Medical students' tobacco product and e-cigarette usage habits: An assessment of their relationship with types of addiction and depression

Tıp fakültesi öğrencilerinin tütün ürünleri ve elektronik sigara kullanım alışkanlıkları: Bağımlılık türleri ve depresyon ile ilişkisinin değerlendirilmesi

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ABSTRACT

Background: Tobacco use remains one of the leading preventable causes of disease and death, while the rising use of e-cigarettes among young adults creates new public health challenges. Medical students, as future physicians, are a key group in which tobacco-related behaviors, addiction patterns, and psychological correlates should be examined. This study aimed to determine the prevalence of tobacco and e-cigarette use among medical students, assess associated sociodemographic and lifestyle factors, and evaluate addiction profiles and depression.

Methods: A cross-sectional survey was conducted among 496 medical students at the Gülhane Faculty of Medicine in 2025. Data were collected through a structured questionnaire including sociodemographic characteristics, tobacco and e-cigarette use, self-reported addiction, and the Beck Depression Inventory. In the data analysis, Student's t-test or Mann–Whitney U test was used for numerical variables, while Pearson's chi-square, Yates' corrected chi-square, and Fisher's exact tests were used for categorical variables. A multivariable binary logistic regression analysis was conducted to determine independent predictors of tobacco use. $p < 0.05$ accepted as statistically significant.

Results: The mean age of participants was 22.6 years; 50% were male. Overall, 26% reported current tobacco use and 5.2% reported e-cigarette use. Cigarettes (98.4%) and e-cigarettes (20.2%) were the most common products. Tobacco use was significantly higher in males and those with higher BMI or family history of tobacco use. All

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tobacco users described themselves as addicted. The most frequent reasons for e-cigarette use were pleasant taste and the desire to quit smoking. Chronic disease prevalence was higher among e-cigarette users. Median depression scores indicated minimal symptoms, with no significant difference between users and non-users.

Conclusions: Tobacco and e-cigarette use remain widespread among medical students and are strongly linked to sociodemographic and lifestyle factors. The very high rate of self-reported addiction may reflect the addictive nature of nicotine, even in a medically educated population. Misconceptions about e-cigarette safety underscore potential gaps in awareness for targeted prevention, effective university tobacco control policies, and integration of addiction awareness into medical education.

Keywords: tobacco, e-cigarette, medical students, addiction, depression

ÖZ

Arka Plan: Tütün kullanımı önlenebilir hastalık ve ölümlerin başlıca nedenlerinden biridir. Gençler arasında artan e-sigara kullanımı ise yeni halk sağlığı sorunları yaratmaktadır. Geleceğin hekimleri olan tıp öğrencilerinde tütün kullanımı, bağımlılık ve psikolojik etkilerinin incelenmesi önemlidir. Bu çalışmada tıp öğrencilerinde tütün ve e-sigara kullanım sıklığının belirlenmesi, ilişkili faktörlerin incelenmesi ve bağımlılık ile depresyon durumlarının değerlendirilmesi amaçlanmıştır.

Yöntemler: 2025 yılında Gülhane Tıp Fakültesi öğrencileri (n=496) arasında kesitsel anket uygulanmıştır. Anket; sosyodemografik özellikler, tütün ve e-sigara kullanımı, öz-bildirim bağımlılık durumu ve Beck Depresyon Envanteri'ni içermiştir. Verilerin analizinde sayısal değişkenler için Student's t-testi veya Mann–Whitney U testi; kategorik değişkenler için ise Pearson ki-kare, Yates düzeltmeli ki-kare ve Fisher's exact test kullanılmıştır. Tütün kullanımıyla ilişkili bağımsız belirleyicileri saptamak amacıyla çok değişkenli ikili lojistik regresyon analizi uygulanmıştır. Anlamlılık düzeyi p<0.05 olarak kabul edilmiştir.

Bulgular: Katılımcıların yaş ortalaması 22,6 yıl olup %50'si erkektir. Öğrencilerin %26'sı tütün, %5,2'si e-sigara kullanmaktadır. En sık kullanılan ürünler sigara (%98,4) ve e-sigara (%20,2) olmuştur. Tütün kullanımı erkeklerde, yüksek BKİ'ye ve ailede tütün öyküsüne sahip olanlarda daha yüksektir. Tüm tütün kullanıcıları kendilerini bağımlı olarak tanımlamıştır. E-sigara kullanımında en sık neden hoş tat ve sigarayı bırakma isteği olmuştur. Kronik hastalık oranı e-sigara kullanıcılarında daha yüksektir. Depresyon puanları minimal düzeyde olup gruplar arasında anlamlı fark bulunmamıştır.

Sonuçlar: Tütün ve e-sigara kullanımı tıp öğrencileri arasında yaygındır ve çeşitli sosyodemografik faktörlerle ilişkilidir. Kendi beyanlarına göre bağımlılık oranının yüksek olması, tıp eğitimi almış bir nüfusta bile nikotinin bağımlılık yapıcı özelliğini yansıtıyor olabilir. E-sigara güvenliğine dair yanlış algılar; önleyici stratejiler, üniversite temelli tütün kontrol programları ve tıp eğitimine bağımlılık farkındalığının entegre edilmesi konusunda potansiyel eksiklikleri göstermektedir.

Anahtar kelimeler: tütün, e-sigara, tıp öğrencileri, bağımlılık, depresyon

Introduction

Tobacco use is reported to be the most common form of substance addiction worldwide. Tobacco use disorder is defined as a loss of control over tobacco product use, difficulty quitting and continued use despite physical or psychological harm caused by it.[1] There is a scientific consensus that all tobacco products are harmful, and no level of exposure is safe. Globally, cigarettes are the most common form of tobacco; however, other products such as hookahs, cigars, heated tobacco, and smokeless tobacco are also consumed.[2]

It has been reported that there are 1.3 billion tobacco users globally.[2] According to the 2022 Türkiye Health Survey published by the Turkish Statistical Institute (TUIK), the proportion of

individuals aged 15 and over who used tobacco products daily increased from 28.0% in 2019 to 28.3% in 2022.[3] The Türkiye Household Health Survey on the Prevalence of Risk Factors for Non-Communicable Diseases found that, in 2023, 34.8% of the Turkish population aged 15 and over used tobacco products, with 31.3% using them daily. The smoking rate among men (46.1%) was higher than among women (23.6%).[4]

Tobacco use is one of the greatest threats to public health worldwide, causing more than 7 million deaths each year and leading to disability and long-term suffering from tobacco-related diseases.[2] A study using data from the 2021 Global Burden of Disease study found that the number of deaths from tobacco-related chronic respiratory diseases globally had increased by 25.4% compared to 1990, while the number of DALYs (disability-adjusted life years) had increased by 15.6%.[5] In another study using the same data, it was reported that the global number of deaths due to cardiovascular diseases attributed to tobacco was 2.1 million in 2021, representing an increase of 71.3% compared to 1990. The number of DALYs increased by 61.2%.[6]

In recent years, the use of electronic cigarettes (e-cigarettes) as an alternative to traditional cigarettes has increased, particularly among young people. E-cigarettes are battery-powered devices that vaporise liquid to provide a smoking experience similar to that of a traditional cigarette. E-cigarettes heat a nicotine-containing liquid (e-liquid) to produce aerosol inhaled by the user, providing a similar smoking experience to traditional cigarettes. However, e-cigarettes contain varying amounts of nicotine and harmful emissions.[7,8] Studies have shown that young people who use e-cigarettes are more likely to start smoking traditional cigarettes in the future.[9]

In Türkiye, e-cigarettes were classified as a 'tobacco product' in 2013 under Law No. 4207 on the 'Prevention and Control of the Harms of Tobacco Products', which prohibited their advertisement,

use in indoor areas and sale to individuals under the age of 18.[10] In 2020, a presidential decree banned the import of e-cigarettes and their accessories.[11] Despite these measures, scientists point out that, as in the rest of the world, the rate of e-cigarette use among young people in Türkiye has increased.[12]

Using tobacco and e-cigarettes can trigger other addictions through biological, psychological and behavioural mechanisms. Research has shown that nicotine use may increase the risk of developing other addictions.[13,14] Furthermore, psychiatric disorders such as depression and anxiety are more prevalent among smokers than in the general population, and a history of depression and alcohol dependence is often reported by individuals trying to quit smoking.[15-17]

It is of great importance to understand the psychological effects and addictive nature of increasing tobacco and e-cigarette use among young healthcare professionals in order to develop effective preventive public health strategies in the future. The aim of this study was to determine the frequency of tobacco and e-cigarette use among medical students, and to examine the sociodemographic and addiction-related factors associated with tobacco and e-cigarette use among medical students. Additionally, the study aimed to explore the factors associated with e-cigarette use among tobacco users and the relationship between addiction types and tobacco use.

Materials and Methods

Study design and sampling

This cross-sectional study was conducted among students enrolled at the Gülhane Faculty of Medicine, University of Health Sciences, between 1 April and 31 July 2025.

The study population consists of all students enrolled at the Faculty during the 2024–25

academic year, totalling 1985 individuals. Using the G-Power Analysis method with the known population sample formula, the minimum number of students to be reached was calculated as 269, assuming a tobacco use frequency of 28%, a confidence interval of 95%, and a margin of error of 5%. To avoid sample loss during implementation, the aim was to survey 10% more students than the calculated minimum, resulting in a total sample size of 296. The sample size was determined using a stratified sampling method, with weighting based on the number of students in each class. Students who agreed to participate were included in the study, resulting in a total of 496 participants.

Data collection tools

The questionnaire was developed following a detailed review of the literature related to the research topic.

The questionnaire included questions on students' sociodemographic characteristics, tobacco and e-cigarette use, addiction-related features, and the Beck Depression Inventory (BDI).

The independent variables of the study were sociodemographic characteristics such as age, gender, body mass index (BMI), family history of tobacco use, academic year, income level, physical activity, and caffeine consumption, as well as addiction-related characteristics. The dependent variables were tobacco and e-cigarette use. Data on these variables were collected through a self-administered questionnaire transferred to Google Forms.

The Beck Depression Inventory was used to assess students' depression status. The inventory consists of 21 items, each describing a specific mood state and presented as a four-point Likert scale. The total score ranges from 0 to 63, and the degree of depression is categorized as follows: minimal (0–9 points), mild (10–16), moderate (17–29), and

severe (30–63). Permission to use the scale was obtained from the original authors via email.[18,19] The questionnaires were transferred to Google Forms.

Data collection

After obtaining ethical committee approval and the necessary permissions, students were gathered in the lecture halls or classrooms where they attended classes on the scheduled days and times, and the purpose of the study was explained to them. The Google Forms link was shared via QR code, and electronic consent was obtained from the participants. The questionnaires were completed online by the students under observation.

Statistical analysis

IBM SPSS Statistics (version 25.0) was used to analyse the data obtained in this study. The normality of the continuous variables was assessed using the Kolmogorov–Smirnov test and visual methods (histogram and Q–Q plot). Continuous variables showing a normal distribution were expressed as mean ± standard deviation (mean ± SD), while those not showing a normal distribution were expressed as median (minimum–maximum).

To compare continuous variables between groups, Student's t-test or Mann–Whitney U-test was used according to the distribution. Categorical variables were compared using the Pearson chi-squared test. If more than 20% of the expected cell counts were below five, the Yates-corrected chi-squared test was applied. In necessary cases, the Fisher's exact test was used. A significance level of $p < 0.05$ was accepted for all statistical analyses.

Ethical approval

Ethical committee approval for the study was obtained from the University of Health Sciences Gülhane Scientific Research Ethics Committee on 11.03.2025, with the approval number 46418926.

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Results

A total of 496 medical students participated in the study. The mean age of the participants was 22.6 ± 2.1 years, with 50% male (n=248) and 50% female (n=248). The mean BMI was 23.3 ± 3.7. According to the BMI classification, 64.7% of the students were of normal weight.

Regarding the distribution of place of residence, most students lived in dormitories (37.5%) or with their families (32.7%). 60.1% of the students were in the clinical phase (4th–6th year). Family income level was mostly moderate (84.5%). 41.1% of the participants' mothers and 60.5% of their fathers were university graduates. 8.1% of the participants had a chronic disease. The proportion of students engaging in regular physical activity was 25.6%, whereas 17.5% did not engage in any physical activity. Regarding daily tea/coffee consumption, 55% reported consuming 1–2 cups per day (Table 1).

48.6% of the participants had a family history of tobacco product use. When examining addiction status, 40.7% of participants reported having at least one addiction. Among participants who reported having an addiction, cigarette addiction was 62.9%, e-cigarette addiction 12.9%, digital addiction 43.1%, and shopping addiction 10.4%. Regarding tobacco and tobacco product use, 26% of all participants used tobacco and tobacco products (39.5% of males; 12.5% of females).

Among tobacco users, 55% initiated use between the ages of 19–24. 75.2% of participants were considering quitting; however, only 1.4% of those planning to quit reported receiving medical support.

The most frequent reasons for e-cigarette use were pleasant flavor (69.2%), desire to quit smoking (61.5%), and not staining teeth or fingers (53.8%) (Table 2).

The median Beck Depression Inventory score was 8 (0–55). According to the scale, this value indicates symptoms at the minimal depression level (Table 3).

The mean age of tobacco users (23.1 ± 2.0 years) was significantly higher than that of non-users (22.5 ± 2.1 years) (p = 0.005). Regarding gender distribution among tobacco and tobacco product users, tobacco use was markedly higher among males (39.5%) than females (12.5%) (p < 0.001). There is a statistically significant difference between the groups according to BMI classification (p < 0.001). While the rate of tobacco use was 42.1% among obese and 43.7% among overweight individuals, it was found to be significantly lower at 18.4% among those with normal weight.

The rate of tobacco use was higher among individuals with a family history of tobacco use (33.6%) than among those without (18.8%) (p < 0.001). In our study, a statistically significant relationship was found between tobacco/tobacco product use and self-reported addiction status (p < 0.001). Accordingly, 63.9% of participants who reported having any form of addiction (n=129) were tobacco users, while all tobacco users (100%) identified themselves as addicted. A significant association was found between daily tea/coffee consumption and tobacco use (p = 0.008). Tobacco use was reported by 44.2% of participants who consumed five or more cups of tea/coffee per day, compared with only 20.0% among those who did not consume any. According to the results of the Beck Depression Inventory, there was no statistically significant difference in depression scores between tobacco users and non-users (Table 4).

In the multivariable binary logistic regression analysis conducted to examine the factors affecting tobacco use, age, gender, BMI, academic year, and family history of tobacco use were found to have statistically significant effects. In particular, the

Table 1. Sociodemographic characteristics of the participants (n=496)		n	%**
Variable			
Age (Years)		Mean±SD=22.6±2.1	
Gender	Male	248	50.0
	Female	248	50.0
Place of residence	With family	162	32.7
	Alone in a student apartment	60	12.1
	With friends in a student apartment	88	17.7
	In a dormitory	186	37.5
Academic Year	Preclinical (Years 1, 2, & 3)	198	39.9
	Clinical (Years 4, 5, & 6)	298	60.1
Family Income Level (Montly)	Low	36	7.3
	Middle	419	84.5
	High	41	8.3
Mother's Education Level	Primary school	132	26.6
	High school or equivalent	160	32.3
	University	204	41.1
Father's Education Level	Primary school	81	16.3
	High school or equivalent	115	23.2
	University	300	60.5
Presence of Chronic Disease	Yes	40	8.1
	No	456	91.9
Physical Activity Status	Regular	127	25.6
	Occasional	282	56.9
	None	87	17.5
Daily Tea/Coffee Consumption	None	35	7.1
	1-2 cups	273	55.0
	3-4 cups	136	27.4
	≥5 cups	52	10.5
BMI Classification	Underweight	30	6.0
	Normal weight	321	64.7
	Overweight	126	25.4
	Obese	19	3.8

*Multiple responses possible, **Column percentage, SD: Standard deviation, BMI: Body mass index

likelihood of being in the tobacco user group was 3.5 times higher among males (CI = 1.984–6.019, p < 0.001), 2.2 times higher among students in the preclinical phase (CI = 1.070–4.406, p = 0.032), and 2.4 times higher among those with a family history of tobacco use (CI = 1.518–3.725, p < 0.001) (Table 5).

The prevalence of e-cigarette use was 5.2% among all participants, whereas among tobacco users it was 20.2%. A statistically significant association was identified between the presence of chronic disease and e-cigarette use among tobacco users (p=0.020). Among tobacco users who reported having a chronic disease, 43.8% used e-cigarettes, whereas this rate was 16.8% among those without a chronic disease. There were no significant differences in terms of age, gender, BMI, educational level, family income, parental

Table 2. Tobacco and addiction-related characteristics of the participants

Variable		n	%**
Current Tobacco/Tobacco Product Use	Yes	129	26.0
	No	367	74.0
Type of Tobacco Product Used (n=129)*	Cigarette	127	98.4
	E- Cigarette	26	20.2
	Roll-your-own tobacco	16	12.4
	Waterpipe	19	14.7
	Other	2	0.4
Family History of Tobacco Use	Yes	241	48.6
	No	255	51.4
Age of Initiation of Tobacco Use (n=129)	≤12 years	4	3.1
	13-18 years	52	40.3
	19-24 years	71	55.0
	≥25 years	2	1.6
Considering Quitting Tobacco (n=129)	Yes	97	75.2
	No	32	24.8
Receiving medical support for quitting tobacco use (n=97)	Yes	7	1.4
	No	90	18.1
Reasons for E-cigarette Use (n=26)*	Flavor	9	69.2
	"Cooler" image	1	7.7
	Ease of use	5	38.5
	Doesn't stain teeth/fingers	7	53.8
	Doesn't bother others	7	53.8
	To quit smoking	8	61.5
	Perceived as less harmful	4	30.8
	Can be used indoors	1	7.7
	Low cost	2	15.4
Addiction Status	Yes	202	40.7
	No	294	59.3
Type of Addiction (n=202)*	Cigarette	127	62.9
	E-cigarette	26	12.9
	Alcohol	16	7.9
	Gambling	5	2.5
	Drugs	0	0.0
	Digital	87	43.1
	Shopping	21	10.4
Beck Depression Inventory Score		Median (min-max)=8 (0-55)	
Beck Depression Inventory Score Categories	Minimal depression	270	54.4
	Mild depression	101	20.4
	Moderate depression	106	21.4
	Severe depression	19	3.8

*Multiple responses possible, **Column percentage, SD: Standard deviation, BMI: Body mass index

Table 3. Distribution of beck depression inventory scores and categories among participants (n = 496)

Variable		n	%*
Beck Depression Inventory Score		Median (min-max)=8 (0-55)	
Beck Depression Inventory Score Categories**	Minimal depression	270	54.4
	Mild depression	101	20.4
	Moderate depression	106	21.4
	Severe depression	19	3.8

*Column percentage, **BDI categories: Minimal (0–9), Mild (10–16), Moderate (17–29), Severe (30–63).

Table 4. Comparison of participants' characteristics by tobacco/tobacco product use status (n=496)

Variable		Use of tobacco/tobacco products, n (%)		p-value
		Yes, 129 (26.0)	No, 367 (74.0)	
Age (years), Mean±SD		23.1±2.0	22.5±2.1	**0.005**[1]
Gender	Male	98 (39.5)	150 (60.5)	**<0.001**[2]
	Female	31 (12.5)	217 (87.5)	
Place of residence	With family	33 (20.4)	129 (79.6)	0.056[2]
	Alone in a student apartment	21 (35.0)	39 (65.0)	
	With friends in a student apartment	29 (33.0)	59 (67.0)	
	In a dormitory	46 (24.7)	140 (75.3)	
Academic Year	Preclinical (Years 1, 2, & 3)	47 (23.7)	151 (76.3)	0.347[2]
	Clinical (Years 4, 5, & 6)	82 (27.5)	216 (72.5)	
Family Income Level (Monthly)	Low	15 (41.7)	21 (58.3)	0.080[2]
	Middle	103 (24.6)	316 (75.4)	
	High	11 (26.8)	30 (73.2)	
Mother's Education Level	Primary school	33 (25.0)	99 (75.0)	0.936[2]
	High school or equivalent	43 (26.9)	117 (73.1)	
	University	53 (26.0)	151 (74.0)	
Father's Education Level	Primary school	21 (25.9)	60 (74.1)	0.965[2]
	High school or equivalent	31 (27.0)	84 (73.0)	
	University	77 (25.7)	223 (74.3)	
Presence of Chronic Disease	Yes	16 (40.0)	24 (60.0)	0.055[3]
	No	113 (24.8)	343 (75.2)	
Physical Activity Status	Regular	39 (30.7)	88 (69.3)	0.310[2]
	Occasional	71 (25.2)	211 (74.8)	
	None	19 (21.8)	68 (78.2)	
Daily Tea/Coffee Consumption	None	7 (20.0)	28 (80.0)	**0.008**[2]
	1-2 cups	61 (22.3)	212 (77.7)	
	3-4 cups	38 (27.9)	98 (72.1)	
	≥5 cups	23 (44.2)	29 (55.8)	
Family History of Tobacco Use	Yes	81 (33.6)	160 (66.4)	**<0.001**[2]
	No	48 (18.8)	207 (81.2)	

[1]Student's t-test, [2]Pearson's Chi-square test, [3]Yates' Corrected Chi-square, [4]Mann-Whitney U test.
Data are expressed as n (%), mean±SD, and median (min-max). Row percentages are given.

Table 4. Continued

Variable		Use of tobacco/tobacco products, n (%)		p-value
		Yes, 129 (26.0)	No, 367 (74.0)	
BMI Classification	Underweight	7 (23.3)	23 (76.7)	**<0.001**[2]
	Normal weight	59 (18.4)	262 (81.6)	
	Overweight	55 (43.7)	71 (56.3)	
	Obese	8 (42.1)	11 (57.9)	
Addiction Status	Yes	129 (63.9)	73 (26.1)	**<0.001**[2]
	No	0 (0.0)	294 (100.0)	
Beck Depression Inventory Score, Median (min-max)		9 (0-55)	8 (0-41)	0.243[4]
Beck Depression Inventory Score Categories	Minimal depression	66 (24.4)	204 (75.6)	0.135[2]
	Mild depression	21 (20.8)	80 (79.2)	
	Moderate depression	36 (34.0)	70 (66.0)	
	Severe depression	6 (31.6)	13 (68.4)	

[1]Student's t-test, [2]Pearson's Chi-square test, [3]Yates' Corrected Chi-square, [4]Mann-Whitney U test.
Data are expressed as n (%), mean±SD, and median (min-max). Row percentages are given.

Table 5. Results of the logistic regression analysis for factors associated with tobacco use

Variables		OR	95% CI	p-value
Age		**1.265**	**1.075-1.489**	**0.005**
Gender	Female	1.000		
	Male	**3.456**	**1.984-6.019**	**<0.001**
BMI		**1.074**	**1.002-1.151**	**0.043**
Academic Year	Clinical (Years 4, 5, & 6)	1.000		
	Preclinical (Years 1, 2, & 3)	**2.171**	**1.070-4.406**	**0.032**
Physical Activity Status	Regular	1.000		
	Occasional	1.057	0.631-1.770	0.834
	None	0.792	0.379-1.655	0.535
Daily Tea/Coffee Consumption	None	1.000		
	1-2 cups	1.273	0.506-3.201	0.608
	3-4 cups	1.854	0.701-4.902	0.213
	≥5 cups	2.894	0.995-8.415	0.051
Family History of Tobacco Use	No	1.000		
	Yes	**2.378**	**1.518-3.725**	**<0.001**

Omnibus Test<0.001, Hosmer and Lemeshow Test=0.723, Nagelkerke R^2=0.230
OR: Odds Ratio, CI: Confidence Interval

education, place of residence, physical activity, tea/coffee consumption and family history of tobacco use.

Most e-cigarette users (19.8%) started using tobacco between the ages of 19-24. There was no significant difference between the two groups in terms of intention to quit or receipt of medical support for quitting. According to the results of the Beck Depression Inventory, although e-cigarette users had higher depression scores, the difference was not statistically significant. (Table 6).

Table 6. Comparison of characteristics among tobacco users by e-cigarette use status (n=129)

Variables		E-cigarette use		p-value
		Yes, 26 (20.2)	No, 103 (79.8)	
Age (years), Mean±SD		23.0±2.2	23.1±1.9	0.772[1]
Gender	Male	18 (18.4)	80 (81.6)	0.520[2]
	Female	8 (25.8)	23 (74.2)	
Place of residence	With family	6 (18.2)	27 (81.8)	0.966[3]
	Alone in a student apartment	5 (23.8)	16 (76.2)	
	With friends in a student apartment	6 (20.7)	23 (79.3)	
	In a dormitory	9 (19.6)	37 (80.4)	
Academic Year	Preclinical (Years 1, 2, & 3)	9 (19.1)	38 (80.9)	1.000[2]
	Clinical (Years 4, 5, & 6)	17 (20.7)	65 (79.3)	
Family Income Level (Monthly)	Low	2 (13.3)	13 (86.7)	-
	Middle	22 (21.4)	81 (78.6)	
	High	2 (18.2)	9 (81.8)	
Mother's Education Level	Primary school	6 (18.2)	27 (81.8)	0.840[3]
	High school or equivalent	8 (18.6)	35 (81.4)	
	University	12 (22.6)	41 (77.4)	
Father's Education Level	Primary school	5 (23.8)	16 (76.2)	0.789[3]
	High school or equivalent	7 (22.6)	24 (77.4)	
	University	14 (18.2)	63 (81.8)	
Presence of Chronic Disease	Yes	7 (43.8)	9 (56.3)	**0.020[4]**
	No	19 (16.8)	94 (83.2)	
Physical Activity Status	Regular	11 (28.2)	28 (71.8)	0.162[3]
	Occasional	10 (14.1)	61 (85.9)	
	None	5 (26.3)	14 (73.7)	
Daily Tea/Coffee Consumption	None	1 (14.3)	6 (85.7)	-
	1-2 cups	12 (19.7)	49 (80.3)	
	3-4 cups	7 (18.5)	31 (81.6)	
	≥5 cups	6 (26.1)	17 (73.9)	
Family History of Tobacco Use	Yes	16 (19.8)	65 (80.2)	1.000[2]
	No	10 (20.8)	38 (79.2)	
BMI Classification	Underweight	3 (42.9)	4 (57.1)	-
	Normal weight	13 (22.0)	46 (78.0)	
	Overweight	8 (14.5)	47 (85.5)	
	Obese	2 (25.0)	6 (75.0)	
Addiction Status	Yes	26 (20.2)	103 (79.8)	-
	No	0 (0.0)	0 (0.0)	
Age of Initiation of Tobacco Use	≤12 years	1 (25.0)	3 (75.0)	-
	13-18 years	9 (17.3)	43 (82.7)	
	19-24 years	16 (22.5)	55 (77.5)	
	≥25 years	0 (0.0)	2 (100.0)	

[1]Student's T-test, [2]Yates-corrected chi-square test, [3]Pearson chi-square test, [4]Fisher's Exact Test, [5]Mann-Whitney U test
Data are expressed as n (%), mean±SD, and median (min-max). Row percentages are given.

Table 6. Continue

Variables		E-cigarette use		p-value
		Yes, 26 (20.2)	**No, 103 (79.8)**	
Considering Quitting Tobacco (n=129)	Yes	18 (18.6)	79 (81.4)	0.593[2]
	No	8 (25.0)	24 (75.0)	
Receiving medical support for quitting tobacco use (n=97)	Yes	1 (14.3)	6 (85.7)	1.000[4]
	No	17 (18.9)	73 (81.1)	
Beck Depression Inventory Score, Median (min-max)		12 (0-55)	9 (0-42)	0.576[5]
Beck Depression Inventory Score Categories	Minimal depression	11 (16.7)	55 (83.3)	-
	Mild depression	6 (28.6)	15 (71.4)	
	Moderate depression	8 (22.2)	28 (77.8)	
	Severe depression	1 (16.7)	5 (83.3)	

[1]Student's T-test, [2]Yates-corrected chi-square test, [3]Pearson chi-square test, [4]Fisher's Exact Test, [5]Mann-Whitney U test
Data are expressed as n (%), mean±SD, and median (min-max). Row percentages are given.

Table 7. Comparison of tobacco use (yes/no) according to self-reported addiction types among participants reporting any addiction (n = 202)

	Tobacco Use		p-value
	Yes, 129 (63.9)	**No, 73 (36.1)**	
Self-Reported Addiction Type			
Cigarette	127 (100.0)	0 (0.0)	**<0.001**[1]
E-cigarette	26 (100.0)	0 (0.0)	-
Alcohol	10 (62.5)	6 (37.5)	1.000[2]
Gambling	2 (40.0)	3 (60.0)	0.354[3]
Digital	28 (32.2)	59 (67.8)	**<0.001**[1]
Shopping	2 (9.5)	19 (90.5)	**<0.001** [2]

[1]Pearson's Chi-square test, [2]Yates' Corrected Chi-square Test, [3]Fisher's Exact Test.
Data are expressed as n (%). Row percentages are given.

Of the 202 participants who reported having an addiction, 63.9% used tobacco and tobacco products. All cigarette smokers (100.0%) and e-cigarette users (100.0%) defined themselves as addicted (p < 0.001). Among those with a digital addiction, however, only 32.2% used tobacco, while 67.8% did not. The rate of tobacco use among those with a shopping addiction was significantly lower (9.5%, p<0.001). No significant association was found between alcohol or gambling addiction and tobacco use (Table 7). During the analyses, no reports of drugs addiction were recorded among the participants.

Discussion

This study examined the prevalence of tobacco and e-cigarette use, as well as the associated sociodemographic determinants, addiction profiles and depression levels, among medical students. Our findings suggest that tobacco and tobacco product use remain a significant health concern for students.

In our study, the prevalence of tobacco and tobacco product use was determined as 26%, which is similar to the 28.3% reported in the Turkish Statistical Institute (TÜİK) Health Survey 2022 data

but slightly lower than the 34.8% reported in the Türkiye Household Health Survey 2023 data. This difference may be related to the fact that, in the Household Health Survey, tobacco use reached its highest levels among women aged 45–59 and men aged 30–44, whereas the participants in our study represented a younger age group (mean age 22.6 years).[3,4] Other studies investigating tobacco and tobacco product use among medical students have also generally reported lower prevalence rates compared to those observed in the general population.[20-22]

In our study, the use of tobacco and tobacco products was found to be significantly more prevalent among males. This finding is consistent with previous studies conducted on tobacco use among university students in Türkiye.[20-22] The higher rates of use among males suggest that tobacco consumption may be associated with cultural norms, gender roles, and the level of social acceptance

In our study, it was observed that more than half of tobacco users initiated use between the ages of 19 and 24. This finding is consistent with epidemiological data reporting that tobacco use most frequently begins during young adulthood.[3,4] The significantly higher prevalence of tobacco use among students with a family history of tobacco consumption underscores the importance of intrafamilial modeling in the development of nicotine dependence. Previous studies have demonstrated that parental smoking significantly increases the risk of initiation among young individuals.[23-25]

The finding that the mean BMI of tobacco users is higher than that of non-users is noteworthy when compared with some conflicting results in the literature.[26,27] Despite the appetite-suppressing effect of smoking, factors such as irregular eating habits, insufficient physical activity, and increased caffeine consumption might explain this finding. In addition, in our study, the proportion of tobacco

users consuming 5 cups or more of tea/coffee daily was significantly higher. This may also be explained by the synergistic stimulant interaction between nicotine and caffeine.[28,29]

The prevalence of e-cigarette use was 5.2% overall and 20.2% among tobacco users, which is higher than reported in some studies conducted on medical students in Türkiye.[20,30] This finding may coincide with the implementation of the 'Smoke-Free University' policy at the institution where the study was conducted, although a direct causal relationship cannot be established.[31] The most common reasons for e-cigarette use included pleasant taste, the desire to quit smoking, and not staining teeth and/or fingers. This finding indicates that the tobacco industry's e-cigarette marketing strategies, which promote the perception of being "less harmful" and "helpful for quitting smoking," are effective among university students.[32-34] However, current scientific evidence does not provide definitive proof that e-cigarettes are safe in the long term or that they ensure permanent success in smoking cessation.[35,36] Additionally, multiple studies have shown that these products are not safe; they can have serious effects on the respiratory and cardiovascular systems and may also cause harm to other organs and systems, including the liver, kidneys, and nervous system.[8,37]

E-cigarettes have been associated with widespread cases of lung injury in the United States. This condition has been defined by the Centers for Disease Control and Prevention (CDC) as "E-cigarette or Vaping Product Use-Associated Lung Injury" (EVALI). According to CDC data, as of February 18, 2020, the number of EVALI cases reached 2807, with 68 confirmed deaths reported.[38] These findings challenge the perception that e-cigarettes are "less harmful".

In our study, the significantly higher rate of chronic disease among e-cigarette users may indicate that these products are particularly chosen as an alternative to smoking by individuals with health

problems. However, the impact of e-cigarette use on the prognosis of chronic diseases remains unclear and should be investigated through long-term studies.[32,35]

It is noteworthy that all tobacco users (100%) reported being addicted. Among these individuals, the rates of cigarette and e-cigarette addiction were recorded as 98.4% and 100%, respectively. Furthermore, tobacco use appears to have a different addiction profile compared to behavioral addictions such as digital or shopping addiction. In our study, 80.8% of individuals with digital addiction did not use tobacco products (p<0.001). This inverse relationship suggests that tobacco use may be an outwardly oriented, socially driven behavior, whereas digital addiction may be more inwardly oriented, characterized by individual isolation. This distinction is consistent with numerous studies examining the individual characteristics associated with digital addiction.[39,40]

According to the Beck Depression Inventory results, although no statistically significant difference was found between tobacco users and non-users, it is noteworthy that scores were higher in the user group. Numerous studies in the literature support a bidirectional relationship between cigarette use and depression and anxiety.[20,41] Upregulation of nicotine receptors and hyper-sensitivity of receptors during withdrawal have been shown in some studies to play a role in the emergence of depressive symptoms.[42] Additionally, oxidative stress and inflammatory responses induced by tobacco products may contribute to the pathophysiology of neuropsychiatric disorders.[43] However, some studies report that no bidirectional relationship exists between tobacco use and depressive symptoms.[44] The lack of a significant difference in our study may be attributed to the limited sample size or varying impacts on students' mental health. Compared with the literature, our findings support the notion that evidence

regarding the association between tobacco use and depressive symptoms is heterogeneous. Although a statistically significant difference was not observed in our study, the potential effect of tobacco use on depressive symptoms should be considered, and future research should investigate this relationship using larger samples and diverse psychiatric measures.

Conclusion

This study highlights various dimensions of tobacco and e-cigarette use among medical students, who are future healthcare professionals, and contributes to our understanding of the multidimensional nature of this behavior. The findings of our research indicate that, in parallel with trends in the general population, the use of tobacco and tobacco products continues to be a significant public health issue within this critical group. Furthermore, tobacco and tobacco product use were found to be strongly associated with factors such as gender, family history, BMI, and lifestyle habits. The notable prevalence of e-cigarette use among tobacco users suggests that these products are attracting increasing interest among young adults.

One of the most striking findings of our study is that nearly all students who use tobacco and tobacco products (cigarettes 98.4%, e-cigarettes 100%) reported themselves as addicted. This finding is consistent with the notion that nicotine has a strong addictive potential, as reflected by participants' self-reports. This finding, which shows how difficult it is to quit tobacco use even among medical students, underscores the importance of preventive interventions aimed at deterring the initiation of tobacco use. Furthermore, the significantly higher rate of chronic disease among e-cigarette users may indicate that these products are often perceived as smoking cessation tools by individuals with health problems.

Another important finding is the differentiation among types of addiction. The observed negative association between tobacco use and digital or shopping addiction may indicate the existence of distinct addiction profiles (social/outward-oriented vs. individual/inward-oriented) and provides an important framework for future research in this area.

The use of tobacco and e-cigarettes among medical students demonstrates that this behavior is not merely an individual choice, but a multidimensional public health issue shaped by the interaction of sociodemographic characteristics, family influence, lifestyle, other types of addiction, and mental health factors. Preventing and reducing nicotine addiction linked to tobacco and tobacco product use is critically important in this student group, who will serve as role models for society as future physicians. Therefore, strengthening university-level tobacco prevention policies and considering the integration of addiction awareness into curricula may be beneficial. Implementing early intervention programs and making evidence-based treatment approaches accessible could serve as a strategic intervention to protect students' individual health while supporting public health.

Limitations

Our study has several limitations. Since the data were self-reported, there is a possibility of recall bias and social desirability bias. In addition, as the research was limited to a single medical faculty, the generalizability of the results is restricted. Furthermore, depression was assessed solely using the Beck Depression Inventory, and no clinical diagnosis was established.

Ethical approval

This study has been approved by the Gülhane Scientific Research Ethics Committee of the University of Health Sciences (approval date: 11.03.2025, number: 46418926). Written informed consent was obtained from the participants.

Author contribution

Study conception and design: AA, EK, IO, CO, HS; data collection: EK, ENO; analysis and interpretation of results: AA, ISG, HA, HS; draft manuscript preparation: AA, EK, ISG, HA, HS. The author(s) reviewed the results and approved the final version of the article.

Conflict of interest

The authors declare that there is no conflict of interest.

Etik kurul onayı

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Çalışma konsepti ve tasarımı: AA, EK, IO, CO, HS; veri toplama: EK, ENO; sonuçların analizi ve yorumlanması: AA, ISG, HA, HS; makaleyi hazırlama: AA, EK, ISG, HA, HS. Yazar(lar)

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