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The predictive role of eating disorders and physical activity in findrisc diabetes risk: the sample of nutrition and dietetics students

O papel preditivo dos distúrbios alimentares e da atividade física no risco de diabetes: amostra de estudantes de nutrição e dietética

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ABSTRACT

Objective

The aim of this study was to investigate the effect of eating disorder risk and physical activity level on diabetes risk in students enrolled in the Department of Nutrition and Dietetics.

Methods

This cross-sectional descriptive study was conducted with 313 students enrolled in the Department of Nutrition and Dietetics at a private foundation university during the academic year of 2021-2022. Data was collected through face-to-face interviews using the Information Form, International Physical Activity Questionnaire, SCOFF Eating Disorders Scale, and Finnish Type-2 Diabetes Risk Questionnaire. The data was analyzed using IBM®SPSS® v.26 statistical software.

Results

Among the Nutrition and Dietetics students, 91.1% were female, mean age was 21.42±3.62 years, and mean body mass ındex was 21.72±3.25 kg/m². According to International Physical Activity Questionnaire assessment, 8.9% of the students were categorized as inactive. The SCOFF Eating Disorders Scale assessment revealed that 25.6% of the students were at risk of developing an eating disorder. The Finnish Type-2 Diabetes Risk Questionnaire assessment indicated that 90.7% of the students had a low to slight risk of diabetes. The results of the correlation analysis showed that as International Physical Activity Questionnaire scores increased, Finnish Type-2 Diabetes Risk Questionnaire scores decreased by 16.8% (p=0.003), and as SCOFF Eating Disorders Scale scores increased, Finnish Type-2 Diabetes Risk Questionnaire scores also increased by 28% (p<0.001). The results of the multiple regression analysis showed that International Physical Activity Questionnaire significantly predicted Finnish Type-2 Diabetes Risk Questionnaire score, accounting for 3.8% of the variance, while SCOFF Eating Disorders Scale predicted Finnish Type-2 Diabetes Risk Questionnaire score, accounting for 8% of the variance (p<0.001).

Conclusion
The findings of this study suggest that physical activity level and susceptibility to eating disorders have a significant effect on the development of diabetes mellitus.

Keywords: Diabetes. Diabetes risk score. Eating disorder. Physical activity.

RESUMO

Objetivo
O estudo visou investigar como o risco de transtornos alimentares e o nível de atividade física influenciam o risco de diabetes em estudantes do Departamento de Nutrição e Dietética.

Métodos
Realizou-se um estudo transversal descritivo com 313 alunos matriculados no Departamento de Nutrição e Dietética de uma universidade privada, utilizando entrevistas face a face para coletar os dados com o Formulário de Informações, o Questionário Internacional de Atividade Física, a Escala de Distúrbios Alimentares SCOFF e o Questionário Finlandês de Risco para Diabetes Tipo, analisados por meio do software estatístico IBM® SPSS® v.26.

Resultados
Os alunos de Nutrição e Dietética avaliados neste estudo apresentaram uma predominância do sexo feminino (91,1%), idade média de 21,42±3,62 anos e o índice de massa corporal médio de 21,72±3,25 kg/m^2. Segundo o Questionário Internacional de Atividade Física, 8,9% dos alunos foram considerados inativos. A avaliação SCOFF revelou que 25,6% dos alunos apresentavam risco de transtornos alimentares. O Questionário Finlandês de Risco para Diabetes Tipo 2 indicou que 90,7% dos alunos apresentavam risco baixo a leve de diabetes. A análise de correlação mostrou uma relação inversa entre os escores do Questionário Internacional de Atividade Física e do Questionário Finlandês de Risco para Diabetes Tipo 2, enquanto os escores do SCOFF estavam positivamente correlacionados com o Questionário Finlandês de Risco para Diabetes Tipo 2. A análise de regressão múltipla indicou que o Questionário Internacional de Atividade Física e o SCOFF foram preditores significativos do escore do Questionário Finlandês de Risco para Diabetes Tipo 2. O Questionário Internacional de Atividade Física explicou 3,8% da variância e o SCOFF, 8% da variância (p<0,001).

Conclusão
Este estudo indica que o nível de atividade física e a propensão a transtornos alimentares influenciam significativamente o risco de desenvolver diabetes mellitus.

Palavras-chave: *Diabetes. Escore de risco de diabetes. Atividade física. Transtorno alimentar.*

INTRODUCTION

Diabetes mellitus is a metabolic problem in which the human body cannot utilize proteins, carbohydrates and fats as much as it should due to insulin insufficiency or conditions in which insulin is effective and requires continuous examination and follow-up. In 1999, World Health Organization (WHO) report revolutionized diabetes classification by introducing a comprehensive system. This encompassed various aetiological types and implemented disease staging, including categories such as normal glucose tolerance, impaired glucose tolerance, diabetes mellitus not requiring insulin treatment, diabetes mellitus requiring insulin therapy for blood glucose control, and diabetes mellitus requiring insulin therapy for survival. Notably, this shift in classification terminology moved from distinctions like insulin-dependent diabetes mellitus or non-insulin-dependent diabetes mellitus to the more precise delineation of type 1 or type 2 diabetes mellitus. [1]. According to the TURDEP-2 study (the Turkish Diabetes Epidemiology Study) conducted in 2010 in Türkiye among individuals aged 20 years and older, the prevalence of diabetes is 13.7%. The number of diabetic patients, which was 6.5 million in 2010 (Türkiye population was 73.3 million), increased to 9 million in 2021 (Türkiye population was 85 million). Considering this increase, it is estimated that Türkiye will be among the top 10 countries with the highest number of diabetes patients among adults in the world by 2045 [2].

The worldwide prevalence of diabetes among individuals aged 20 to 79 years old was 10.5% in 2021, equivalent to 536.6 million people and this prevalence rate would increase to 12.2% in 2045, affecting approximately 783.2 million people globally. Middle-income countries are expected to experience a greater relative increase in diabetes prevalence (21.1%) compared to high-income (12.2%) and low-income (11.9%) countries during the period between 2021 and 2045 [3].

The definition of health by WHO encompasses not only the absence of disease or infirmity but also the presence of complete physical, mental, and social well-being [4]. Regular physical activity is required to protect and improve human health, to reduce the risk of chronic diseases, and to control body weight/composition [5]. Physical activity in diabetes increases insulin sensitivity and decreases insulin resistance in body tissues. Thus, it reduces the insulin requirement of individuals, lowers blood glucose levels and contributes to the improvement of metabolic control. Therefore, it has an effect on improving quality of life [6].

The term "Eating Disorders" clinically defines a group of diagnoses such as binge eating, excessive exercise, eating behavior disorders (vomiting, use of laxatives... etc.) based on negative thoughts about body shape and body weight [7]. According to the classification in DSM-5 (Diagnostic and Statistical Manual of Mental Health Disorders – 5th Edition), 8 subgroups including bulimia nervosa, anorexia nervosa, rumination disorder, binge eating disorder, pica syndrome, avoidant/restricted food intake disorder as well as other defined eating disorders and undefined eating disorders are considered under the heading of Feeding and Eating Disorders [8]. It has been shown that the general public perception of low body weight leads to pressure and desire to have a low body weight especially in adolescents and young adults, which in turn leads to a negative change in their eating awareness and behaviors [9]. Inappropriate eating behaviors that develop in young adults may adversely affect cognitive functions (related to understanding, comprehension and learning) and also may be accompanied by problems related to low body weight or an irregular diet [10].

The primary target in the treatment of diabetes is lifestyle modification [11]. The development of healthy eating habits among healthy lifestyle behaviors and leading a more physically active life have an important role in lifestyle change. Based on this, the aim of this study was to reveal the effect of eating disorder risk and physical activity level on diabetes risk in students of the Department of Nutrition and Dietetics. At the same time, it is thought to contribute to the literature by examining the relationship between diabetes risk and eating disorders and physical activity level in students of the Department of Nutrition and Dietetics who have a high level of awareness about healthy eating.

METHODS

This is a cross-sectional, descriptive study. The study population comprised of 379 students who were enrolled in the first, second, third, and fourth years of the Department of Nutrition and Dietetics at the Faculty of Health Sciences in a private foundation university during the academic year of 2021-2022. The sample size calculation for this study. The calculation of Cohen's effect size (r) was conducted using the following formula: $^{d=\frac{M_1-M_2}{\sqrt{SD_1^2-SD_2^2}}r=\frac{d}{\sqrt{\left((D^2)+4\right)}}}$ and it was computed as r=0.362. Utilizing the effect size, Power analysis in the study was conducted using R program version 4.3.1, with a significance level (alpha error) set at 5% and a power (beta error) of 20%. In anticipation of a significant difference between variables following the study process, it was determined that a minimum of 121 samples would be sufficient. On the other hand, the sample size determination with a 95% confidence interval and ± 5% margin of error. Initially calculated based on a population of 379, using the formula; $^{n=\frac{\left(N\times t^2\times p\times q\right)}{\left(d^2\times\left(N-1\right)\right)+\left(t^2\times p\times q\right)}}$...", the minimum required sample size was 191. However, during the involved, using the random sampling method sampling process, a total of 313 samples were achieved.

Ethical approval was obtained from the Uskudar University Non-Interventional Research Ethics Committee on 28/12/2021, with the approval number 61351342/December 2021-11. Participants were fully informed about the purpose of the study and voluntarily provided their consent to participate. The collection of data was accomplished through face-to-face interviews. This research was conducted in accordance with the principles outlined in the Helsinki Declaration and the ethics guidelines for research and publication.

Data Collection and Evaluation

Information Form – It consists of questions prepared by the researchers by reviewing the literature to define the demographic and anthropometric information of the participants.

International Physical Activity Questionnaire (IPAQ) – It was developed by a group of experts in 1998 to monitor physical activity status based on a global criterion. In this study, the IPAQ-Short Form, which consists of 7 questions and whose Turkish validity and reliability study was conducted by Öztürk in 2005, was used. In this form, 3 specific activity types, namely walking, moderate-intensity activities and vigorous-intensity activities, as well as sitting times are questioned; frequency and duration are calculated separately for each activity type. MET refers to oxygen demand at rest. The MET value is multiplied by duration and frequency values to obtain a score of "MET-min/week" and based on these scores, physically inactive (MET-min/week<600), minimally active (MET-min/week=600-3000) and very active (MET-min/week>3000) are grouped [12].

SCOFF Eating Disorders Scale – Morgan and colleagues developed the SCOFF scale in 2000 as a tool for assessing the risk of eating disorders. Subsequently, a Turkish validation and reliability study was conducted by Aydemir in 2015. The SCOFF scale consists of five items, with one point assigned for each affirmative response, resulting in a maximum score of five points. A cutoff score of two points has been established, and individuals who score two or higher are considered to be at risk of having an eating disorder [13].

Finnish Type-2 Diabetes Risk Score (FINDRISC) – The FINDRISC tool was developed in 1987 by Lindström and Tuomilehto with the objective of identifying individuals who are at risk for developing T2DM (type 2 diabetes mellitus). In 1992, a cohort study was conducted to determine the validity of the tool. A Turkish validity and reliability study for FINDRISC was later carried out by Demirağ in 2016. FINDRISC is composed of eight questions that assess age, Body Mass Index (BMI), waist circumference, physical activity, fruit and vegetable consumption, hypertension, pre-pregnancy blood glucose level, and family history of diabetes. Possible scores on the FINDRISC range from 0 to 26. Risk levels are classified thus the range of 0-7 is considered as low, the range of 7-11 is slight, the range of 12-14 is moderate, the range of 15-20 is high and 21-26 is very high [14]. The use of the FINDRISC is also recommended by the Turkish Society of Endocrinology and Metabolism. There are relevant studies showing that the FINDRISC is useful in determining the risk of type 2 diabetes in the early period [15,16].

Statistical Evaluation of Data

The demographic characteristics of the study population were analyzed using descriptive statistics. Categorical variables were reported as frequency and percentage, while the normality of the numerical variables was assessed using the Shapiro-Wilk test. Descriptive statistics for normally distributed numerical data were presented as mean±standard deviation, while median

(minimum-maximum) was used for non-normally distributed data. The Mann-Whitney U test was employed to compare two independent groups that did not have normal distributions, and the Kruskal-Wallis H test was applied to compare more than two independent groups. To express the results of the multiple comparison tests, letter notation was used next to the medians. These statistical methods allowed for appropriate comparison and interpretation of the data in the study.

The relationships between the scales were analyzed using Spearman's Rank Difference Correlation Coefficient, which is a non-parametric statistical method that measures the strength and direction of the association between two variables. In interpreting the correlation coefficient, the following criteria were employed: "<0.2 represents a very weak correlation", "0.2-0.4 represents a weak correlation", "0.4-0.6 represents a moderate correlation", "0.6-0.8 represents a high correlation", and "0.8> represents a very high correlation" [17]. Multiple Regression Analysis was utilized to test the effect between variables. This mathematical method is used to explain the relationship between a dependent variable and one or more independent variables. These statistical analyses allowed for a comprehensive understanding of the relationships and effects between the variables of interest in the study [18].

The reliability of the scales was assessed using Cronbach's Alpha coefficient, a widely accepted measure of internal consistency. All statistical calculations and interpretations were performed with a significance level of "$\alpha<0.05$, $\alpha<0.01$, $\alpha<0.001$", and hypotheses were established as bidirectional. The statistical analysis was carried out using IBM®SPSS® v.26 (Inc., Chicago, IL, USA) software.

RESULTS

Of the 313 students of the Department of Nutrition and Dietetics who participated in the study, 91.1% were female. The mean age of the students was 21.42±3.62 years and the mean BMI was 21.72±3.25 kg/m2. The mean daily sleep duration was 7.69±1.14 hours and 53.4% of the students reported that they performed more than 150 minutes/week of physical activity in line with WHO recommendations (Table 1).

Table 1 – Descriptive findings of nutrition and dietetics students.

Characteristic	n	%
Gender		
Female	285	91.1
Male	28	8.9
Age (years) ($\bar{X}$±SD)	21.42±3.62	
Body Mass Index (kg/m^2) ($\bar{X}$±SD)	21.7±23.25	
Underweight (<18.5 kg/m^2)	47	15.0
Normal (18.5-24.9 kg/m^2)	224	71.6
Overweight and Obese (≥25 kg/m^2)	42	13.4
Daily Avarage Sleep Duration (hours) ($\bar{X}$±SD)	7.69±1.14	
Physical Activity of Over 150 Minutes per Week		
Yes	167	53.4
No	146	46.6
Presence of Chronic Disease		
Yes	31	9.9
No	282	90.1

According to IPAQ physical activity level assessment, 8.9% of the students were physically inactive, according to SCOFF assessment, 25.6% had an eating disorder risk and according to FINDRISC assessment, 90.7% of the students had low/slight T2DM risk level (Table 2).

Table 2 – Summary statistics of International Physical Activity Questionnaire, SCOFF Eating Disorders Scale and Finnish Type-2 Diabetes Risk Questionnaire data collection tools.

Data Collection Tools	n	%
IPAQ Categorical Breakdown ($\bar{X}$±SD)	2207.50±2010.07	
Inactive	28	8.9
Minimally active	109	34.8
Very active	176	56.3
SCOFF Eating Disorders Status ($\bar{X}$±SD)	0.85±1.05	
No Risk of Eating Disorders	233	74.4
Risk of Eating Disorders	80	25.6
FINDRISC T2DM Risc Status ($\bar{X}$±SD)	5.62±4.08	
Low/Slight Risk	284	90.7
Medium Risk	19	6.1
High/Very High Risk	10	3.2

Note: FINDRISC: Finnish Type-2 Diabetes Risk Questionnaire; IPAQ: International Physical Activity Questionnaire; SCOFF Eating Disorders Scale; SD: Standard Deviation.

There was no statistically significant difference in the median scores of the IPAQ (p= 0.151), SCOFF (p=0.188), and FINDRISC (p=0.694) assessments between male and female Nutrition and Dietetics students. A significant negative correlation, with a very weak magnitude (r=-0.144, p=0.044), was found between the students' age and the median IPAQ scores, while a significant positive correlation, with a weak magnitude (r=0.233, p<0.001), was observed between the students' age and the median FINDRISC scores. This indicated that as the students' age increased, there was a 14.4% decrease in IPAQ scores and a 23.3% increase in FINDRISC scores. The median IPAQ scores were significantly higher (p<0.001) for students who engaged in physical activity for more than 150 minutes per week, and the median FINDRISC scores were significantly lower (p=0.002) for the same group of students. The median SCOFF scores (p=0.025) and FINDRISC scores (p=0.003) of students with chronic diseases were significantly higher. Furthermore, the median SCOFF scores (p<0.001) and FINDRISC scores (p<0.001) of students classified as "overweight and obese" according to their BMI were significantly higher compared to those classified as underweight (Table 3).

The results indicated a statistically significant negative weak correlation (r=-0.168; p<0.01) between the IPAQ scores and FINDRISC scores of the Nutrition and Dietetics students. This suggests that as the IPAQ scores of the students increase, their FINDRISC scores decrease by 16.8%. Additionally, a statistically significant positive weak correlation (r=0.280; p<0.001) was observed between the SCOFF scores and FINDRISC scores of the students. This indicates that as the SCOFF scores increase, there is a corresponding increase of 28% in the FINDRISC scores (Table 4).

The relationship between the IPAQ, SCOFF and FINDRISC scores of the Nutrition and Dietetics students was analyzed using regression analysis, as shown in Table 5. The results showed that IPAQ scores explain about 3.8% of the variation in the FINDRISC scores of the students. The effect of the IPAQ scores on the FINDRISC scores was found to be statistically significant (F=5.825; p<0.05), and an increase in the IPAQ scores by one unit was found to result in a decrease of 0.256 in the FINDRISC scores. Similarly, SCOFF scores were found to explain approximately 8% of the variation in the FINDRISC scores of the students, and the effect of SCOFF scores on FINDRISC scores was found to be statistically significant (F=27.135; p<0.001). An increase in the SCOFF scores by one unit was found to result in an increase of 1,095 in the FINDRISC scores.

Table 3 – Comparison of of International Physical Activity Questionnaire, SCOFF Eating Disorders Scale and Finnish Type-2 Diabetes Risk Questionnaire scores according to students' descriptive findings.

Characteristic	IPAQ Median (min-max)	SCOFF Median (min-max)	FINDRISC Median (min-max)
Gender			
Female	1593 (90-10236)	0 (0-3)	5 (0-20)
Male	2181 (90-19458)	0 (0-3)	5 (0-13)
U	3333.5	3437.5	3811.5
p	0.151	0.188	0.694
Age			
s	**-0.114**	0.023	**0.233**
p	**0.044**	0.682	**<0.001**
Body Mass Index			
Underweight (<18.5 kg/m²)	1629 (90-6264)	0[a] (0-2)	4[a] (0-16)
Normal (18.5-24.9 kg/m²)	1588.5 (90-19458)	0[a] (0-3)	5[ab] (0-20)
Overweight and Obese (≥25 kg/m²)	1998 (501-5391)	1[b] (0-3)	8,5[b] (0-19)
H	1.085	**21.998**	**26.276**
p	0.581	**<0.001**	**<0.001**
Daily Avarage Sleep Duration	-0.093	-0.106	-0.107
s	0.100	0.060	0.059
p			
Physical Activity of >150 min/week			
Yes	2004 (90-19458)	0 (0-3)	5 (0-20)
No	1398.8 (90-7560)	0 (0-3)	5.5 (0-19)
U	**8599**	12135.5	**9699.5**
p	**<0.001**	0.940	**0.002**
Presence of Chronic Disease			
Yes	1272 (90-5226)	1 (0-3)	8 (0-19)
No	1663.5 (90-19458)	0 (0-3)	5 (0-20)
U	3499.5	**3388**	**2981**
p	0.068	**0.025**	**0.003**

Note: FINDRISC: Finnish Type-2 Diabetes Risk Questionnaire; IPAQ: International Physical Activity Questionnaire; SCOFF Eating Disorders Scale; U: Mann-Whitney U Test; H: Kruskal-Wallis H Test. The difference between medians without a common letter is significant. As stated in the Statistical Evaluation of Data section: 'All statistical calculations and interpretations were performed with a significance level of $\alpha<0.05$, $\alpha<0.01$, $\alpha<0.001$, and hypotheses were established as bidirectional.' The numbers highlighted in bold represent the data that are statistically significant.

Table 4 – The examination of the relationship between International Physical Activity Questionnaire, SCOFF Eating Disorders Scale and Finnish Type-2 Diabetes Risk Questionnaire data collection tools.

Data Collection Tools	IPAQ	SCOFF	FINDRISC
IPAQ			
s	1		
p	–		
SCOFF			
s	0.022	1	
p	0.694	–	
FINDRISC			
s	**-0.168**	**0.280**	1
p	**0.003**	**<0.001**	–

Note: FINDRISC: Finnish Type-2 Diabetes Risk Questionnaire; IPAQ: International Physical Activity Questionnaire; SCOFF Eating Disorders Scale; s: Spearman's Rank Differences Correlation Coefficient. All statistical calculations and interpretations were performed with a significance level of $\alpha<0.05$, $\alpha<0.01$, $\alpha<0.001$, and hypotheses were established as bidirectional. The numbers highlighted in bold represent the data that are statistically significant.

Table 5 – The effect of International Physical Activity Questionnaire and SCOFF Eating Disorders Scale scores on Finnish Type-2 Diabetes Risk Questionnaire.

Variable	*Unstandardized Coefficients*				F	R^2
	β	SE	*t*	*p*		
FINDRISC						
Constant	6.224	0.340	18.298	**<0.001**	5.825	0.038
IPAQ	-0.256	0.056	-2.413	**<0.016**		
FINDRISC						
Constant	4.682	0.285	16.428	**<0.001**	27.135	0.080
SCOFF	1.095	0.210	5.209	**<0.001**		

Note: FINDRISC: Finnish Type-2 Diabetes Risk Questionnaire; IPAQ: International Physical Activity Questionnaire; SCOFF Eating Disorders Scale. β: Beta Coefficient; SE: Standard Error. All statistical calculations and interpretations were performed with a significance level of $\alpha < 0.05$, $\alpha < 0.01$, $\alpha < 0.001$, and hypotheses were established as bidirectional. The numbers highlighted in bold represent the data that are statistically significant.

DISCUSSION

This study aimed to evaluate the effect of eating disorder risk and physical activity level on diabetes risk in students of the Department of Nutrition and Dietetics at a foundation university.

When the general statistics of the data collection tools of the study were examined, it was found that only 1 out of every 10 students was inactive according to the IPAQ assessment, 1 out of every 4 students had an eating disorder risk according to the SCOFF assessment, and 9 out of every 10 students had a low/slight level (1-4%) in terms of the risk of developing diabetes in the next 10 years according to the FINDRISC assessment. In the study conducted by Atayoğlu et al. on 1500 adults, 13.5% of the participants were found to be in the high-risk group and FINDRISC was associated with an increased risk of diabetes as BMI increased [19]. Similarly, the findings of Topbaş's study, which analyzed the 10-year risk of developing diabetes among university students, revealed that 70% of the participants were in the low-risk category, while 27.1% were considered to have a slight risk [20]. This disparity in results may be attributed to the fact that the study sample comprised of students majoring in Nutrition and Dietetics, who are likely to possess a heightened level of consciousness and awareness regarding healthy eating habits. In contrast, the elevated risk of diabetes in community-based studies as compared to our study may be due to a lower level of awareness concerning healthy nutrition as well as an increasing average age, which is a contributing factor in the development of T2DM.

The results obtained from this study suggest that gender does not play a significant role in determining the risk of diabetes. However, the literature presents conflicting results, with some studies indicating that the FINDRISC scores are higher in women among university students [15,21], while others report that either men or women have a higher risk score [19,22]. This inconsistency might be attributed to the composition of the study sample consisted of Nutrition and Dietetics students, who exhibit a heightened level of consciousness and awareness regarding healthy eating habits, regardless of their gender.

This study established that there was a significant 23.3% increase in FINDRISC diabetes risk scores with increasing age. Furthermore, individuals who engaged in physical activity for more than 150 minutes per week, in accordance with WHO recommendations, were found to have significantly lower risk levels compared to those who did not. The literature supports these findings, as multiple studies have demonstrated that FINDRISC scores increase with advancing age [23-25]. In agreement with these findings, Bülbül et al.'s study also showed that increased physical activity levels were associated with a decrease in diabetes risk [26]. This study also found a significant negative correlation between increasing age and physical activity levels among the students. This may be attributed to the fact that age and physical activity levels are recognized as risk factors for T2DM [27].

This study did not uncover any significant association between the students' sleep duration and their FINDRISC scores. This finding is consistent with the results of a study conducted by Aksu, which found that daily sleep duration did not have an impact on the risk of developing diabetes among 479 academics [28]. Despite the fact that sleep duration and quality can affect glucose metabolism [29], this may be due to the fact that the mean daily sleep duration of the students in this study (7.69±1.14 hours) was within the recommended range of 7-9 hours for individuals aged 18 years and older [30].

Additionally, the study found that the FINDRISC scores of those who had a diagnosed disease by a physician were significantly higher. This finding is supported by the results of Bülbül et al.'s study [26]. The increasing incidence and prevalence of diabetes mellitus is known to be associated with the development of other chronic diseases. Schwarz and colleagues have indicated that FINDRISC could be applied to identify insulin resistance in a population at high risk for T2DM and to predict potential glucose intolerance [31].

According to the results of the correlation analysis conducted in this study, as the IPAQ physical activity scores of the students increased, a significant decrease of 16.8% was found in FINDRISC scores. According to the results of multiple regression analysis, IPAQ scores predicted approximately 3.8% of the change in FINDRISC scores of the students in a statistically significant way. Increasing physical activity level reduces the risk of developing chronic diseases. In a clinic-based study by Hellgren et al. focusing on physical activity to prevent diabetes and reduce metabolic risk factors in individuals with IGT (impaired glucose tolerance) on 9734 individuals, it was found that physical activity caused body weight loss in individuals with chronic diseases and positive results in the basic risk factors for chronic diseases [32]. This situation shows parallelism with the result of our study; as the level of physical activity decreases, the risk of developing diseases increases.

According to the results of the correlation analysis conducted in this study, as the SCOFF eating disorder scores of the students increased, a significant increase of 28% was found in FINDRISC scores. According to the results of regression analysis, SCOFF scores significantly predicted approximately 8% of the change in FINDRISC scores. One of the most comprehensive studies investigating eating disorders in individuals with diabetes was conducted by Herpertz et al. In a multicenter prevalence study of 663 patients, eating disorder rates were found to be 5.9% current and 10.3% lifetime in patients with T1DM and 8.0% current and 14.0% lifetime in patients with T2DM [33]. Individuals with diabetes have to regulate their eating habits and lifestyles in order to keep blood glucose under control throughout their lives. Due to the nature of diabetes, diet lists to be followed and prohibited foods may lead to anxiety and consequently deterioration in eating attitudes and behaviors as a result of mental preoccupation preoccupation focusing on food and weight control.

CONCLUSION

Healthy nutrition and physical activity level, which are among healthy lifestyle behaviors, play an important role in the treatment of many health problems, especially diabetes. In this study conducted with Department of Nutrition and Dietetics students, who have a high level of awareness and consciousness about healthy lifestyle behaviors compared to the general population, it was found that although 9 out of every 10 students had a low/mild risk of diabetes, their physical activity levels and predisposition to eating disorders significantly affect the development of diabetes. And also IPAQ significantly predicted FINDRISC score, accounting for 3.8% of the variance, while SCOFF predicted FINDRISC score, accounting for 8% of the variance. It is thought that the findings

obtained from this study will provide guidance to reduce the possible risk factors of diabetes. Based on this, it is recommended that young adults, who will form the healthy societies of the future, should be supported by developing preventive/protective education and awareness activities with multidisciplinary approaches to develop healthy lifestyle behaviors in the early stages of their lives.

This study has some limitations. It was only done with students from one fondation university's Nutrition And Dietetics Department, and the majority of the participants were female. Also, the study was only conducted with students within the university age range.

REFERENCES

1. Endocrinology and Metabolism Society of Türkiye. Guidelines for the diagnosis, treatment and follow-up of diabetes mellitus and its complications [Internet]. 2020 [cited 2022 Dec 16]. Avaliable from: https://file.temd.org.tr/Uploads/publications/guides/documents/diabetes-mellitus_2022.pdf.
2. Republic of Türkiye Ministry of Health General Directorate of Public Health. Prevalence of Obesity in Türkiye [Internet]. 2002 [cited 2022 Dec 16]. Avaliable from: https://hsgm.saglik.gov.tr/tr/obezite/turkiyede-obezitenin-gorulme-sikligi.html.
3. Sun H, Saeedi P, Karuranga S, Pinkepank M, Ogurtsova K, Duncan B, et al. IDF Diabetes Atlas: Global, regional and country-level diabetes prevalence estimates for 2021 and projections for 2045. Diabetes Res Clin Pr. 2022;183:109119.
4. World Health Organization (WHO). Constitution [Internet]. 2022 [cited 2022 Dec 16]. Avaliable from: https://www.who.int/about/governance/constitution.
5. Warburton DE, Bredin SS. Reflections on physical activity and health: What should we recommend? Can J Cardiol. 2016;32(4):495-504.
6. Public Health Institution of Türkiye. Türkiye Physical Activity Guide [Internet]. 2014 [cited 2022 Dec 16]. Avaliable from: https://hsgm.saglik.gov.tr/depo/birimler/saglikli-beslenme-hareketli-hayat-db/Fiziksel_Aktivite_Rehberi/Turkiye_Fiziksel_Aktivite_Rehberi.pdf.
7. Hamadi L, Holliday J. Moderators and mediators of outcome in treatments for anorexia nervosa and bulimia nervosa in adolescents: A systematic review of randomized controlled trials. Int J Eat Disor. 2019;53(1):3-19.
8. American Psychological Association. Diagnostic and statistical manual of mental disorders. 5th. ed Washington: APA; 2013.
9. Tunç P. Childhood Trauma and Eating Attitudes in University Students. Curr Approa Psychiatr. 2019;11(1):203-19.
10. Altun M, Kutlu Y. The Views of Adolescent about the Eating Behaviour: A Qualitative Study . Floren Nightingale J Nursing. 2015;23(3):174-84.
11. Turkish Diabetes Foundation. Diabetes Diagnosis and Treatment Guide [Internet]. 2019 [cited 2022 Dec 16]. Avaliable from: https://www.turkdiab.org/admin/PICS/files/Diyabet_Tani_ve_Tedavi_Rehberi_2019.pdf
12. Öztürk M. Validity and reliability of the international physical activity questionnaire and determination of physical activity levels in university students [master's thesis]. Ankara: Hacettepe University Institute of Health Sciences; 2005.
13. Aydemir Ö, Köksal B, Yalın Sapmaz Ş, Yüceyar H. Reliability and validity of Turkish form of SCOFF Eating Disorders Scale. Anatolian J Psychiat. 2015;16(1):31-5.
14. Demirağ HE. Diabetes risk assessment of the first degree relatives of patients with TYPE-2 diabetes mellitus [thesis]. Aydin: Adnan Menderes University; 2016.
15. Colak M. Physical activity levels and type 2 diabetes risk scores of university students. Stud Ethno-Med. 2015;9(3):401-9.
16. Demirağ H, Hintistan S, Tuncay B, Cin A. Vocational School of Health Services Students Determination of Diabetes Risks. J İnönü Univer Vocational School Health Services. 2018;6(2):25-35.
17. Choi J, Peters M, Mueller RO. Correlational analysis of ordinal data: From Pearson'sr to Bayesian polychoric correlation. Asia Pac Educ Rev. 2010;11(4):459-66.

18. Şekercioğlu G, Bökeoğlu ÖÇ, Büyüköztürk Ş. Investigation of Research Self-Efficacy in Prospective Teachers in Terms of Different Variables and Determination of Predictors. Akd U Jfa. 2018;1(2):137-47.
19. Atayoglu AT, Inanc N, Başmisirli E, Çapar AG. Evaluation of the Finnish Diabetes Risk Score (FINDRISC) for diabetes screening in Kayseri, Türkiye. Prim Care Diabetes. 2020;14(5):488-93.
20. Topbaş E. Type 2 Diabetes Mellitus (Dm) Risk In University Students And Related Factors . ACU Sağlık Bil Derg. 2019;10(4):616-20.
21. Gezer C. The Assesment Of Relatıon Between Waist/Height Ratio And Type 2 Diabetes Risk Among Nursing Students. J Food Health Sci. 2017;3(4):141-9.
22. Al-Shudifat AE, Al-Shdaifat A, Al-Abdouh AA, Aburoman MI, Otoum SM, Sweedan A, et al. Diabetes Risk Score in a Young Student Population in Jordan: A Cross-Sectional Study. J Diabetes Res. 2017;8290710.
23. Kulak E, Berber B, Temel H, Kutluay SN, Yıldırım M, Dedeoğlu FN, et al. Determination of type 2 diabetes risk levels in individuals applying to family medicine. Turk J Family Prac. 2019;23(1):20-30.
24. Awad A, Alsaleh FM. 10-year risk estimation for type 2 diabetes mellitus and coronary heart disease in Kuwait: A cross-sectional population-based study. PLoS One. 2015;10(1):e0116742.
25. Makrilakis K, Liatis S, Grammatikou S, Perrea D, Stathi C, Tsiligros P, et al. Validation of the Finnish diabetes risk score (FINDRISC) questionnaire for screening for undiagnosed type 2 diabetes, dysglycaemia and the metabolic syndrome in Greece. Diabetes Metab. 2011;37(2):144-51.
26. Bülbül E, Çelik S, Alçiçek H, Dindar A, Furtana M, Günal M, et al. Determining Diabetes Risk and Healthy Lifestyle Behaviors in Nursing Students. Türk Diyab Obez. 2020;3:230-8.
27. International Diabetes Federation. Diabetes Atlas 2022 Report [Internet]. 2022 [cited 2022 Dec 7]. Avaliable from: https://diabetesatlas.org/2022-reports/.
28. Aksu İ. Type 2 Diabetes Risk Among Academicians: South-Eastern Türkiye Sample [thesis], Gaziantep: Hasan Kalyoncu University Institute of Health Sciences; 2018.
29. Olgun N. Diabetes (Type 2) and Care. In: Akın S, Durna Z. Chronic Diseases and Care. Istanbul: Nobel Medical Publishing House; 2012.
30. National Sleep Foundation. Sleep in America Poll Sleep In The Modern Family [Internet]. 2014. [cited 2022 Dec 7]. Avaliable from: https://www.thensf.org/wp-content/uploads/2021/03/2014-Sleep-in-America-poll-summary-of-findings-FINAL-Updated-3-26-14-.pdf.
31. Schwarz PE, Li J, Reimann M, Schutte AE, Bergmann A, Hanefeld M, et al. The Finnish Diabetes Risk Score is associated with insulin resistance and progression towards type 2 diabetes. J Clin Endocrinol Metab. 2009;94(3):920-6.
32. Hellgren MI, Petzold M, Beteus-Forslund H, Wedel H, Jansson PA, Lindblad U. Feasibility of a randomized controlled intervention with physical activity in participants with impaired glucose tolerance recruited by FINDRISC: A pilot study. Scand J Public Health. 2014;42(5):463-70.
33. Herpertz-Dahlmann B. Adolescent eating disorders: Definitions, symptomatology, epidemiology and comorbidity. Child Adolesc Psychiatr Clin N Am. 2009;18(1):31-47.

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