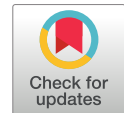


# İstanbul Journal of Pharmacy

## Original Article

## Open Access

## Awareness towards the thirdhand smoke and new- generation tobacco products in a health-science based college campus in Türkiye



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### Abstract

**Background and Aims:** Thirdhand smoke (THS), as a newly emerging environmental health concern, refers to the residual toxic chemicals left on surfaces and in dust after tobacco smoke has dissipated, posing potential health risks even in smoke-free environments. It has a major impact on public health along with new generation tobacco products (NGTP). This study aims to evaluate the smoking habits, awareness of the THS concept, and knowledge level about NGTPs of Acibadem Mehmet Ali Aydınlar University campus, a health-science-based college in Türkiye, to develop safer and sustainable campus strategies.

**Methods:** The evaluation was performed via an online survey (Google Forms) that was voluntarily applied to university students and academic staff at Acibadem Mehmet Ali Aydınlar University between March and May 2023. The questions were designed to measure lifestyle and social factors such as demographic characteristics, smoking levels, secondhand smoke (SHS) and THS awareness and knowledge about NGTPs as well as to clarify campus recognition.

**Results:** Based on the findings, 46.0% (n=177) of the participants were smokers, and 54.0% (n=208) were non-smokers. Most participants had never heard of THS (73.8%), but were aware of the possible public health hazards with a moderate Beliefs About Thirdhand Smoke (BATHS) score,  $35.97 \pm 7.38$ . Surprisingly, there was no distinct difference in the knowledge of e-cigarette content as well as the NGTP among students.

**Conclusion:** Even though passive and active smoking is well known by people, it is crucial to emphasise THS to inform people fighting against tobacco. Our results showed that there is a noticeable lack of knowledge and awareness about THS, e-cigarettes and NGTP, and further studies on these topics are needed for smoke-free campuses and stronger anti-smoking policies.

### Keywords

Thirdhand smoke • Passive smoking • Public awareness • Environmental pollution



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## INTRODUCTION

Smoking is known as the biggest preventable cause of death worldwide and in Türkiye. Along with affecting people's health, smoking produces a severe socioeconomic burden (Özcan, 2022). According to World Health Organization (WHO), at the global level, the number of individuals who use tobacco is estimated to be 1.7 billion in the next three years (WHO, 2022). In addition, The Global Burden of Disease study reported that more than 9 million people died due to indirect and direct tobacco exposure each year (Reitsma et al., 2021). Due to high tobacco production, Türkiye ranks third in daily cigarette consumption (Özcan, 2022).

In addition to the direct inhalation of cigarette smoke (CS), environmental exposure represents an important health hazard. The concepts of THS and SHS have gained importance within the scope of environmental exposure (Bilir, 2018). THS refers to the harmful chemicals in CS that remain on surfaces such as furniture, carpets, clothing, and skin after the smoke has dissipated. As previously demonstrated, in indoor spaces, nicotine does not vanish after the smoke clears; it absorbs into nearby surfaces and is later released back into the air (Matt et al., 2011). Similar to THS, SHS is a relatively older concept and means passive smoking. Studies show that SHS dissipates relatively quickly after smoking stops, but THS can remain on surfaces and in the environment for much longer periods, sometimes even days or weeks (Lioy, 2006). Unlike SHS, which is inhaled, THS can also be absorbed through oral and dermal contact (Kolci et al., 2023). Understanding the impact of THS on human health is essential for identifying its hazardous effects on target organs. Studies on THS reported that exposure to THS may lead to toxic responses on the skin (Jacob et al., 2017; Martins-Green et al., 2018; Sakamaki-Ching, et al., 2022), DNA function (Hang et al., 2013; Hang et al., 2020), respiratory system (Bahl et al., 2016; Matt et al., 2011; Pozuelos et al., 2019; Reis & Kolci, 2023; Sarker et al., 2020) and reproductive system (Liu & Chen, 2022). Furthermore, THS exposure was related to lung cancer, asthma, and thrombosis-related illnesses *in vivo* and *in vitro* (Bahl et al., 2016; Hang et al., 2013).

Despite anti-smoking laws, homes remain a stubborn battleground for SHS, and even non-smokers or those moving into a recently cleaned residence might face the insidious threat of lingering toxins. Studies reveal that CS does not simply vanish into thin air; it leaves behind a treacherous residue on surfaces, creating invisible contamination zones (Bahl et al., 2014; Bahl et al., 2016; Jacob et al., 2017; Matt et al., 2019; Matt et al., 2011; Northrup et al., 2016). One research revealed that even after a two-month vacancy and thorough cleaning, a house still harboured traces of SHS. This highlights the need for robust measures to protect non-smokers from

SHS (Singer et al., 2003). Even in non-smoking rooms, hotel guests exposed to nearby smoking areas had detectable nicotine levels in their urine, revealing the far reach of SHS. In this study, Matt et al. (2014) highlighted that partial smoking bans in hotels continue to pose a serious health risk to non-smokers, especially children and infants who are the riskiest groups (Matt et al., 2014). The most critical step in the fight against THS is informing people about its harmful effects and components (Drehmer et al., 2017; Ferrante et al., 2013). Since there is no safe level of exposure to THS and SHS, absolute avoidance remains the sole, surefire path to protecting public health (Díez-Izquierdo et al., 2018). Smokers' efforts to avoid smoke—like separate rooms, outdoor puffs, and ventilation—are ultimately ineffective and cannot protect others from the lingering toxins of THS (Drehmer et al., 2017).

Healthcare professionals' awareness of THS is crucial for public education, although smoking remains a common habit among them (Erbaycu et al., 2004). Healthcare professionals influence both society and youth, so raising awareness of smoking, starting with policies targeting healthcare professionals, is crucial. Although there are studies in our country about THS, in which health workers and university students are examined separately as samples (Salimoglu et al., 2023), there are limited studies on the awareness of THS as well as NGTP knowledge of individuals as healthcare professionals/candidates. Several studies only evaluated the awareness of THS in medical faculty students in Türkiye (Aras & Bayraktar, 2024; Akbal et al., 2023). However, these studies were conducted in a limited population, thus not representing a wide-range of healthcare professionals. Hence, in the present study, we conducted a survey based on THS awareness and NGTP knowledge in a university campus that trains professionals working in many different positions in the field of health, such as pharmacy, medicine and the faculty of health sciences.

Therefore, the present study aims to investigate the smoking habits, environmental sensitivity, awareness of THS and SHS, and knowledge about NGTPS among the students and academic staff of Acibadem Mehmet Ali Aydınlar University, which generally provides education in the field of health.

## MATERIAL AND METHODS

### Study Design and Population

The present study was conducted via an online platform (Google Forms) among university students of Acibadem Mehmet Ali Aydınlar University Campus, as well as academic staff, between March and May 2023. Participants who answered the questionnaire were included in the study, with 385 participants. Considering the recommendations of Bryman and Cramer (2004) to calculate the sample size according to the



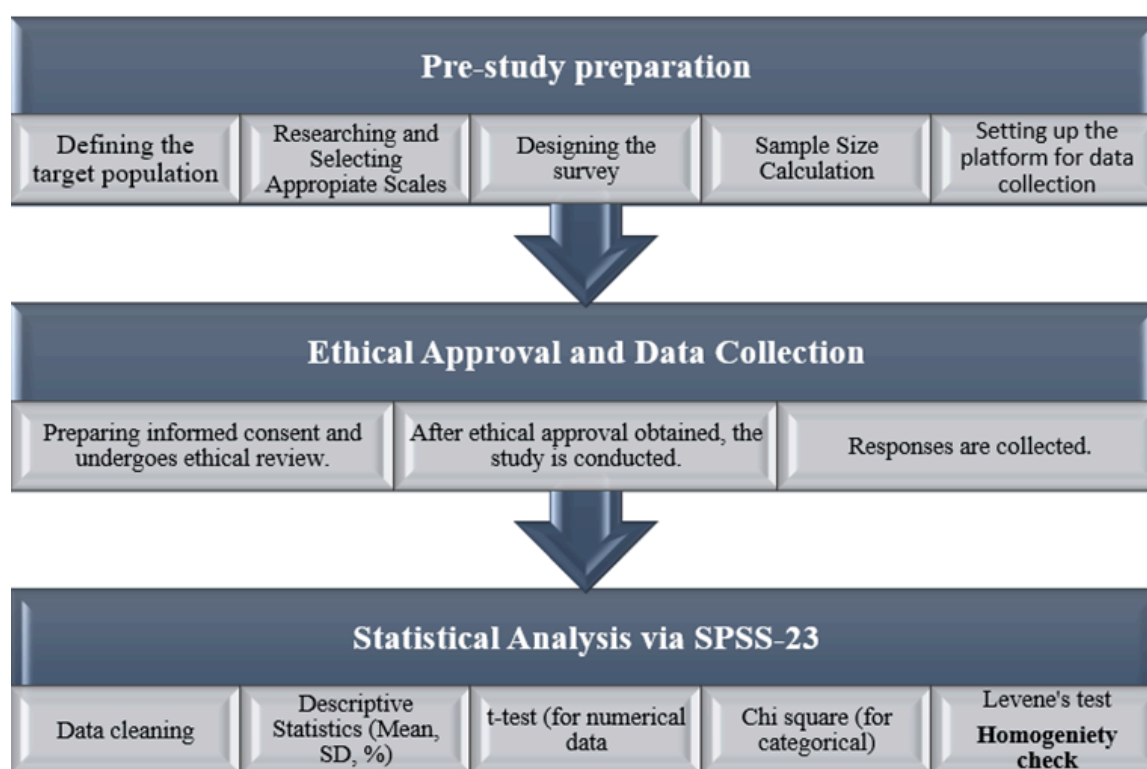


Figure 1. Flowchart of the study design

number of scale items, 385 participants who agreed to participate in the study were included (Bryman & Cramer, 2004). In addition, in cases where the population size was unknown in the survey studies, a sample size of 384 participants was used as mentioned previously (Cochran, 1977). The online platform (Google Form) was chosen for its low cost, capacity to reach several participants quickly despite the online learning setting, and eco-friendliness. Additionally, the study was conducted on campus, including a substantial portion of the campus population, consisting of students and academic staff. The statistical analysis and methodology are also presented in detail as a flowchart in Figure 1.

The study was discussed in the Acibadem Healthcare Institutions Medical Research Ethics Committee (ATADEK) meeting numbered 2023/03, and it was found to be appropriate in terms of medical ethics with the decision number 2023-03/57. This study was conducted in accordance with the Declaration of Helsinki for medical research involving human subjects. Consent was obtained from each participant in the study before starting to fill out the questionnaire.

### Study Questionnaire

In the survey study, there were 56 questions about the demographic characteristics of the students and academic staff, their smoking habits, SHS exposure and awareness towards THS, knowledge about NGTPs, and their campus satisfaction levels. The survey does not contain open-ended questions,

except for the question asking participants about their nationality information. To evaluate the awareness about THS, the BATHS scale (beliefs about THS scale) was used according to the previous method (Haardorfer et al., 2017) and its Turkish adaptation (Çadırcı et al., 2021). The scale was developed in a five-point Likert type (Strongly disagree, disagree, undecided, agree, strongly agree) and consists of 9 propositions. Participants can score a minimum of 1 point (strongly disagree) and a maximum of 5 points (strongly agree) per question. Since the scale consists of 9 questions, the total score range of the scale ranges from 9 to 45 points, and the scale is evaluated over the total score. A high score indicates that the person has a high awareness of THS. Knowledge status about NGTPs was evaluated with a Likert analysis containing 5 questions in addition to 6 nominal questions with three options (Yes, No, Not Sure). Also, the campus satisfaction evaluated with 4 Likert type questions.

### Statistical Analysis

After the survey application, the data analysis process was performed. The data obtained from the survey application were analyzed with the help of an expert for statistical analysis. The data analysis process was conducted using appropriate statistical tests and methods for interpretation. Before proceeding to the data analysis phase, data cleaning was performed to ensure that a clean dataset would be used in the subsequent stages of the analysis. In this context, the data were first checked for any incorrect or missing entries.

**Table 1.** Distribution of participants according to SHS exposure

Variable	Group	n	%
Is there anyone in your house who smokes besides you?	Yes	243	63.1
	No	128	33.2
	Not sure	14	45811
In the last week, have you been exposed to cigarette smoke at home or in the surrounding area, even if you do not smoke?	Yes	269	69.9
	No	104	27.0
	Not sure	12	45660
In the last week, approximately how many hours have you been exposed to cigarettes smoked by someone else in a closed environment?	Not exposed	77	20.0
	< 1 hour	92	45923
	1-2 hours	79	45797
	3- 5 hours	64	45824
	> 5 hours	73	19.0

n: number of participants, SHS: Secondhand smoke

Missing values were filled with the group mean. To identify potential outliers, both the z-score and the Mahalanobis distance were calculated. Based on the results of these two measures, no data points were removed from the dataset. To assess whether the dataset followed a normal distribution, the skewness and kurtosis values were examined. Skewness and kurtosis values between -2 and +2 indicate a normal distribution (Pilowsky et al.,2024). It was determined that the skewness and kurtosis values of the scales used in this study were within the normal limits. Descriptive statistics data are presented as number (n) mean, standard deviation (SD), and percentage (%). The relationship between the dependent and independent variables was examined with t-test. While interpreting the t-test, relevant fields were examined according to whether Levene's homogeneity assumption was met or not (Levene, 1960). To assess the magnitude of group differences, Cohen's d was calculated as a measure of effect size. Cohen's d values were interpreted following conventional thresholds: 0.2 as small, 0.5 as medium, and 0.8 as large effects. For the categorical variables, chi-square tests of independence were performed to examine the association between the variables. The effect sizes for chi-square analyses were quantified using Phi ( $\phi$ ) for 2x2 contingency tables and Cramér's V for larger tables. These effect sizes were interpreted based on established guidelines, with values of 0.1, 0.3, and 0.5 representing small, medium, and large effects, respectively (Cohen, 1988). Data were analyzed with the statistical program SPSS-23 (SPSS INC., Chicago, IL, USA). In our study,  $p < 0.05$  was considered statistically significant. The results are reported with corresponding effect sizes to provide a comprehensive understanding of the practical significance of the findings.

## RESULTS

### Participants' Characteristics

The evaluation was made of 385 participants comprising 213 (55.32%) females and 172 (44.68%) males. Also, 323 (83.9%) participants were students and 62 (16.1 %) were academicians. Furthermore, it is seen that most of the participants were from (17.3%, n=67) Faculty of Medicine, (39.0%, n=150) Faculty of Pharmacy (*Suppl. Table S1*). Almost all the participants were of Turkish nationality (89.1%, n=360). Also, 44.4% (n=165) of the participants took the toxicology course, while 55.6% (n=202) did not take the toxicology course. In addition, 46.0% (n=177) of the participants used to smoke, 54.0% (n=208) did not smoke, 22,1% (n=85) of the smoker participants tried to quit and 40.5% (n=156) did not try to quit smoking (*Suppl. Table S2*).

### Distribution of Participants Based on Their SHS Exposure and Their Awareness of its Risks

A striking 63.1% of participants (n=243) reported the presence of at least one smoker in their household, beyond themselves, highlighting the widespread exposure to SHS. Moreover, 69.9% (n=269) of the participants were exposed to CS at home or in the surrounding area, even if they did not smoke in the last 1 week (*Table 1*). Moreover, 97.4% (n=375) of the participants stated that they had heard of the concept of passive smoking before, whereas 2.4% (n=10) had never heard. In addition, based on the data obtained, almost half (50.4%) of the participants were entirely unfamiliar with the concept of SHS, despite the other half (49.6%) having some prior awareness (*Suppl. Table S3*).

Furthermore, according to our findings, 41.6% of the participants (n=160) experienced all of the following health problems



**Table 2.** Evaluation of whether the participants heard the concept of THS based on their demographic characteristics.

Variable	Did the participant hear THS?		Chi-square	p	Phi – Cramer's V	Approximate Significance
<b>Profession</b>	<b>Yes</b>	<b>No</b>			0.124	0.015
Student	77	246	5944	0.018*		
Academician	24	38				
<b>Gender</b>					0.049	0.337
Female	60	153	0.923	0.337		
Male	41	131				
<b>Status of taking the toxicology course</b>					0.129	0.013
Yes	54	111	6226	0.013*		
No	44	163				
<b>Smoking status</b>					0.019	0.716
Yes	48	129	0.133	0.716		
No	53	155				

Participants' awareness significantly differed based on their profession and whether they had taken a toxicology course. Statistical difference based on the status of hearing of the THS concept\*  $p < 0.05$ . THS: Thirdhand smoke

associated with exposure to SHS: sore throat, cough, watery eyes/redness, and headache (*Suppl. Table S4*).

### Distribution of Participants' Awareness Towards THS, Knowledge about NGTPs, and Their Campus Satisfaction Levels

Interestingly, the study revealed further nuances in THS awareness. The majority of participants 73.8% ( $n=284$ ) in the study had never heard of the concept of THS, highlighting a significant knowledge gap despite the growing awareness of SHS hazards. The remaining 26.2% ( $n=284$ ) acknowledged some familiarity with THS, suggesting pockets of understanding in the middle of the prevailing unfamiliarity. In addition, participants' awareness significantly differed based on their profession and whether they had taken a toxicology course ( $p < 0.05$ ) (*Table 2*). Moreover, gender and smoking status, surprisingly, did not emerge as determinants of THS awareness in this study. However, occupational and educational backgrounds played a significant role, highlighting the need for tailored educational strategies based on individual profiles.

Among participants who had heard of SHS, only a minority (42.4%,  $n=81$ ) were familiar with the concept of THS. The majority (57.6%,  $n=110$ ) remained unaware of THS, despite knowing about its related term, SHS. Moreover, the trend became even more pronounced among participants who had not heard of SHS. A smaller part 10.3% ( $n=20$ ) in this group had some knowledge of THS, while a vast majority (89.7%,  $n=174$ ) were entirely unfamiliar with both concepts (*Suppl. Table S5*).

To assess participants' awareness about THS, the method of Haardörfer and colleagues (2017), the BATHS scale, was used

with a minimum score of 9 and a maximum of 45 through nine questions in the survey (*Table 3*). The total BATHS scores of the participants in this study were found to be  $35.97 \pm 0.38$  (out of 45), which indicates moderate awareness of THS.

On the other hand, the NGTP knowledge of participants based on their "profession" or "taking the toxicology course" was also determined. The answers to the question of "e-cigarettes contain tobacco" differed statistically significantly according to their status of taking a toxicology course ( $p < 0.05$ ). Moreover, the answers given to the questions "Heated tobacco products contain nicotine", "Electronic cigarettes are only aromatic liquid vapours" and "Smoke from e-cigarettes and heated tobacco products leaves less residue in the environment than traditional cigarettes" also showed significant differences based on the toxicology course as well ( $p < 0.05$ ) (*Table 4*). Interestingly, only the responses to the question "Smoke from e-cigarettes and heated tobacco products leaves less residue in the environment than traditional cigarettes" showed statistically significant differences based on profession ( $p < 0.05$ ). Based on this, it can be concluded that both students and academic staff exhibited similar distribution based on the responses on the tobacco content of e-cigarettes (*Table 5*). The knowledge of the NGTPs was evaluated with a Likert analysis containing 5 questions. In addition, based on our findings, the NGTP knowledge of the participants was  $15.11 \pm 5.28$ , over the maximum 25 points (*Table 6*). Moreover, the smoking status had a statistically significant effect on BATHS scores ( $p < 0.05$ ) and NGTP scores ( $p < 0.05$ ), which might suggest that smokers scored lower on the BATHS scale and had lower NGTP knowledge level than non-smokers. At this stage of the





**Table 3.** Evaluation of whether the participants heard the concept of THS based on their demographic characteristics.

Statement	Strongly agree -5- (n)	Agree -4- (n)	Undecided -3- (n)	Disagree -2- (n)	Strongly disagree -1- (n)
Breathing air today in a room that was smoked yesterday can harm the health of infants and children.	173	151	39	16	7
Breathing air today in a room that was smoked yesterday can harm the health of adults.	148	154	50	25	7
Smoke particles in the room that was smoked yesterday can cause cancer.	137	129	84	25	9
Smoke particles can remain in a smoking room for days.	130	158	62	24	10
Smoke particles can remain in a smoking room for weeks.	121	119	99	29	16
Smoke particles penetrate the furniture and walls in a smoking room.	151	155	55	15	8
Smoke particles left on the skin, hair and clothes after smoking can be passed on by touching other people.	12	28	64	28	12
After touching surfaces where cigarette smoke settles, particles can enter the body through the skin.	133	127	81	34	9
Opening windows or using air conditioning does not remove all the smoke particles from a room.	153	143	51	30	7
<b>Total BATHS score:</b>	<b>35.97± 0.38</b>				

The total BATHS scores of the participants in this study were found to be 35.97± 0.38 out of 45.

BATHS: Beliefs about thirdhand smoke scale; n: Number of participants

data analysis, independent sample t-test analyses were conducted to examine whether there was a significant difference in the scores of the BATHS and NGTP according to the smoking status of the participants and whether they took the toxicology course. In this context, it was first tested whether there was a significant difference in the scores of the BATHS scale and NGTP according to the smoking status of the participants. As a result of this analysis, it was concluded that “smoking status” caused a statistically significant difference on BATHS scores [ $t(382) = -1.996$ ,  $p < 0.05$ ] and NGTP [ $t(382) = 4.374$ ,  $p < 0.05$ ] (*Suppl. Table S6*). In addition, the score of the campus satisfaction questionnaire consisting of 4 questions made with a 5-point Likert-type analysis was found to be  $11.33 \pm 3.72$ , over the maximum of 20 (*Table 7*).

Lastly, an independent sample t-test was conducted to test whether the participants took a toxicology course or not and whether it made a significant difference on the BATHS and NGTP scores. As a result of this analysis, it was determined that the status of the participants taking the toxicology course had a statistically insignificant effect on their BATHS scores [ $t(369) = .641$ ,  $p > .05$ ]. However, it was concluded that the toxicology course taking status caused a statistically significant difference in NGTP scores [ $t(369) = -2.160$ ,  $p < 0.05$ ] (*Suppl. Table S7*).

## DISCUSSION

University campuses, which consist of a young population and academicians, are spaces where individuals spend a significant portion of their daily lives. As such, raising awareness of THS exposure and the transportation of THS pollutants on campuses is crucial. While research on THS is limited both nationally and globally, studies on this topic are growing, and societal awareness is on the rise. The study is the first survey in the literature that evaluates the awareness of THS, SHS exposure, and knowledge status about NGTPs among students and academic personnel at Acibadem Mehmet Ali Aydınlar University, which primarily educates candidates in the health-care system. A 2019 study revealed that 16.0% of the 18.9 million healthcare and social assistance workers are current cigarette users (Nilan et al., 2019). Another study focusing on physicians in Türkiye found that 55.1% of smokers began smoking during their university years. This trend may be attributed to non-smokers before starting university due to the stress experienced in medical school (Baltacı et al., 2014). In this study, 46.0% ( $n=177$ ) of the 385 participants were smokers, while 54.0% ( $n=54$ ) were non-smokers. This distribution could be attributed to the fact that a significant portion of our study group comprised individuals of university age, a critical period for smoking initiation, with the most common age range for



**Table 4.** The distribution between the knowledge of NGTP and the status of taking a toxicology course.

Variable	Status of taking the toxicology course		Chi-square	p	Cumulative n (%)	Phi – Cramer's V	Approximate Significance
	Yes	No					
E-cigarettes contain tobacco							
Yes	59	84	7.93	0.019*	147 (38.2)	0.146	0.019
No	47	76			129 (33.5)		
Not sure	59	47			109 (28.3)		
E-cigarettes contain nicotine							
Yes	99	118	5.16	0.076	226 (58.7)	0.118	0.076
No	26	51			80 (20.8)		
Not sure	40	38			79 (20.5)		
Heated tobacco products contain nicotine							
Yes	95	108	13.13	0.001*	208 (54.0)	0.188	0.001
No	24	61			90 (23.4)		
Not sure	46	38			87 (22.6)		
E-cigarettes are less harmful than traditional cigarettes							
Yes	60	91	2.35	0.309	156 (40.5)	0.079	0.309
No	68	78			151 (39.2)		
Not sure	37	38			78 (20.3)		
Electronic cigarettes are only aromatic liquid vapour							
Yes	34	71	16.48	0.000*	113 (29.4)	0.210	0.000
No	76	101			180 (46.8)		
Not sure	55	35			92 (23.9)		
Smoke from e-cigarettes and heated tobacco products leaves less residue in the environment than traditional cigarettes							
Yes	70	101	0.010*	0.010*	177 (46.0)	0.158	0.010
No	37	62			103 (26.8)		
Not sure	58	44			105 (27.3)		

Statistical difference based on the status of taking the toxicology course for each question \* p<0.05

NGTP:New Generation Tobacco Products.

starting smoking being 14-25 years old (Reitsma et al., 2021). Therefore, it was revealed that the stress experienced by students contributes to their smoking habits, particularly in crowded social settings. This finding underscores the importance of implementing mandatory courses on the dangers of smoking and substance abuse, beginning in secondary education, to help curb future smoking trends among young people. Interestingly, another recent report on smoke awareness in the campus revealed that there is no statistically significant relationship with the demographic characteristics of the participants and their level of perception about smoke in the campus (Derehi et al., 2023).

The harms of smoking are not only on smokers, but passive exposure also causes problems. Some studies have shown that SHS may be more harmful than direct exposure (Bahl et al., 2014). Although people are aware of passive smoking, it

is still one of the most serious problems threatening public health today. In a study by Çadırcı et al. in 2021, 99.8% of the participants had heard of passive smoking, while only 0.2% had not. In our study, 97.4% (n=375) of the participants stated that they had heard of the concept of passive smoking, while only 2.6% (n=10) had not heard. Also, based on participants' hearing of SHS, it was seen that the rate of those who did was 49.6% (n=191) and 50.4% (n=194) of those who did not. Based on this, it was revealed that most of the participants do not know that the concepts of passive smoking and SHS are the same. It was also found that 26.2% (n=101) of the individuals in our study had heard of the concept of THS before, and 73.8% (n=284) had never heard of this concept. Similarly, in a study on health professionals, it was seen that approximately 65% of the participants had not heard of the concept of THS before (Darlow et al., 2017). Besides, a study conducted by

**Table 5.** The distribution between the knowledge of NGTP and professions.

Variable	Profession			Chi-square	p
	Student	Academician	Phi – Cramer's V    ApproximateSignificance		
E-cigarettes contain tobacco.					
Yes	118	29	0.086(0.086)	2871	0.238
No	109	20			
Not sure	96	13			
E-cigarettes contain nicotine.					
Yes	184	42	0.118 (0.118)	5378	0.068
No	66	14			
Not sure	73	6			
Heated tobacco products contain nicotine.					
Yes	171	37	0.121(0.121)	5629	0.060
No	72	18			
Not sure	80	7			
E-cigarettes are less harmful than traditional cigarettes.					
Yes	130	26	0.046(0.046)	0.798	0.671
No	125	26			
Not sure	68	10			
The electronic cigarette is only aromatic liquid vapour.					
Yes	94	19	0.117(0.117)	5266	0.072
No	145	35			
Not sure	84	8			
Smoke from e-cigarettes and heated tobacco products leaves less residue in the environment than traditional cigarettes.					
Yes	152	25	0.138(0.138)	13.13	0.26*
No	78	25			
Not sure	93	12			

Statistical difference based on the profession for each question \* p<0.05.

NGTP:New Generation Tobacco Products

**Table 6.** Distribution of the participants about NGPT knowledge.

Statement	Strongly agree -5- (n)	Agree -4- (n)	Undecided -3- (n)	Disagree -2- (n)	Strongly disagree -1- (n)
E-cigarettes and heating tobacco products are less likely to cause cancer than traditional cigarettes.	61	110	77	95	42
E-cigarettes and heated tobacco products are less addictive than traditional cigarettes.	52	103	73	109	48
Smoking a flavoured e- cigarette indoors does not bother me.	56	113	67	103	46
E-cigarettes and heated tobacco products can be used in smoking cessation treatment.	44	118	90	76	47
E-cigarettes and heated tobacco products do not harm passive smokers.	43	93	78	104	67
<b>Total NGTP score:</b>	<b>15.11 ± 5.28</b>				

NGTP knowledge of the participants was 15.11 ± 5.28, over the maximum 25 points.

NGTP: New Generation Tobacco Products, n: number of participants

Özcan (2022), 86.9% of the participants had never heard of the concept of THS (Özcan, 2022). Moreover, in a study on Turkish

physicians, 69.6% of participants had never heard THS (Çadırcı et al., 2021).





**Table 7.** Distribution of participants based on “smoke-free” campus satisfaction.

Variable	Group	n	%	Mean±SD
The number of non-smoking areas on campus and access to these areas is sufficient.	Strongly disagree	48	12.5	2.95±1.277
	Disagree	132	34.4	
	Undecided	43	11.2	
	Agree	114	29.7	
	Strongly agree	47	12.2	
I think that people obey the rules where there is a “no smoking” statement on the campus.	Strongly disagree	55	14.3	2.90±1.262
	Disagree	122	31.7	
	Undecided	55	14.3	
	Agree	112	29.1	
	Strongly agree	40	10.4	
I warn people when I see an individual smoking in areas where there is a “no smoking” statement on campus.	Strongly disagree	80	20.8	2.60±1.256
	Disagree	131	34.1	
	Undecided	73	19	
	Agree	62	16.1	
	Strongly agree	38	9.9	
The cigarette smoke in the cafeterias in the open area of the campus does not bother me, it does not affect my choice of sitting area.	Strongly disagree	81	21.1	2.89±1.388
	Disagree	92	24.0	
	Undecided	58	15.1	
	Agree	95	24.7	
	Strongly agree	58	15.1	

The participants in these surveys have a limited awareness of the concept of THS due to its relatively recent emergence and increasing popularity in recent years. It is anticipated that as research in this area expands, awareness towards THS will also increase.

In this study, the BATHS scale was used to measure the awareness of people about THS. According to our findings, this score was found to be  $35.97 \pm 7.38$ . When compared with other studies, it can be concluded that the consciousness level of the participants is moderate based on the BATHS score. In the study conducted on 6<sup>th</sup> grade medical students, the BATHS scores of the participants were higher but close to our findings. In addition, non-smokers have relatively higher BATHS scores than smokers, similar to our results (Akbal et al., 2023); In another study in the literature, the awareness of non-smoker workers about THS was higher as well (Özcan, 2022; Odacı, 2020). A similar survey conducted among medical students revealed a BATHS score nearly identical to that of our study. Although no statistically significant difference was observed in terms of smoking status, non-smokers tended to exhibit a higher level of awareness (Aras & Bayraktar, 2024). Moreover, an independent sample t-test was conducted to test whether the participants took a toxicology course or not and whether it made a significant difference in the BATHS scores. As a result of this analysis, it was determined that the status

of the participants taking the toxicology course had a statistically insignificant effect on their BATHS scores. Participants' hearing status of the concept of THS varied significantly based on whether they had taken a toxicology course. However, there was no significant difference in the BATHS scores between the groups. It showed that enhancing the content of toxicology courses at universities could be a solution. Additionally, organizing informative symposiums on THS for other health-related faculties may also be beneficial.

Moreover, it was previously reported that hearing status of the concept of THS caused a significant difference in the BATHS scores of the participants (Odacı, 2020). According to our results, the average value of the participants who stated that they knew the concept of THS was significantly higher than the average value of the participants who stated that they had not heard of THS before. Based on these findings, it can be concluded that the BATHS score of those who heard the concept of THS was higher than those who did not, but this difference was not found at a significant level.

College students seem to smoke greater than the general population. This study showed a lack of smoke-free zones on campus, making current smoking laws weak, unfortunately. The average scores for the questions on campus satisfaction indicate indecisiveness. While there was uncertainty about overall campus satisfaction, the majority reported that they

would not intervene if they saw someone smoking in a no-smoking area. Hospitals and universities need stricter policies to create smoke-free campuses with legal action for SHS. Since young adults and teenagers are generally ignoring warnings from adults like parents and teachers, it might be suggested that it is important to improve student-run groups in an active campus life to promote a smoke-free environment. These groups could use social media and videos to promote healthy living (focusing on the benefits, not just the dangers of smoking), encourage interaction between students, and create relatable role models with catchy slogans. Therefore, it might be suggested that peer influence and positive messaging to discourage smoking on campus may be a potent method to decrease smoking rates as well as smoking areas on the campus.

E-cigarettes are gaining popularity despite no health organization endorsing them as smoking cessation aids due to missing long-term data. This rise in e-cigarette use might pose a public health threat for the young generation and might lead to nicotine addiction in non-smokers and hinder smokers from quitting completely (Polat, 2021). Based on the literature findings on the knowledge of e-cigarettes, it was stated that 70.2% of the participants said that e-cigarettes contain nicotine, while only 7.5% said it does not, surprisingly. Also, 73.7% of the participants argued that e-cigarettes are not just water vapour (Karabiber, 2021). Our study was in parallel to the literature in these aspects, in which 33.5% (n=129) of the participants think that e-cigarettes do not contain tobacco. Similarly, it is seen that most of the participants (58.7%, n=226) think that e-cigarettes contain nicotine.

## CONCLUSION

Based on this study, it appears that awareness of THS remains relatively low among participants, indicating a lack of understanding. While passive smoking is a well-known concept in society, participants are unfamiliar with the synonymous term, SHS. Additionally, the use of e-cigarettes and other NGTPs is emerging as a significant issue among college students. Therefore, universities might consider adjusting their curriculum, goals, learning objectives, organization, counselling services, and social conditions to address these issues. These findings could also serve as a basis for further research on THS and e-cigarettes/NGTPs in society, particularly among the younger generation and those from diverse socioeconomic backgrounds.



**Ethical Committee Approval** Acibadem Healthcare Institutions Medical Research Ethics Committee (ATADEK) meeting numbered 2023/03, and it was found to be appropriate

in terms of medical ethics with the decision number 2023-03/57.

**Informed Consent** Informed consent was obtained from the participants.

**Peer-review** Externally peer-reviewed.

**Author Contributions** Conception/Design of Study: R.R., Y.Ş.; Data Acquisition: Y.Ş.; Data Analysis/Interpretation: Y.Ş.; Drafting Manuscript: R.R., Y.Ş.; Critical Revision of Manuscript: R.R.; Final Approval and Accountability: R.R., Y.Ş.

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