12510471

ARTICLE TYPE: RESEARCH ARTICLE

Type 2 Diabetes Risk and Behavioral Risk Factors and Type 2 Diabetes Awareness Among Vocational School Students

Meslek Yüksekokulu Öğrencilerinde Tip 2 Diyabet Riski ve Davranışsal Risk Faktörleri ile Tip 2 Diyabet Farkındalığı

Fatmaz Zehra Küçük[1*], Nermin Olgun[2], Ayla Yava[3], Yasemin Sazak[4]

[*1]Harran University Health Services Vocational School of Health Services, Şanlıurfa, Turkey, e-mail: zehraklc2015@gmail.com,Tel:05327443029,ORCID:0000-0002-0343-5291

[2]Hasan Kalyoncu University. Faculty of Health Sciences, Department of Nursing, Gaziantep, Turkey, e-mail: nermin.olgun@hku.edu.tr,Tel:05327859875,ORCID:0000-0002-8704-4588

[3]Hasan Kalyoncu University. Faculty of Health Sciences, Department of Nursing, Gaziantep, Turkey, e-mail: ayla.yava@hku.edu.tr,Tel:05372419171,ORCID:0000-0003-3468-6779

[4]Kahramanmaraş İstiklal University Elbistan Vocational School of Health Services, Kahramanmaraş, Turkey, E-mail: yaseminsazak44@gmail.com, Tel: 0541 447 49 44, ORCID: 0000-0001-9296-0719

ÖZET

Amaç: Bu çalışmanın amacı, üniversite öğrencileri arasında tip 2 diyabet ile ilişkili risk faktörlerini belirlemek ve hastalık hakkındaki farkındalık ve bilgilerini değerlendirmektir.
Materyal ve metod: Araştırma 320 üniversite öğrencisinin google formlar aracılığıyla katılımıyla gerçekleştirilmiştir. Veri analizi için IBM SPSS 25.00 paket programı kullanılmış; sayı, yüzde, ortalama değer, bağımsız örneklem t testi, tek yönlü varyans analizi ve Pearson korelasyon testi kullanılmıştır. İstatistiksel anlamlılık düzeyi $p<0.5$ olarak kabul edilmiştir.
Bulgular: Çalışmaya katılanların yaş ortalaması 21,09±3,08 yıl olup, %74,1'i kadındır. FINDRISK ölçeğine göre, katılımcıların %84,5'i diyabet gelişim konusunda düşük riske sahipken, %46,9'u orta düzeyde hastalık bilincine sahiptir. Ortalama FINDRISK skoru 25 yaş ve üzeri bireylerde, egzersiz yapmayanlarda, obez olanlarda ve ailesinde DM öyküsü olanlarda daha yüksekti. Bu farklılıklar istatistiksel olarak anlamlıydı.
Tartışma ve Sonuç: Çalışmada, 25 yaş ve üzeri bireyler ile birinci derece akrabalarında DM olan bireyler arasında hastalık farkındalığı puanları açısından istatistiksel olarak anlamlı bir fark ($p<0,05$) bulunmuştur ve her iki grup da daha yüksek puan almıştır. Sağlıklı beslenme, düzenli egzersiz, aşırı kilo ve ailede diyabet öyküsü, özellikle üniversite öğrencileri arasında diyabet farkındalığını ve yaygınlığını etkilemektedir.

Anahtar Kelimeler: Diabetes Mellitus, FINDRISK, Diyabet Farkındalığı, Hemşirelik Araştırması

ABSTRACT

Objective: This study aimed to identify the risk factors associated with type 2 diabetes among university students and assess their awareness and knowledge of the disease.
Material and Methods: The research was conducted with the participation of 320 university students through google forms. IBM SPSS 25.00 package program was used for data analysis; number, percentage, mean value, independent sample t test, one-way analysis of variance and Pearson correlation test were used. Statistical significance level was accepted as $p<0.5$.
Results: The study participants had a mean age of 21.09±3.08 years, with 74.1% being female. Based on the FINDRISK scale, 84.5% of participants had a low risk of developing diabetes, while 46.9% had moderate disease awareness. The mean FINDRISK score was higher in individuals aged 25 years and older, those who did not exercise, those who were obese, and those with a family history of DM. These differences were statistically significant.
Discussion and Conclusion: The study found a statistically significant difference ($p<0.05$) in disease awareness scores between individuals aged 25 years and older and those with DM in their first-degree relatives, with both groups scoring higher. Healthy diet, regular exercise, overweight, and family history of diabetes influence diabetes awareness and prevalence, especially among university students.

Keywords: Diabetes Mellitus, FINDRISK, Diabetes Awareness, Nursing Research

Sorumlu Yazar/Corresponding Author: Fatmaz Zehra KÜÇÜK, Harran University Vocational School of Health Services, Şanlıurfa, Turkey, e-mail: zehraklc2015@gmail.com, Tel: 0532 744 30 29, ORCID: 0000-0002-0343-5291

Atıf /Cite: Küçük FZ, Olgun N, Yava A, Sazak Y. Type 2 Diabetes Risk and Behavioral Risk Factors And Type 2 Diabetes Awareness Among Vocational School Students. Mehes Journal, 2024:2(2), 1-10. https://doi.org/10.5281/zenodo.12510471

INTRODUCTION

Diabetes Mellitus (DM), one of the most common chronic diseases of our age, is a chronic metabolic health problem that is rapidly spreading and causes life-threatening complications that cause significant changes in the lifestyle of individuals and shorten life span. It poses a serious global risk due to the numerous complications and comorbidities it causes (1). As of 2021, 537 million adults (aged 20-79 years) in the world are living with diabetes. By 2030, this number is estimated to increase to 643 million, and by 2045, this number is expected to increase to 783 million (2).

Type 2 DM accounts for approximately 90% of all diabetes cases in the World (2). In epidemiology studies conducted in Turkey between 1998 and 2012, it was determined that the prevalence of diabetes increased by 90%, this rate reached 13.7% in the adult population, and in 2018, diabetes caused an increase in the rate of premature mortality, especially in the population aged 30-70 years (3-6). According to the data of the International Diabetes Federation (IDF) for 2021, Turkey ranked first in Europe with a diabetes prevalence of 15.9%; the number of individuals with diabetes in the age range of 20-79 years has reached 9 million and it is estimated that this number will reach 13.4 million by 2045 (2, 4-7). Although it was previously thought to occur only in middle-aged and elderly people, Type 2 DM is now also seen in young adults (4-6,8). The main risk factors for Type 2 DM are classified as overweight and obesity, sedentary lifestyle, unhealthy diet, moderate non-diabetic hyperglycemia, hypertension, dyslipidemia, aging, family history of diabetes, low birth weight and gestational diabetes in women (6-10).

The World Health Organization aims to promote and support the adoption of effective measures for surveillance, prevention and control of modifiable risk factors and complications of diabetes, especially in low- and middle-income countries. In order to prevent type 2 diabetes and to prevent complications and early deaths that may arise from the disease, it is important to provide individuals with practices such as reducing obesity, increasing regular physical activity, healthy eating, avoiding smoking and controlling blood pressure, which are modifiable risk factors(11, 12). Schools, especially the university period, are favorable environments to increase knowledge and awareness about lifestyle-related diseases and the importance of healthy nutrition and physical activity (13).

The prevalence of risk factors of Type 2 diabetes such as overweight or obesity, lack of physical activity, unhealthy diet, smoking and alcohol use is high in university students. It has been

reported that the prevalence of obesity increases significantly at the end of the university years due to malnutrition in university students (14-17). It is observed that modifiable risk factors of type 2 diabetes are becoming increasingly common among young individuals. Modifiable risk factors and associated type 2 diabetes are becoming more prevalent at all ages, including adolescents. In order to prevent type 2 diabetes, early diagnosis of risky individuals and raising awareness of individuals are required. If the risk levels of individuals are determined and their level of awareness/knowledge on the subject is determined, behavior modification programs specific to the community and individual can be developed, the disease can be diagnosed early, prevented or delayed. The objective of this study was to assess the risk of type 2 diabetes development in university students and their knowledge levels regarding behavioral risk factors and type 2 diabetes awareness.

MATERIALS AND METHODS

The descriptive study was completed with 320 students who agreed to participate in the study. Ethics committee permission (Ethics committee no: XXXX) was obtained from the ethics committee of a XXX university. The introductory information form, Finnish Type 2 DM Risk Scale (FINDRISK), Questionnaire on Type 2 Diabetes Awareness Level and Behavioral Risk Factors were recorded on the evaluation form created on Google Forms and the link was sent, and the questions started with the students' acceptance and approval to fill out the questionnaire and were completed in an average of 5-7 minutes.

The initial information form for the students included their sex, age, body mass index, smoking and alcohol use status, history of chronic disease, regular physical activity status, and dietary habits. The Finnish Type-2 DM Risk Scale (FINDRISK) is a questionnaire that is widely used in our country and recommended by the Turkish Society of Endocrinology and Metabolism, and there are studies suggesting that it is a good measurement tool for determining the risk of type 2 DM in the early period. The Finnish Type-2 DM Risk Scale (FINDRISK) is a scale consisting of eight questions (age, BMI, waist circumference, exercise status, consumption of fruits and vegetables, hypertension status, previous high or borderline blood sugar, family history of diabetes) that is used to determine the risk of Type-2 diabetes that may develop within 10 years without going to the hospital. The FINDRISK scale, developed by Lindström et al. in 1987, is used to identify individuals at risk for Type-2 DM without laboratory tests. It was validated in 1992. The score on the FINDRISK scale indicates an individual's 10-year risk for type 2 diabetes. Risk levels are categorized as low (< 7 points), mild (7 to 11 points), moderate (12 to 14 points), high (15 to 20 points), and very high (≥ 20 points), with a score

range of 0 to 26. The test result is an estimate of the likelihood of the development of type 2 diabetes within the next ten years (15). Questionnaire on Type 2 Diabetes Awareness Level and Behavioral Risk Factors; the form, which includes questions about the nutrition of individuals, was created by Dinççağ et al. (2017) (17).

The question form includes information about Type 2 DM. The form consists of 25 questions and each correct answer is evaluated as 1 point. Those who answered no to five questions (20, 21, 35, 36 and 42) and yes to the other questions were considered to have answered the questions correctly and correct answers were evaluated as "1" point. According to the knowledge score of the participants, those who scored less than or equal to 10 were grouped as those with no awareness, those who scored between 11 and 15 as those with awareness, and those who scored between 16 and 25 as those with high awareness (17).

Evaluation of the Data

IBM SPSS 25.00 package program was used for data analysis. In the statistical analysis, number and percentage distribution, mean standard deviation were used to evaluate the descriptive variables of the individuals. Skewness and Kurtosis normality distribution test was performed to evaluate the conformity of the data to normal distribution. According to Tabachnick and Fidell, if Skewness and Kurtosis values are between +1.5 and -1.5, it means that the scales and dimensions used are normally distributed and parametric tests should be used (18). The scales used in the study were skewed between 1.5 and 1.5, so t-test, ANOVA, and Pearson correlation were used to determine the relationship between the scale values. As a result of the variance analysis, Tukey test was used according to the homogeneity of variance to determine from which groups the difference originated. Statistical significance level was accepted as $p<0.5$.

RESULTS

Table 1. Distribution of participant characteristics (n=320)

Characteristics		**Min-Max**	$\bar{X}$**±SS**
Age (years)		17-45	21.09±3.08
Body mass index (BMI)		14.70-35.43	22.09±3.48
		N	**%**
Age Groups	Under 21	240	75.0
	21-25 years old	64	20.0
	Age 25 and over	16	5.0
Gender	Female	237	74.1
	Male	83	25.9

Smoking Status	Smoking	58	18.1
	No smoking	262	81.9
Alcohol use status	Yes	22	6.9
	No	298	93.1
Chronic Disease Prevalence	Yes	23	7.2
	No	297	92.8
Regular Physical Activity	Yes	105	32.8
	No	215	67.2
Daily Regular Nutrition Status	Always	124	38.8
	Sometimes	187	58.4
	Never	9	2.8
Fast-food eating frequency	Every day	17	5.3
	Every second day	29	9.1
	Averaging weekly.	140	43.8
	Average monthly	134	41.9
Body Mass Index Groups	Weakly	48	15.0
	Normal Weight	207	64.7
	Fat	57	17.8
	Class 3 Obesity	7	2.2
	Classified as level 2 obesity	1	0.3
The programs students are enrolled in	Medical Services and Techniques	98	30.6
	Childcare and Youth Services	55	17.2
	Finance, banks and insurances	74	23.1
	Architecture and Urban Planning	40	12.5
	Computer Technologies	31	9.7
	Financial Accounting and Taxes	9	2.8
	International Trade	8	2.5
	Plant and Animal Production	5	1.6

$\bar{X}$:Mean, SS: Standard deviation

The study participants had a mean age of 21.09±3.08 and a mean BMI of 22.09±3.48. Of the participants, 75% were 25 years of age or younger, 74.1% were female, 18.1% smoked, and 6.9% drank alcohol. While 92.8% of the participants did not have any chronic diseases, 32.8% engaged in regular physical activity, 58.4% sometimes ate regularly, and 43.8% ate fast food once a week on average. Meanwhile, 64.7% of the individuals were classified as having a normal weight. Additionally, 30.6% of the individuals were enrolled in the Department of Medical Services and Techniques (refer to Table 1).

Table 2. Diabetes Risk Level and Type 2 DM Awareness Level of Participants According to the Findrisk Scale (n= 320)

	Number (n)	**Percentage (%)**
Low (<7 puan)	269	84.1
Mild (7-11 puan)	48	15.0

Diabetes Risk Level According to the Fındrisk Scale	Medium (12-14 puan)	3	0.9
Level of Awareness of Type 2 DM	Not aware (≤10 puan)	109	34,1
	Aware (11-15 puan)	150	46,9
	Highly aware (16-25 puan)	61	19,1
Scale Score Averages		**Min-Max**	**$\bar{X}$±SS**
Findrisk Survey Score		0-16	4.45±2.87
Type 2 DM Awareness Level Score		0-25	11.95±5.04

$\bar{X}$:Mean, SS: Standard deviation

According to the FINDRISK scale, 84.5% of the individuals participating in the study had a low risk of diabetes disease, while 46.9% had an average level of disease awareness. The mean FINDRISK questionnaire score was 4.45±2.87 and the mean awareness level score was 11.95±5.04 (Table 2).

Table 3. Comparison of Findrisk Scale Diabetes Risk Level and Type 2 DM Awareness Scores by Descriptive Characteristics of Participants (n= 320)

Variables		**n**	**Findrisk scale $\bar{X}$±SS**	**Awareness Score $\bar{X}$±SS**
Age	Under 21[a]	240	4.59±2.82	12.14±5.00
	21 – 25 years old[b]	64	3.60±2.78	10.71±5.27
	25 age and over[c]	16	5.75±3.27	14.12±3.61
	Test Statistic		F=4.787, **p=0.009 b-a, b-c**	F=3.635, **p=0.027 b-c**
Gender	Female	237	4.43±2.92	12.20±4.60
	Male	83	4.50±2.71	11.25±4.09
	Test Statistic		t=-0.195, p=0.846	t=1.302, p=0.196
Smoking status	Yes	58	4.20±2.78	11.24±4.82
	No	262	4.50±2.89	12.11±5.08
	Test Statistic		t=-0.721, p=0.471	t=-1.199, p=0.231
Alcohol use status	Yes	22	4.54±2.50	10.22±5.24
	No	298	4.44±2.89	12.08±5.01
	Test Statistic		t=0.156, p=0.876	t=-1.674, p=0.095
Chronic disease prevalence	Yes	23	4.47±2.01	11.86±5.37
	No	297	4.45±2.92	11.96±5.02
	Test Statistic		t=0.060, p=0.953	t=-0.089, p=0.930
Regular physical activity	Yes	105	3.91±3.08	12.59±4.51
	No	215	4.71±2.72	11.65±5.26
	Test Statistic		t=-2.363, **p=0.019**	t=1.568, p=0.118
Daily regular nutrition status	Always	124	4.26±2.94	11.95±5.02
	Sometimes	187	4.55±2.82	11.93±5.08
	Never	9	5.00±3.08	12.55±4.92
	Test Statistic		F=0.533, p=0.587	F=0.066, p=0.937
Fast-Food eating frequency	Every day	17	3.94±3.07	12.70±5.75
	Every second day	29	3.89±2.48	11.51±5.66
	Averaging weekly	140	4.53±2.94	11.80±5.20
	Averaging weekly	134	4.55±2.85	12.12±4.67
	Test Statistic		F=0.633, p=0.594	F=0.292, p=0.831
Body mass index groups	Weakly[a]	48	3.85±2.58	11.60±3.92
	Normal weight[b]	207	3.72±2.50	12.05±5.28
	Fat[c]	57	6.94±2.33	11.73±5.19
	Obese[d]	8	9.12±2.94	13.12±3.79
	Test Statistic		F=35.038, **p=0.001**	F=0.283, p=0.837

			a-c, a-d, b-c, b-d	
Presence of DM in a first-degree relative	Yes	39	7.58±1.98	13.69±5.01
	No	281	4.01±2.70	11.71±5.00
	Test Statistic		t=-10.031, **p=0.001**	t=-2.306, **p=0.022**

t: Independent groups t test, F: One-way analysis of variance, $\bar{X}$: Mean, SD: Standard Deviation

a, b, c, d difference between groups

It was found that the mean FINDRISK score was higher in individuals aged 25 years and older, those who did not exercise, those who were obese and those with DM in their first-degree relatives, and this difference was statistically significant. The study found a statistically significant difference (p<0.05, Table 3) in disease awareness scores between individuals aged 25 years and older and those with DM in their first-degree relatives.

Table 4. The Relationship Between Findrisk Scale and Awareness Questionnaire (n= 320)

Scales	**Findrisk scale**	**Awareness survey**
Findrisk scale	1	
	r=0.108	
Awareness survey	p=0.055	1

r=Pearson Correlations

It was also found that there was no statistical relationship between the Findrisk Scale and the Awareness Questionnaire (Table 4).

DISCUSSION

The prevalence of Type 2 DM in the community is increasing rapidly, but the majority of the community does not have sufficient knowledge about the risk of developing diabetes and the complications that may arise in the future due to poorly managed diabetes. The aim of our study was to determine the risk of developing diabetes in the next decade, behavioral risk factors, and awareness of type 2 diabetes, particularly among university students. Cultural factors, inadequate information about diabetes, lack of opportunities, and health policies lead to inadequate awareness of diabetes. In our study, it was found that the mean FINDRISK score was higher in those aged 25 years and older, those who did not exercise, those who were obese, and those with DM in first-degree relatives, and this difference was statistically significant. Mesud et al. in Pakistan, it was found that women had significantly higher diabetes awareness scores than men (p<0.05), and urban residence status, better education and higher socio-economic status were significantly associated with higher diabetes awareness (19). In Gambia, Foma et al. found that educational level significantly predicted awareness of DM, with college

and high school educated participants being more likely to be aware of DM compared to those with no formal education. Participants who knew someone with diabetes were more likely to know about DM than those who did not. No statistically significant relationship was found between awareness of DM and variables such as age, ethnicity, gender, occupation, place of residence, and co-morbidities (20). In a descriptive study conducted by Nieto-Martinez et al., subjects with normal weight and subjects without abdominal obesity were found to have a low or slightly high risk of type 2 DM, while individuals with central obesity were found to have a higher risk of type 2 DM. In addition, those who reported participating in physical activity for ≥ 30 minutes a day were in the low risk group and those who did not were in the high risk group, similarly, 70% of those at low to mild risk of Type 2 DM reported consuming fruits and vegetables every day compared to only 2.6% of those in the very high risk group (21). Al-Hussaini and Mustafa reported that more than two thirds of the students had general information about diabetes, two thirds had accurate information about diabetes risk factors, more than half had accurate information about symptoms and complications, two thirds had accurate information about treatment and management of diabetes and more than two thirds had accurate information about diabetes follow-up (22). Kulak et al. found that 60% of the participants were physically inactive and those who did not exercise had a high risk of diabetes (23). Çoşansu et al. found that those who did not exercise had a high risk of diabetes (24).

CONCLUSION

University students exhibit significant differences in diabetes risk and awareness, which are influenced by factors such as age, exercise habits, obesity, and family history of type 2 diabetes. To prevent and manage type 2 DM, it is crucial to implement education and awareness programs during university years.

Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

Ethics Approval and Consent

Ethics Committee Approval (Board name, date and number): Hasan Kalyoncu University Health Sciences Non-Interventional Research Ethics Committee Decision, 03.05.2021, 2021/062

Conflict of Interest: Not declared

Financial Support: None

Participant consent: Consent was obtained from all participants via google forms.

Acknowledgments: None

***** This study has not been presented at any scientific event

Author Contributions

Fatmaz Zehra KÜÇÜK, Nermin OLGUN, Ayla YAVA, Yasemin SAZAK: Hypothesis, Literature Review, Writing.

REFERENCES

1. Popoviciu MS, Paduraru L, Nutas RM, Ujoc AM, Yahya G, Metwally K, et al. Diabetes Mellitus Secondary to Endocrine Diseases: An Update of Diagnostic and Treatment Particularities. International Journal of Molecular Sciences. 2023;24(16):12676.
2. Ogurtsova K, Guariguata L, Barengo NC, Ruiz PL-D, Sacre JW, Karuranga S, et al. IDF diabetes Atlas: Global estimates of undiagnosed diabetes in adults for 2021. Diabetes research and clinical practice. 2022;183:109118.
3. Satman I, Omer B, Tutuncu Y, Kalaca S, Gedik S, Dinccag N, et al. Twelve-year trends in the prevalence and risk factors of diabetes and prediabetes in Turkish adults. European journal of epidemiology. 2013;28:169-80.
4. Çatalçam S, Uzaldi EB, Arpaci DK, Bayraktaroğlu T, Bilici M. Üçüncü Basamak Bir Hastaneye Başvuran riskli Popülasyonda Oral Glukoz Tolerans Testi ile Diabetes Mellitus ve Prediyabet Prevalansının Tespiti. Türkiye Diyabet ve Obezite Dergisi. 2017;1(3):111-5.
5. Erdoğan G, Coşansu G. Diyabet Risk Farkındalığı: Bir Metropol Örneği. Sürekli Tıp Eğitimi Dergisi. 2021;30(5):307-16.
6. Selph S, Dana T, Blazina I, Bougatsos C, Patel H, Chou R. Screening for type 2 diabetes mellitus: a systematic review for the US Preventive Services Task Force. Annals of internal medicine. 2015;162(11):765-76.
7. Nnamudi AC, Orhue NEJ, Ijeh II. Assessment of the FINDRISC tool in predicting the risk of developing type 2 diabetes mellitus in a young adult Nigerian population. Bulletin of the National Research Centre. 2020;44:1-9.
8. Gabriel R, Acosta T, Florez K, Anillo L, Navarro E, Boukichou N, et al. Validation of the Finnish type 2 diabetes risk score (FINDRISC) with the OGTT in health care practices in Europe. Diabetes Research and Clinical Practice. 2021;178:108976.
9. Adhikari NCD. Prevention of heart problem using artificial intelligence. International Journal of Artificial Intelligence and Applications (IJAIA). 2018;9(2):21-35.
10. Brehm B, Summer S, Khoury J, Filak A, Lieberman M, Heubi J. Health status and lifestyle habits of US medical students: a longitudinal study. Annals of medical and health sciences research. 2016;6(6):341-7.
11. Wu Y, Ding Y, Tanaka Y, Zhang W. Risk factors contributing to type 2 diabetes and recent advances in the treatment and prevention. International journal of medical sciences. 2014;11(11):1185.
12. Lee KS, Vaillancourt T. Longitudinal associations among bullying by peers, disordered eating behavior, and symptoms of depression during adolescence. JAMA psychiatry. 2018;75(6):605-12.
13. Yilmaz FT, Celik S, Anataca G. Perceived diabetes risk and actual risk level in relatives of individuals with type 2 diabetes: Its relationship with promotive and protective health behaviors. Electronic Journal of General Medicine. 2022;19(6).
14. Franz MJ, Boucher JL, Evert AB. Evidence-based diabetes nutrition therapy recommendations are effective: the key is individualization. Diabetes, metabolic syndrome and obesity: targets and therapy. 2014:65-72.
15. Lindstrom J, Tuomilehto J. The diabetes risk score: a practical tool to predict type 2 diabetes risk. Diabetes care. 2003;26(3):725-31.
16. Kulkarni M, Foraker RE, McNeill AM, Girman C, Golden SH, Rosamond WD, et al. Evaluation of the modified FINDRISC to identify individuals at high risk for diabetes among middle-aged white and black ARIC study participants. Diabetes, Obesity and Metabolism. 2017;19(9):1260-6.
17. Dinççağ N, Celik S, Cemile İ, Tütüncü Y, YILDIZ SÖ, Satman I. Awareness of diabetes and obesity in Turkey. Turkish Journal of Endocrinology and Metabolism. 2017;21(2):31.
18. Tabachnick BG, Fidell LS. Using multivariate statistics: HarperCollins Publishers; 1983.
19. Masood I, Saleem A, Hassan A, Zia A, Khan AT. Evaluation of diabetes awareness among general population of Bahawalpur, Pakistan. Primary care diabetes. 2016;10(1):3-9.
20. Foma MA, Saidu Y, Omoleke SA, Jafali J. Awareness of diabetes mellitus among diabetic patients in the Gambia: a strong case for health education and promotion. BMC public health. 2013;13:1-8.
21. Nieto-Martinez R, Barengo NC, Restrepo M, Assefi A. Large scale application of the Finnish diabetes risk score in Latin American and Caribbean populations: a descriptive study. Frontiers in Endocrinology. 2023;14:1188784.

22. Al-Hussaini M, Mustafa S. Adolescents' knowledge and awareness of diabetes mellitus in Kuwait. Alexandria Journal of Medicine. 2016;52(1):61-6.
23. Kulak E, Berber B, Temel H, Kutluay SN, Yıldırım M, Dedeoğlu FN, et al. Aile hekimliğine başvuran bireylerde tip 2 diyabet risk düzeyinin belirlenmesi. Türk Aile Hek Derg. 2019;23(1):20-30.
24. Cosansu G, Celik S, Özcan S, Olgun N, Yıldırım N, Demir HG. Determining type 2 diabetes risk factors for the adults: A community based study from Turkey. Primary care diabetes. 2018;12(5):409-15.