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BUSAD 2024; 5(1): 19- 28 **BİNGÖL ÜNİVERSİTESİ SAĞLIK DERGİSİ** Original Article

Examination of Type 2 Diabetes Risk, Behavioural and Family Risk Factors, and Type 2 Diabetes Awareness in Healthcare Professionals Vocational School Students: The case of the Eastern Anatolian region of Turkey

Sağlık Hizmetleri Meslek Yüksekokulu Öğrencilerinde Tip 2 Diyabet Riski, Davranışsal ve Ailesel Risk Faktörleri ve Tip 2 Diyabet Farkındalığının İncelenmesi: Türkiye'nin Doğu Anadolu Bölgesi Örneği

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ÖZ

Bu çalışma, üniversite öğrencilerde tip 2 diyabet riskini, davranışsal ve ailesel risk faktörlerini ve tip 2 diyabet farkındalığını araştırmak amacıyla yapılmıştır. Araştırma bir devlet üniversitesi öğrencilerine uygulanmıştır. Verilerin toplanmasında "bilgilendirilmiş onam formu", "sosyo-demografik özellikler ile ilgili sorular", "Finlandiya Tip-2 DM Risk Ölçeği (FINDRISK) ve Tip 2 diyabet farkındalık düzeyi ve davranışsal risk faktörleri ile ilgili sorular anketi" kullanılmıştır Analizlerde frekans ve yüzde hesaplaması, bağımsız gruplar t-testi ve tek yönlü ANOVA testi kullanılmıştır. Öğrencilerin FINDRISK ölçeği ortalamasının 6,16±3,66, Tip 2 DM hakkındaki farkındalık düzeyi ölçeği ortalamasının ise 14,63±3,62 olduğu belirlenmiştir. Ayrıca öğrencilerin FINDRISK ölçeğine göre belirlenen diyabet riski ile Tip 2 DM bilgi düzeyi arasında negatif yönde zayıf bir korelasyon vardır (r=0,038, p>0,05). Çalışmaya katılan öğrencilerin farkındalık düzeyi arttıkça diyabet riskinin azaldığı görülmüştür.

Anahtar Kelimeler: Diyabet, Farkındalık, FINDRISK, Tip 2 diyabet, Üniversite.

ABSTRACT

This study was conducted to investigate the risk of type 2 diabetes, behavioral and familial risk factors, and awareness of type 2 diabetes in university students. The research was applied to students of a state university. In data collection, "informed consent form", "questions about social-demographic characteristics", "Finnish Type-2 DM Risk Scale (FINDRISK) and Questions on type 2 diabetes awareness level and behavioral risk factors" were used. Frequency and percentage calculation, independent groups t-test, and one-way ANOVA test were used in the analysis. It was determined that the average of the FINDRISK scale of the students was 6.16±3.66 and the mean of the awareness level scale about Type 2 DM was 14.63±3.62. In addition, there is a weak negative correlation between the diabetes risk determined according to the Findrisk scale of the students and the level of knowledge of type 2 DM.(r=0.038, p>0.05). It was observed that the risk of diabetes decreased as the awareness level of the students participating in the study increased.

Keywords: Awareness, Diabetes, FINDRISK, Type 2 diabetes, University.

Ethics committee approval was obtained from Iğdır University Scientific Research and Publication Ethics Committee (Decision number: 14.03.2022 and E-37077861-200-62170).

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INTRODUCTION

Diabetes, one of the most serious and common chronic diseases of our time, is a life-threatening, disabling and costly condition that causes complications and shortens life expectancy (1). Worldwide, more than half a billion people are living with diabetes, which means that more than 10.5% of the world's adult population currently has the disease (2). In Turkey, there are approximately 7 million people aged 20-79 with diabetes, which is about 15% of the total adult population (3). Diabetes is classified into four types: type 1, type 2, gestational, and other specific diabetes. Type 2 diabetes is the most prevalent, accounting for around 90% of all diabetes cases (4,5). Type 2 diabetes usually develops after the age of 30, and its incidence has been increasing in the last 10-15 years in people under the age of 30 due to obesity and sedentary lifestyles (6). As the genetic predisposition to type 2 diabetes increases, the disease is occurring in successive generations and at younger ages (1, 7). The International Diabetes Federation (IDF) classifies individuals who are overweight or obese, have an unhealthy diet, a sedentary lifestyle and/or a family history of diabetes as being at high risk for type 2 diabetes (4). Diabetes is a serious chronic disease that occurs when the pancreas does not produce enough insulin or the body cannot use the insulin it does produce effectively (6). Prediabetes develops before diabetes. During prediabetes, insulin resistance and first-phase insulin failure occur (8). The transition from prediabetes to type 2 diabetes can be delayed or prevented with the right lifestyle changes and pharmacological treatments (9). The Finland Diabetes Prevention Study is one of the first controlled, randomised trials to show that type 2 diabetes is preventable by lifestyle intervention (9, 10). Knowledge and awareness of type 2 diabetes are also important for behaviour change (11). For example, it has been reported that raising awareness of type 2 diabetes may be a very important factor in the long-term prevention of type 2 diabetes (12). In addition, research shows that addressing modifiable risk factors such as obesity, diet and physical inactivity can delay the onset of the disease (13). The cornerstone of managing type 2 diabetes is a healthy lifestyle, which includes a healthy diet, regular physical activity, not smoking and maintaining a healthy body weight (6). Over the past three years, the coronavirus pandemic has affected the lifestyles of young people, leading to more inactive lifestyles and unhealthy diets. Behavioural change and awareness of lifestyle changes are therefore very important in type 2 diabetes (12, 14). In many studies, the presence of diabetes risk and a low or moderate level of awareness cause problems in the diagnosis and treatment of diabetes. (11-13, 24-26, 36)

The purpose of this study was to investigate the risk of type 2 diabetes, behavioral and family risk factors, and type 2 diabetes awareness among students at the vocational school of health services.

Research questions

1. What is the risk of students developing type 2 diabetes?
2. Do students have behavioral and familial risk factors?
3. What is the awareness level of students about type 2 diabetes?
4. Is there a relationship between behavioral and familial risk factors and awareness situations?

MATERIALS AND METHODS

Research type

This study was conducted in the descriptive type.

The universe and sample of the research

The universe of the research consisted of 1800 students studying at the vocational school of health services a state university in Turkey. The sample of the study consisted of 331 students who agreed to participate in the study without sampling.

Data collection tools

Personal information form: This form; consists of a total of 10 questions consisting of questions such as gender, age, class, health insurance, income level, exercise status, chronic disease status and smoking.

Finland type-2 Diabetes Mellitus (DM) risk scale (FINDRISK): The FINDRISK scale consists of eight questions, developed by Tuomilehto and Lindström in 1987 and validated in 1992, to identify participants at risk for Type-2 DM without any laboratory test. The sensitivity of the score was calculated as 81% and the selectivity as 76%. (15). In our country, it is also recommended by the Turkish Endocrinology and Metabolism Association and the Diabetes Nursing Association (6). On the other hand, FINDRISK scale score scores were evaluated as 10-year type-2 diabetes risk as "low < 7 points, Mild = 7-11 points, Moderate = 12-14 points, High = 15-20 points, Very high ≥ 20 points". And according to the aforementioned score result, the minimum score is "0" and the maximum score is "26". The internal consistency coefficient of the FINDRISK scale, as measured by Cronbach's alpha, was found to be 0.830 in this study.

Questions on type 2 diabetes awareness level and behavioral risk factors: This questionnaire consists of 25 questions and each correct answer is evaluated as 1 point. Those who answered no to eight questions (1, 3, 6, 8, 14, 20, 23, and 24) and answered yes to the other questions were considered to have answered the questions correctly, and the correct answers were evaluated as "1" point and the total score was calculated. Categorization of participants according to DM knowledge score: Those who score less than or equal to 10, those who do not have awareness. Those who score between 11 and 15 are those with awareness. Those who scored between 16 and 25 were grouped as those with high awareness. The questionnaire prepared by the International Diabetes Federation (IDF) in Dinççağ et al. (2017) was prepared with modifications (12). In this study, the Cronbach's Alpha coefficient of the scale was found to be 0.902.

Data collection and analysis

Between 16.03.2022 and 30.03.2022, the research was applied to students at an Eastern Anatolia state university by e-mail with a link to a Google forms-created form. In data collection, "informed consent form", "Personal information form", "Finland Type-2 DM Risk Scale and Type 2 diabetes awareness level, and questions about behavioral risk factors questionnaire" were used. The study's inclusion criteria comprised students from the vocational school of health services who agreed to participate. Students outside the vocational school of health services and those who refused to participate were excluded. The data of the study were evaluated using the SPSS 23 program. Descriptive statistical methods (Frequency, Percentage, Average, Standard deviation) were used to evaluate the study data. T-Test and one-way analysis of variance (ANOVA) tests were used to indicate the differentiation of the students' opinions in terms of sociodemographic variables. Post-hoc tests were used to determine the source of a multi-significant difference between groups. In addition, the comparison was made with the Chi-square test in the data compared. The confidence interval was 95% and the significance level was 0.05. Correlation analysis was performed to determine the relationship between the two variables. When evaluating correlation strength in this study, the following ranges were used as references: very weak correlation (r = 0–0.25), weak correlation (r = 0.26–0.49), medium correlation (r = 0.50–0.69), strong correlation (r = 0.70–0.89), and very high correlation (r = 0.90–1.0) (16).

Ethical approval

Before starting the study Iğdır University Scientific Research and Publication Ethics Committee approved with the date 14.03.2022 and the number E-37077861-200-62170. The students who will participate in the research were informed about the purpose of the research, the method, the time they will allocate for the research, the fact that participating in the research would not cause any harm and that participation was completely voluntary, and their permission was obtained.

Limitations of the research

The study is limited to the participation of Iğdır University health services vocational school students, their education about DM and the qualifications measured by the scales used.

RESULTS AND DISCUSSION

Analysing Table 1, the mean age of the students participating in the study was 21.60±2.31 years, the body mass index was 22.32±3.22, the mean waist circumference was 77.20±12.17 cm, 67.2% of the students were older than 21 years and 70.2% were of ideal weight. There were 62.7% female students, 90.7% had no chronic diseases, 63% were in their second year and 73.8% had no family history of diabetes. Although 56.6% of the study participants have a poor economic situation, 54.5% do not have health insurance. In addition, 68.1% did not smoke and 70.5% did not exercise regularly or irregularly.

Table 1. Comparison of FINDRISK and Type 2 DM awareness levels with average scores according to students' introductory characteristics (N=331)

	N	%	FINDRISK Mean ± Sd	Test	p	Type 2 DM Awareness Mean ± Sd	Test	p
Age Group (Average age: 21,60±2,31)								
20 and under years	108	32,8	5,84±3,37	t=1,099	p>0,05	15,59±4,10	t=3,402	p<0,05
21 and above years	223	67,2	6,31±3,79			14,16±3,29		
Body mass index groups (Average BMI: 22,32±3,22) kg/m^2								
Weak	37	11,1	4,89±2,97			14,82±3,98		
Ideal weight	233	70,4	5,49±3,12	F=38,08	p<0,05	14,70±3,67	F=0,410	p>0,05
Overweight	61	18,4	9,48±4,08			14,26±3,27		
Gender								
Female	207	62,5	5,58±3,29	t=3,802	p<0,05	14,51±3,47	t=0,770	p>0,05
Male	124	37,5	7,13±4,03			14,83±3,88		
Chronic disease of statement								
Yes	31	9,4	7,48±4,72	t=1,674	p>0,05	14,83±4,13	t=0,292	p>0,05
No	300	90,6	6,02±3,51			14,61±3,58		
Class								
1. Class	122	36,9	6,35±3,69	t=0,730	p>0,05	16,13±4,00	t=6,047	p<0,05
2. Class	209	63,1	6,05±3,64			13,75±3,08		
Diabetes Diagnosis in Family								
Yes	86	26,0	8,97±3,39	t=9,027	p<0,05	14,06±3,78	t=1,643	p>0,05
No	245	74,0	5,18±3,22			14,83±3,56		
Social security								
Yes	151	45,6	6,01±3,95	t=0,698	p>0,05	14,47±3,70	t=0,722	p>0,05
No	180	54,4	6,29±3,40			14,76±3,58		
Income status								
Income less than expenses	187	56,5	6,27±3,35	F=1,594	p>0,05	14,96±3,74	F=2,692	p>0,05
Income expense balances	122	36,9	6,23±4,13			14,03±3,19		

Income higher than expenses	22	6,6	4,82±3,20			15,12±4,55		
Regular exercise status								
Irregular/not	233	70,3	6,50±3,73	F=2,799	p<0,05	14,52±3,50	F=2,885	p<0,05
1 day a week	43	13,0	5,49±3,01			14,75±3,50		
3 days a week	25	7,6	4,60±3,40			13,49±3,14		
Doing every day	30	9,1	5,80±3,80			16,23±4,68		
Smoking status								
Smoker	90	27,2	5,49±3,01	F=2,443	p>0,05	15,91±4,31	F=8,359	p<0,05
Non-smoker	226	68,3	4,60±3,40			14,20±3,26		
Quit smoking	15	4,5	5,80±3,80			13,46±2,59		

%: Percent, N: Number, Sd: Standard deviation, F: One-way anova, t: Independent sample test, p = 0,05

When the FINDRISK scores and Type 2 DM awareness scores of the students are examined; While the FINDRISK score did not show a significant difference according to age, class, and smoking variables (p>0.05), it was found that Type 2 DM awareness scores were higher in students under the age of 20, 1st year students and smoking students and showed a statistically significant difference. (p<0.05).

In addition, the students' body mass index, gender variable, and those with a family history of diabetes; While Type 2 DM awareness score did not show a significant difference (p>0.05), FINDRISK scores were found to be higher in overweight, male students and students with a family history of diabetes, with a statistically significant difference (p<0.05).

When the FINDRISK scores and Type 2 DM awareness scores are examined according to the regular exercise status of the students; It was found that the FINDRISK score was higher in students who exercised irregularly or could not, and showed a statistically significant difference. In addition, Type 2 DM awareness scores were found to be higher in students who exercised every day and showed a statistically significant difference (p<0.05). There was no statistically significant difference between FINDRISK score and Type 2 DM awareness scores according to the chronic illness, social security and income status (p>0.05) (Table 1).

Table 2. Awareness levels of students about Type 2 DM (N=331)

Awareness mean score: Mean±Sd:14,63±3,62				
Awareness levels	n	%	Mean±Sd	Test /p
Unaware	31	9,4	10,35±0,33	F=486,113 **p<0,05**
Awareness	202	61	13,01±1,37	
With high awareness	98	29,6	19,32±2,72	

%: Percent, N: Number, Sd: Standard deviation, F: One-way anova(post-hoc Tukey); p = 0,05.

The mean score of the awareness questionnaire about type 2 DM risk factors of the students was determined as 14.63±3.62. (Table 2). It was found that 61% of the students had type 2 DM risk awareness, 9.4% had no awareness and 29.6% had a high level of awareness, the average scores of the students with high levels of awareness about type 2 DM risk factors were high and the difference was statistically significant. (p<0.05)

Table 3. Students' risk level of type-2 diabetes according to FINDRISK scale score and ten-year risk status (N=332)

Total score	n	%	Degree of risk	10 year risk

(<7)	207	62,5	Low	(%1) (1/100)
7-11	99	29,9	Light	(%4) (1/25)
12-14	16	4,8	Middle	(%16) (1/6)
15-20	9	2,7	High	(%33) (1/3)
(>20)	-	-	Very high	(%50) (1/2)
FINDRISK score: Mean±Sd :6,16±3,66 (min:0 score , max:19 score)				

%: Percent, N: Number, Sd: Standard deviation, min: Minimum, max: Maximum

When the risk of type-2 diabetes was evaluated according to the FINDRISK scale score results of the students; It is seen that 62.5% are in the low-risk group, 29.9% are in the mild risk group, 4.8% are in the medium-risk group and 2.7% are in the high-risk group. In addition, the average FINDRISK score of the participants was found to be 6.16 ± 3.66 (Min:0 points, Max:19 points) (Table 3).

Table 4. Comparison of students' awareness levels about Type 2 DM according to familial and behavioral risk factors

		Awareness levels						Test P
		Unaware		Awareness		With high awareness		
Family and behavioral risk factors		n	%	n	%	n	%	
Who has a diagnosis of diabetes in the family	No	2	1	121	58,7	83	40,3	χ^2 = 11,684 **p<0,05**
	1st degree relative	1	1,6	47	73,4	16	25	
	2 st degree relative	3	4,9	43	70,5	15	24,6	
Exercising/not exercising at least 30 minutes a day	exerciser	2	1,9	71	68,9	30	29,1	χ^2 = 1,871 p>0,05
	non-exerciser	4	1,8	140	61,4	84	36,8	
The condition of consuming vegetables, fruits or brown bread daily	consuming every day	1	1,9	36	66,7	17	31,5	χ^2 = 0,251 p>0,05
	not consuming every day	5	1,8	175	63,2	97	35	

%: Percent, N: Number, p = 0,05, χ^2 Chi-square tests

When the awareness levels of the students according to familial and behavioral risk factors were examined, there was a statistically significant difference between the awareness level of Type 2 DM and familial risk factors (p<0.05), but there was no statistically significant difference between the level of awareness of type 2 DM and behavioral risk factors.(p>0.05) (Table 4). 29.1% of students with a high level of awareness about type 2 DM, 68.9% of students with sufficient levels of awareness, and 1.9% of students with insufficient awareness levels stated that they regularly exercise for 30 minutes every day. In addition, 1.6% of those with a family diagnosis of diabetes have insufficient diabetes-related awareness level, 73.4% have sufficient awareness level and 25% have a high awareness level (Table 4).

Table 5. The relationship between students' diabetes risk level and their level of awareness about Type 2 DM

	Awareness Score: (Mean±Sd:14.63±3.62)				
	*r	P			
FINDRISK score: (Mean±Sd:6.16±3.66)	-,038	,491			
	Awareness Level				
	Unaware	Awareness	With high awareness		Test P
FINDRISK level	%	%	n	%	
Low	51,6	64,4	61	62,2	Pearson Ki kare= 4,633 p>0,05
Light	35,5	28,7	30	30,6	
Middle	6,5	4,0	6	6,1	
High	6,5	3,0	1	1,0	

%: Percent, N: Number, r=correlation analysis

According to the FINDRISK scores of the students and whether their level of knowledge about type 2 DM showed awareness, Pearson correlation and chi-square test were examined (Table 5). There is a weak negative correlation between diabetes risk and type 2 DM information level determined according to the FINDRISK scale (r=0.038, p>0.05).

Worldwide, one in 10 adults is currently living with diabetes. In addition, half of people with diabetes are unaware of their condition. The prevalence of diabetes in the world population has increased from 151 million (4.6%) in 2000 to 537 million (10.5%) today. Unless significant action is taken to address the problem, it is expected to reach 783 million (12.2%) by 2045 (4, 17). Therefore, our study was based on the investigation of type 2 diabetes risk, behavioural and familial risk factors, and awareness of type 2 diabetes in young adults, especially students of the vocational school of health services.

In our study, it was determined that 62.5% of the participants were in the low-risk group according to their ten-year risk status and 60% were DM aware according to the Type-2 DM awareness level. Similarly, in research conducted in our nation and worldwide, there are studies in which participants' ten-year risk status is low although their awareness levels are sufficient or high (7, 12, 18-23). Furthermore, contrary to our results, there are several national and global research in the literature suggesting that the risk of diabetes is high and awareness levels are low (11, 24-27).

All of these studies suggest that in our study, students who study in the departments of the vocational school of health services, attend diabetes courses, and have a normal body mass index have a low 10-year risk status and awareness of diabetes.

When the FINDRISK scores and type 2 DM awareness scores were examined according to the students' regular exercise status, it was found that the FINDRISK score was higher in students who exercised irregularly or could not exercise and showed a significant difference. It

was also found that Type 2 DM awareness scores were higher in students who exercised every day and showed a significant difference ($p<0.05$).

In similar studies, it is stated that regular exercise reduces the risk of DM (7, 25, 28-31). On the contrary, it is stated that not exercising regularly or being inactive has a high risk of DM (32-34). As a result, we believe that the studies in the literature are similar to our study in terms of the students' regular exercise status and that this is related to the fact that our students have high levels of diabetes awareness and that the students exercise regularly in other studies.

While the Type 2 DM awareness score of the students did not show a significant difference in those with diabetes in their family, it was found that the risk of diabetes was higher in those with diabetes in their family according to FINDRISK scores and showed a significant difference ($p<0.05$). Similarly, studies have shown that those with a family history of DM have a level of awareness of type 2 DM (7, 19, 35, 36). In addition, studies have found that participants with a family history of DM exhibit better knowledge scores than those without a family history of DM (13, 26, 27, 34).

When FINDRISK scores and Type 2 DM awareness scores of students were investigated according to gender variables, while the Type 2 DM awareness score did not indicate a significant difference, FINDRISK scores were found to be higher in males and indicated a significant difference ($p<0.05$). In the studies conducted with university students, it was determined that female students had better diabetes awareness than male students (7, 37-39). Also, it was shown that the risk of type 2 diabetes is higher in males than in females (40). In contrast to our study, Çoşansu et al. (33) in his study, it was found that women's diabetes risk scores are higher and more significant than men's (33). In this study, we believe that male students have a higher DM risk status because female students practice healthy lifestyle habits, have a lower Body mass index, and have a lower waist circumference. In addition, there was no significant relationship between health insurance, income status and chronic disease status in our study.

There is a weak negative correlation between diabetes risk determined by the Fındrisk scale and type 2 DM knowledge level ($r=0.038$, $p>0.05$). That as the awareness level of students increases, the risk of diabetes decreases. Similarly, in Osman's (7) study, there is a high, positive, and statistically significant relationship between diabetes risk as determined by the Findrisk scale and type 2 diabetes information level, and as the diabetes risk of students increases, the level of awareness increases (7). In addition, in the literature review, no other study was found that determined the relationship between diabetes risk determined according to the Fındrisk scale and type 2 DM awareness level. We believe that the decrease in the risk of diabetes is attributable to the fact that the students in our study are students of the vocational school of health services and take courses about diseases every semester.

CONCLUSIONS AND RECOMMENDATIONS

In this study, which was conducted to evaluate the relationship between type 2 DM risk, behavioral and familial risk factors and awareness levels in health services vocational school students; it was determined that approximately 60% of the students had a low diabetes risk status and had awareness about diabetes. According to these study results, we believe that to determine the ten-year diabetes risk status and Type-2 DM awareness without any invasive intervention with the Findrisk scale, diabetes health education should be provided in all education periods, and individuals should be aware of the situation at a very early stage of their lives.

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REFERENCES

1. Olgun N, Çelik S. All aspects of internal medicine nursing book. Ankara Nobel Medical Bookstores. 2021:327-33.
2. Sun H, Saeedi P, Karuranga S, Pinkepank M, Ogurtsova K, Duncan BB, et al. IDF diabetes Atlas: Global, regional and country-level diabetes prevalence estimates for 2021 and projections for 2045. Diabetes research and clinical practice. 2022;183:109119.
3. Ministry of Health TC. World Diabetes Day 2020. General Directorate of Health Promotion. 2020:https://sggm.saglik.gov.tr/TR-76887/dunya-diyabet-gunu-2020.html.
4. IDF DA. IDF Diabetes Atlas 10th edition. https://diabetesatlasorg/atlas/tenth-edition/. 2021(International Diabetes federation).
5. Salem A, Men P, Ramos M, Zhang Y-J, Ustyugova A, Lamotte M. Cost–effectiveness analysis of empagliflozin compared with glimepiride in patients with Type 2 diabetes in China. Journal of Comparative Effectiveness Research. 2021;10(6):469-80.
6. TEMD: Diabetes Prevention. Turkish Society of Endocrinology and Metabolism Guidelines for the Diagnosis, Treatment and Follow-up of Diabetes Mellitus and its Complications 2020, 14th Edition (259-260):https://file.temd.org.tr/Uploads/publications/guides/documents/20200625154506-2020tbl_kilavuz86bf012d90.pdf.
7. Osman AO. Type 2 diabetes risk, behavioural and familial risk factors and type 2diabetes awareness in university students: Institute of Health Sciences, master's thesis; 2020.
8. Ünal G. Awareness of type 2 diabetes, adherence measurement and investigating the usefulness of muscle/fat ratio instead of body mass index: Istanbul Medipol University Institute of Health Sciences; 2019.
9. Milenkovic T, Bozhinovska N, Macut D, Bjekic-Macut J, Rahelic D, Velija Asimi Z, et al. Mediterranean diet and type 2 diabetes mellitus: a perpetual inspiration for the scientific world. a review. Nutrients. 2021;13(4):1307.
10. ADA. American Diabetes Association Addendum 9. Pharmacologic approaches to glycemic treatment: Standards of medical care in diabetes-2020. . Diabetes care. 2020;43(Supplement_1):S98. doi: 10.2337/dc20-S009. .
11. Amankwah-Poku M. A cross-sectional study of knowledge and awareness of type 2 diabetes mellitus in a student population in Ghana: do demographics and lifestyle make a difference. Health Psychology and Behavioral Medicine. 2019;7(1):234-52.
12. Dinççağ N, Celik S, Idiz C, Tütüncü Y, Yıldız SÖ, Satman İ. Awareness of Diabetes and Obesity in Turkey. Turkish Journal of Endocrinology & Metabolism. 2017;21(2).
13. Galaviz KI, Narayan KV, Lobelo F, Weber MB. Lifestyle and the prevention of type 2 diabetes: a status report. American journal of lifestyle medicine. 2018;*12*(1):4-20.
14. Yurtsever Çelik S, Yıldırım N, Olgun N. COVID-19 Pandemic and Diabetes. Journal of Nursing Forum on Diabetes, Obesity and Hypertension. 2020;*12*(1):56-9. http://www.tdhd.org/tjdn-dergi.
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. Karagöz Y. Spss-Amos-Meta: Applied Statistical Analysis. Ankara: Nobel Publishing, 2019; Updated 2nd Edition.
17. 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.
18. Şahin D, Gökay N, Özel Ş, Kıral A, Zehra,, Tozlu G, Üstün Y. Sadly Alameda alveolarly diabetes risk canalizing. Journal of the Nursing Forum on Diabetes, Obesity and Hypertension. 2019;*11*(2):7-12.
19. Skøt L, Nielsen JB, Leppin A. Who perceives a higher personal risk of developing type 2 diabetes? A cross-sectional study on associations between personality traits, health-related behaviours and perceptions of susceptibility among university students in Denmark. BMC Public Health. 2018;*18*(1):1-10.
20. Bülbül E, Çelik S, Alçiçek H, Dindar A, Furtana M, Günal M, et al. Determination of Diabetes Risk and Healthy Lifestyle Behaviours in Nursing Students. Turkish Journal of Diabetes and Obesity. 2020;*4*(3):230-8.
21. Topbaş E. Type 2 DM Risk and Associated Factors in University Students. Acibadem University Journal of Health Sciences. 2019;(4):616-20.
22. Al-Shudifat A-E, Al-Shdaifat A, Al-Abdouh AA, Aburoman MI, Otoum SM, Sweedan AG, et al. Diabetes risk score in a young student population in Jordan: a cross-sectional study. Journal of Diabetes Research. 2017;2017.
23. Mohammed AAA-LG, Al-Aaragi ANH, Merzah MA. Knowledge, attitude, and practice regarding diabetic mellitus among a sample of students at technical institute of Karbala. Medical Journal of Babylon. 2018;*15*(2):164.

24. Stack JW, Mahoney SE, Hearon CM. Factors associated with diabetes risk in south texas college students. International Journal of Exercise Science. 2014;*7*(2):2.
25. Antwi J, Lavin R, Sullivan S, Bellavia M. Perception of and risk factors for type 2 diabetes among students attending an upstate New York college: a pilot study. Diabetology & Metabolic Syndrome. 2020;*12*(1):1-8.
26. Xu Y, Zhang D, Liu K, Guo Y, Yang Y. Self-reported knowledge on diabetes and its related factors among Chinese college students: a cross-sectional study. BMJ open. 2016;*6*(9):e011963.
27. Gazzaz ZJ. Knowledge, attitudes, and practices regarding diabetes mellitus among university students in Jeddah, Saudi Arabia. Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy. 2020;13:5071.
28. Smith AD, Crippa A, Woodcock J, Brage S. Physical activity and incident type 2 diabetes mellitus: a systematic review and dose–response meta-analysis of prospective cohort studies. Diabetologia. 2016;*59*(12):2527-45.
29. Avşar P, Kazan EE, Pınar G. Investigation of university students' dietary habits and risk factors related to obesity and chronic diseases. Yildirim Beyazit University Journal of Nursing. 2013;*1*(1).
30. Doğan B, Yörük N, Öner C, Yavuz G, Oğuz A. Evaluation of diabetes risk and dietary habits of university students and employees. Turkish Journal of Family Medicine. 2017;*21*(2):50-5.
31. Alqahtani M, Almutairi FE, Albasseet AO, Almutairi KE. Knowledge, attitude, and practice of diabetes mellitus among the saudi population in Riyadh, Saudi Arabia: a quantitative study. Cureus. 2020;*12*(1).
32. Kulak E, Berber B, Temel H, Kutluay SN, Yıldırım M, Dedeoğlu FN, et al. Determination of type 2 diabetes risk level in individuals applying to family medicine. Turkish Journal of Family Medicine. 2019;*23*(1):20-30.
33. 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.
34. Çevik AB, Karaaslan MM, Koçan S, Pekmezci H, Şahin SB, Kırbaş A, et al. Prevalence and screening for risk factors of type 2 diabetes in Rize, Nourtheast Turkey: findings from a population-based study. Primary care diabetes. 2016;*10*(1):10-8.
35. Ubangha LO, Odugbemi TO, Abiola AO. Diabetes mellitus: Identifying the knowledge gaps and risk factors among adolescents attending a public school in Lagos State. Journal of Clinical Sciences. 2019;*13*(4):193.
36. Aljin V, Umadevi R, Anantha Eashwar V. Awareness of diabetes among patients with type 2 diabetes mellitus attending a rural health and training center. International Journal of Community Medicine and Public Health. 2018;*5*(10):4597-602.
37. Dsouza R, George P. Diabetes Awareness among College Going Students. IOSR Journal of Dental and Medical Sciences (IOSR-JDMS). 2015;*14*(6):25-8.
38. Jayachandran S, Pradeep S, Tintu K, Shajahan S, Mathew S, Sushmitha D, et al. Differences in awareness of diabetes among males and females. Journal of Health and Allied Sciences NU. 2014;*4*(01):083-5.
39. Mahdiyeh S, Nasim D, Peyman A, Nikmohammad A, Reza T, Shatha AS, et al. Assessment of diabetes knowledge among adolescents in selected Iranian schools in UAE. 2013.
40. Gezer C. Evaluation of the relationship between waist/height ratio and type 2 diabetes risk in nursing students. Food and health. 2017;*3*(4):141-9.