

Evaluation of Third Hand Cigarette Smoke Exposure and Awareness in University Students

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ABSTRACT

Background: Third Hand Smoke (THS) is tobacco dust that settles in the environment after smoking. It combines with other pollutants in the air and diffuses back into the air. It can enter the systemic circulation by inhalation, absorption through the skin, and ingestion of tobacco dust-contaminated objects. Exposure to THS negatively affects the health of all people, especially infants and children. The aim of the study is to reveal THS exposure and awareness in 6th grade students of Ankara Yıldırım Beyazıt University (AYBU) Faculty of Medicine and the factors associated with it.

Methods and Results: As a data collection tool, a questionnaire consisting of a Beliefs About Third Hand Smoke (BATHS-T) Scale was prepared to recognize sociodemographic data form, smoking status, tobacco control policies, smoking bans at home and in the car, attitudes towards buying / renting a house / car, and THS awareness. Using an online survey, 322 people were reached.

Conclusions: As a result of this study, it was found that the sixth grade students of the medical faculty had a good level of beliefs about third-hand smoke; It has been seen that he believes in its effect on health and its permanence in the environment. Female gender, living with family, having good or higher academic achievement, not smoking, supporting anti-tobacco policies, not living with a smoker were associated with higher BATHS-T score. In this respect, the study reached different results from the existing literature. Further studies is needed to elucidate this difference.

Keywords: Awareness, Beliefs About Third Hand Smoke (BATHS-T), Third Hand Smoke

Üniversite Öğrencilerinde Üçüncü El Sigara Dumanı Maruziyet ve Farkındalığının Değerlendirilmesi

ÖZET

Giriş: Üçüncü El Sigara Dumanı (ÜESD), sigara içildikten sonra çevreye yerleşen tütün tozudur. Havadaki diğer kirleticilerle birleşerek tekrar yayılır. Solunum yoluyla, deri yoluyla emilmeyle ve tütün tozuyla kontamine olmuş nesnelerin yutulması yoluyla sistemik dolaşıma girebilir. ÜESD 'ye maruz kalmak başta bebek ve çocuklar olmak üzere tüm insanların sağlığını olumsuz etkiler. Araştırmanın amacı Ankara Yıldırım Beyazıt Üniversitesi (AYBÜ) Tıp Fakültesi 6. sınıf öğrencilerinde ÜESD maruziyeti ve farkındalığını ve ilişkili faktörleri ortaya koymaktır.

Yöntem ve Bulgular: Veri toplama aracı olarak sosyodemografik veri formu, sigara içme durumu, tütün kontrol politikaları, ev/araba satın alma/kiralamaya yönelik tutumları evde ve arabada sigara içme yasaklarını tanımaya yönelik sorular Üçüncü El Sigara Dumanı Hakkında İnançlar (ÜESDHİ) Ölçeği'nden oluşan bir anket hazırlandı. Çevrimiçi anket kullanılarak 322 kişiye ulaşıldı.

Sonuç: Bu çalışmanın sonucunda tıp fakültesi altıncı sınıf öğrencilerinin üçüncü el sigara dumanına ilişkin inançlarının iyi düzeyde olduğu; Sağlığa etkisine ve çevrede kalıcılığına inandığı görülmüştür. Kadın cinsiyet, aileyle birlikte yaşama, akademik başarısının iyi veya yüksek olması, sigara içmeme, tütün karşıtı politikaları destekleme, sigara içen biriyle yaşamama daha yüksek ÜESDHİ puanı ile ilişkiliydi. Bu açıdan çalışmada mevcut literatürden farklı sonuçlara ulaşılmıştır. Bu farklılığın aydınlatılması için ileri çalışmalara ihtiyaç vardır.

Anahtar Kelimeler: Farkındalık, Üçüncü El Sigara İçme Hakkında İnançlar (ÜESDHİ), Üçüncü El Sigara Dumanı

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Smoking is a risk factor for the world's leading causes of death, including lung and other cancers, heart disease and respiratory diseases. Firsthand cigarette smoke; It is the smoke that the user inhales into their own lungs while breathing. It is also called active smoking or widespread smoking. Substances such as acid, alcohol, aldehyde, ketone, cyanide, and carbon monoxide, which are among the chemicals found in tobacco smoke, have a direct toxic effect and cause damage to tissues and organs (1). Secondhand cigarette smoke (SHS/passive cigarette smoke) is the smoke that comes from the burning end of a cigarette or tobacco product. It is also the smoke that smokers breathe (1). Third-hand smoke (THS) is the invisible tobacco "dust" that settles in and stays in the environment after you quit a cigarette. Thirdhand smoke contains more than 250 chemicals; these substances accumulate on the surfaces after smoking tobacco, pass into the gas phase and disperse again or combine with other pollutants in the environment to form secondary pollutants. These harmful chemicals remain on clothes, hair, carpet, furniture, curtains, toys; Covers all surfaces in the home and car. Infants and children can inhale or inhale toxins through the skin and mouth when crawling on the floor, sitting in car seats, or in the lap of adults exposed to THS. THS contributes to indoor air pollution. THS exposure may continue long after SHS occurs. It has been found that harmful particles can remain on surfaces even weeks and months after smoking. It has also been found that it is almost impossible to completely remove THS residues from surfaces with conventional cleaning methods, resulting in continued exposure to THS. In addition, dangerous carcinogens called tobacco-specific nitrosamines (TSNA) are formed when the nicotine in tobacco smoke reacts with nitrous acid (HONO), a common component of indoor air pollutant (2).

Human exposure to THS and its health, behavioral, and social-cultural consequences have not been conclusively proven. However, the existing literature reveals that THS poses a potential health hazard for non-smokers. Infants and young children are particularly susceptible to THS exposure because of their immature respiratory and immune systems. One study reported that THS accumulates in the homes of smokers and persists even after the smokers have moved and the homes have been cleaned and painted for new residents (3). Non-smokers residing in houses where smokers lived before are unintentionally exposed to.

Knowledge and beliefs about SHS are associated with smoking cessation and reduction; however, few studies have examined similar constructs for how THS and Beliefs About Third Hand Smoke (BATHS-T) Scale can influence smoking-related preventive behaviors. It has been found that awareness of the harmful effects of THS is associated with the stricter enforcement of indoor smoking bans

and the increased number of smoking cessation attempts. Based on this literature, informing the individuals trained in THS about the harms of THS will cause them to develop more accurate attitudes about having a smoke-free house and being protected from the harmful effects of THS. In the national and international literature review, it was seen that studies on THS belief generally focused on parents, and a study was conducted with family physician(4-6).

In a study by Matt et al., THS was found to be associated with high nicotine levels in the hands of non-smokers who lived in houses where cigarettes had been previously smoked, and this led to unwanted exposure (7). Quarantine precautions were implemented throughout the world during the COVID-19 pandemic. This resulted in a great increase in the time spent at home, and, therefore, greater exposure to indoor air pollutants, including the toxic substances of tobacco smoke (8). THS is found in many enclosed spaces, including homes, public buildings, rented houses and apartments and rented cars, and despite the smoking ban can affect non-smokers. Although the restrictions in public places are promising, these restrictions have made passive smoking in home environments the main source of THS (9). In a study related to the smoking ban, it was shown that young children could be less protected by these restrictions than adults (10).

In this study, it was aimed to examine the third hand smoke exposure and awareness level of sixth grade students at Ankara Yıldırım Beyazıt University (AYBU) Faculty of Medicine.

METHOD

Study Design

This cross-sectional study was conducted by Ankara Yıldırım Beyazıt University Faculty of Medicine, Department of Public Health, with sixth grade students between 20.03.2020 and 07.11.2021.

Sample

In our study, no sample calculation was made, and it was aimed to reach all the sixth grade students of the medical faculty actively continuing their education and training at Ankara Yıldırım Beyazıt University. There are a total of 630 students in Turkish-English classes in the 2020-2021 and 2021-2022 academic years. Our questionnaire is shared in student WhatsApp communication groups. Before starting the study, it is guaranteed that no personal information will be requested from the participants, that the information will be collected anonymously, that the information will be used for scientific purposes and will not be shared with third parties, and that the Declaration of Helsinki will be complied with. Informed consent was obtained from each participant. On a voluntary basis, 322 (51%) answers were obtained. Since it was planned to

include all intern physicians present at the planning stage of the study, a sample size and power calculation was not made. It is aimed to reach the whole universe. However, the Covid 19 epidemic experienced during the implementation period of the study created difficulties in reaching all students. However, we have completed our work by reaching more than half of our universe. The result of the power analysis after the study on the current number of people reached was found to be 0.90. The strength of our work is sufficient.

Ethical Issues

Approval was obtained with the decision of Ankara Yıldırım Beyazıt University ethics committee dated 14.06.2021 and numbered 76.

Measurement Tools

1. Sociodemographic Characteristics: The sociodemographic questions section consisting of 27 questions was created by the researchers using the existing literature. The sociodemographic characteristics of the participants (age, gender, monthly income, who they live with now, academic achievement), smoking status, consisting of 7 questions, their opinions about the smoking policies of the state, consisting of 4 questions (such as banning tobacco use in indoor and public places, taxation of tobacco products, increasing the price of tobacco products, prohibiting the sale of tobacco products to those under the age of 18, prohibiting the sale of tobacco products to those under the age of 18), the presence of a smoker at home, the rules of smoking at home consisting of 3 questions and the presence of a personal vehicle, and the rules of smoking in their personal vehicles consisting of 3 questions and the vehicle when purchasing/renting; There are 4 questions that question the effect of THS exposure on choices when buying/renting a house and choosing a room in a hotel (3,4,11-13).

2. Beliefs About Third Hand Smoke (BATHS-T) Scale: BATHS-T measures individuals' beliefs about third-hand smoke (14). Turkish validity and reliability study of the beliefs about third-hand smoke (BATHS-T) scale was conducted. The Cronbach's alpha value is 0.90 (15). The Cronbach's alpha value of current study is 0.95. Scale; It consists of 9 questions, 5 of which (1, 2, 3, 7 and 8) question the effects of THS on health, and 4 of them (4, 5, 6 and 9) question the persistence of THS in the environment. The answers are arranged in a 5-point likert type. Individuals choose one of the answers 1: Strongly disagree, 2: Disagree, 3: Undecided, 4: Agree, 5: Strongly agree. The average score is obtained by dividing the total score by the number of questions. A minimum of 1 and a maximum of 5 points can be obtained. The higher the score, the higher the awareness of individuals is interpreted. These tools were

and applied to the students online. These tools were uploaded to the Google search engine as a questionnaire and applied to the students online. The survey link was shared in the contact WhatsApp groups of the 6th grade students of AYBU Faculty of Medicine. Personal data of the participants, such as mobile phone numbers and e-mail, were not used.

Statistical Analyses

Data were evaluated using the IBM-SPSS (Version 22.0) program. The normal distribution of data was evaluated with the Kolmogorov-Smirnov test. Mann-Whitney U test was applied for the 2 groups that did not fit the normal distribution. Kruskal-Wallis test and pairwise comparison post hoc test were applied for more than 2 groups that did not fit the normal distribution. The statistical significance was accepted as $p < 0.05$.

RESULTS

322 (51%) people with a mean age of 24.31 ± 1.69 participated in the study. The mean BATHS-T total score of the participants was 4.12 ± 0.90 . Table 1 shows the distribution of the participants' BATHS-T scores according to their sociodemographic characteristics. 55.6% of the participants were women; 44.4% are male. The mean BATHS-T total score of female participants was 4.25 ± 0.78 , and the mean BATHS-T total score of male participants was 3.95 ± 1.02 . The mean BATHS-T total score of female participants was higher than the BATHS-T total score of male participants (MW-U=10916, $p < 0.05$). In the BATHS-T scale health impact subscale, female participants scored higher than male participants (MW-U=10529.50, $p < 0.05$). There was no statistically significant relationship between the gender variable and the BATHS-T environmental permanence subscale score (MW-U=11524.50, $p > 0.05$). 74.5% of the participants reported a monthly income of 4500 TL or more, and the difference between monthly income and BATHS-T score both in total and permanence in the environment and health impact subscale scores is not significant (M-WU=9503, $p > 0.05$; M-WU=9675.50, $p > 0.05$; M-WU=9129.50, $p > 0.05$). 47.8% of the participants live with their families, 40.7% stay in the student house and 11.5% live in the dormitory. A statistically significant difference was found between the place where the participants lived and their BATHS-T total score, BATHS-T environmental permanence subscale score, and BATHS-T health impact subscale score (KW=16.19, $p < 0.05$; KW=14.54, $p < 0.05$; KW=15.31, $p < 0.05$). 59.6% of the participants defined their academic achievement as good or above. A significant difference was found between academic achievement and BATHS-T total score (both environmental permanence and health impact subscale) (M-WU=10504.50, $p < 0.05$; M-WU=10300.50, $p < 0.05$; M-WU=10691.50, $p < 0.05$).

Table 1: Distribution of participants' BATHS-T scores according to their sociodemographic characteristics					
CHARACTERISTIC	Mean \pm standard deviation	N (%)	Scale (Total) median (min-max)	Scale (Persistence in the environment) median (min-max)	Scale (Health effect) median (min-max)
Age	24,31 \pm 1,69				
Gender	Male	179 (55,6)	4,11 (1,00-5,00)	4,00 (1,00-5,00)	4,00 (1,00-5,00)
	Female	143 (44,4)	4,44 (1,00-5,00)	4,50 (1,00-5,00)	4,40 (1,00-5,00)
P value			0,022	0,116	0,006
M-WU			10906	11524,50	10529,50
Income status	4500 and below	82 (25,5)	4,28 (1,00-5,00)	4,25 (1,00-5,00)	4,20 (1,00-5,00)
	over 4500	240 (74,5)	4,33 (1,00-5,00)	4,25 (1,00-5,00)	4,20 (1,00-5,00)
P value			0,640	0,817	0,322
M-WU			9503	9675,50	9129,50
Living together	With family	154 (47,8)	4,56 (1,00-5,00)	4,75 (1,00-5,00)	4,40 (1,00-5,00)
	Student house	131 (40,7)	4,00 (1,00-5,00)	4,00 (1,00-5,00)	4,00 (1,00-5,00)
	Dormitory	37 (11,5)	4,56 (1,00-5,00)	4,50 (1,00-5,00)	4,40 (1,00-5,00)
P value			<0,001	0,001	<0,001
KW			16,19	14,54	15,3
Academic success	Middle and below	130 (40,4)	4,11 (1,00-5,00)	4,00 (1,00-5,00)	4,00 (1,00-5,00)
	Good and above	192 (59,6)	4,44 (1,00-5,00)	4,50 (1,00-5,00)	4,40 (1,00-5,00)
P value			0,015	0,007	0,027
M-WU			10504,50	10300,50	10691,50

Table 2 shows the distribution of the participants' scores on the BATHS-T scale according to some characteristics of smoking. The smoking rate of the participants was 28.6%. While the mean BATHS-T total score of non-smokers was 4.20 ± 0.87 , the mean total score of BATHS-T of smokers was 3.92 ± 0.95 . A statistically significant difference was found between the smoking status of the participants and the BATHS-T total, BATHS-T environmental permanence subscale, and BATHS-T health impact subscale scores (M-WU=8814 $p < 0.05$; M-WU=8804 $p < 0.05$; M-WU=8709 $p < 0.05$). The majority of the participants stated that they support the ban on smoking indoors, increasing the tax on tobacco products, bans on advertising and not selling under the age of 18 within the scope of the anti-tobacco policy. 98% of the participants supported the ban on the sale of tobacco products to individuals under the age of 18. The least supported policy (51%) was to increase the tax on tobacco products. The average BATHS-T total score of those who support the law prohibiting tobacco use in closed places such as restaurants and bars and in public areas as part of the fight against tobacco; The mean BATHS-T total score of those who did not support was 4.17 ± 0.87 ; 3.69 ± 1.17 mean BATHS-T total score of the undecided; It is 3.63 ± 1.07 . Those who supported the law

prohibiting tobacco use in closed spaces such as restaurants and bars and in public spaces within the scope of combating tobacco received higher BATHS-T total and BATHS-T environmental permanence subscale scores (KW=6.32, $p < 0.050$; KW=7.50, $p < 0.050$). No statistically significant difference was found between supporting the relevant law and BATHS-T health impact subscale scores (KW=5.66, $p > 0.050$) While the average BATHS-T total score of those who support the increase in the tax (price) of tobacco products is 4.28 ± 0.90 , the BATHS-T total score of those who are undecided is 3.63 ± 1.07 ; the mean BATHS-T total score of those who did not support it was 3.97 ± 0.097 . Supporters of increasing the tax (price) of tobacco products received higher BATHS-T total, BATHS-T environmental permanence subscale, BATHS-T health impact subscale scores (KW=17.90, $p < 0.050$; KW=19.72, $p < 0.050$; KW=16.37 $p < 0.050$). While the mean BATHS-T total score of those who support the banning of tobacco products is 4.18 ± 0.87 , the mean BATHS-T total score of those who do not support it is 3.74 ± 1.67 , and the mean BATHS-T total score of those who are undecided is 3.82 ± 0.87 . Those who supported banning the advertising of tobacco products had higher BATHS-T total and BATHS-T environmental persistence subscale scores (KW=7.72, $p < 0.05$; KW=9.57, $p < 0.05$). However, no statistically significant difference

was found between supporting the prohibition of advertising of tobacco products and BATHS-T health effect subscale scores (KW=5.86, $p>0.05$). While the mean BATHS-T total score of those who support the ban on the sale of tobacco products to those under the age of 18 in the fight against tobacco is 4.12 ± 0.89 , the mean BATHS-T total score of those who do not support it is 2.81 ± 1.57 ; the mean BATHS-T total score of the undecided was 5.00 ± 0.00 . Those who supported the ban on the sale of tobacco products to those under the age of 18 in the fight against tobacco received higher BATHS-T total and BATHS-T health impact subscale scores (KW=7.16, $p<0.05$; KW=7.65, $p<0.05$). However, no statistically significant difference was found between supporting the prohibition of selling tobacco products to those under the age of 18 and BATHS-T (permanence in the environment subscale) scores (KW=5.31 $p>0.05$).

Table 3 shows the distribution of the participants' scores on the BATHS-T scale according to some characteristics of smoking at home. 34.5% of the participants stated that they had a smoker at home other than themselves. The mean BATHS-T total score was 3.95 ± 0.94 in the group who responded that there was someone outside of the house who smoked; The mean BATHS-T total score was 4.20 ± 0.88 in the group who answered that there was no smoker at home. Participants who answered that they smoked outside the home had statistically lower BATHS-T total, BATHS-T environmental permanence subscale, and BATHS-T health impact subscale scores (KW=7.33, $p<0.05$; KW=6.53, $p<0.05$; KW=7.69, $p<0.05$).

Table 2: Distribution of participants' BATHS-T scores according to some characteristics of smoking					
CHARACTERISTIC		N (%)	Scale (Total) median (min-max)	Scale (Persistence in the environment) median (min-max)	Scale (Health effect) median (min-max)
Smoking status	Smoke	230 (71,4)	4,44 (1,00-5,00)	4,50 (1,00-5,00)	4,40 (1,00-5,00)
	Don't smoke	92 (28,6)	4,00 (1,00-5,00)	4,00 (1,00-5,00)	4,00 (1,00-5,00)
P value			0,018	0,016	0,012
M-WU			8814	8804	8704
In the fight against tobacco, do you support the law that prohibits the use of tobacco in indoor and public spaces such as restaurants and bars?	Yes	290 (90,1)	4,33 (1,00-5,00)	0,25 (1,00-5,00)	4,40 (1,00-5,00)
	No	22 (6,8)	3,83 (1,22-5,00)	3,88 (1,00-5,00)	4,00 (1,20-5,00)
	Don't know	10 (3,1)	3,33 (1,67-5,00)	3,25 (1,75-5,00)	3,50 (1,60-5,00)
P value			0,042	0,023	0,059
KW			6,32	7,50	5,66
Do you support increasing the tax (price) of tobacco products in the fight against tobacco?	Yes	165 (51,2)	4,56 (1,00-5,00)	4,75 (1,00-5,00)	4,60 (1,00-5,00)
	No	108 (33,5)	4,11 (1,00-5,00)	4,00 (1,00-5,00)	4,00 (1,00-5,00)
	Don't know	49 (15,2)	3,89 (2,00-5,00)	3,75 (2,00-5,00)	3,80 (2,00-5,00)
P value			<0,001	<0,001	<0,001
KW			17,90	19,72	16,37
Do you support banning the advertising of tobacco products in the fight against tobacco?	Yes	273 (84,8)	4,33 (1,00-5,00)	4,50 (1,00-5,00)	4,40 (1,00-5,00)
	No	30 (9,3)	3,72 (1,00-5,00)	4,00 (2,00-5,00)	3,80 (1,00-5,00)
	Don't know	19 (5,9)	4,00 (2,00-5,00)	34,00 (2,00-5,00)	4,00(2,00-5,00)
P value			0,021	0,008	0,053
KW			7,72	9,57	5,86
Do you support the ban on the sale of tobacco products to persons under the age of 18 in the fight against tobacco?	Yes	317 (98,4)	4,33 (1,00-5,00)	4,25 (1,00-4,00)	4,25 (1,00-5,00)
	No	3 (0,9)	3,66 (1,00-3,78)	3,75 (1,00-4,00)	3,60 (1,00-3,60)
	Don't know	2 (0,6)	5,00 (5,00-5,00)	5,00 (5,00-5,00)	5,00 (5,00-5,00)
P value			0,028	0,070	0,022
KW			7,16	5,31	7,65

Table 3: Distribution of participants' BATHS-T scores according to some characteristics of smoking at home					
CHARACTERISTIC		N (%)	Scale (Total) median (min-max)	Scale (Persistence in the environment) median (min-max)	Scale (Health effect) median (min-max)
Does anyone (other than you) smoke in your home?	Yes	111 (34,5)	4,00(1,00-5,00)	4,00 (1,00-5,00)	4,00 (1,00-5,00)
	No	211 (65,5)	4,44(1,00-5,00)	4,50 (1,00-5,00)	4,40 (1,00-5,00)
P value			0,007	0,011	0,006
M-WU			9578,50	9727,50	9541,50
Are there rules regarding smoking in your home?	No, smoking is allowed anywhere in the house.	17 (5,3)	4,00 (1,67-5,00)	4,00 (1,75-5,00)	4,00 (1,60-5,00)
	Yes, smoking is allowed in some rooms/sometimes.	81 (25,2)	4,00 (1,00-5,00)	4,00 (1,00-5,00)	4,00 (1,00-5,00)
	Yes, smoking is prohibited inside the house.	224 (69,6)	4,44 (1,00-5,00)	4,50 (1,00-5,00)	4,40 (1,00-5,00)
P value			0,108	0,093	0,075
KW			4,44	4,75	5,19
Do guests at your home ask permission to smoke?	None	34 (10,6)	4,44 (1,33-5,00)	4,63 (1,50-5,00)	4,40 (1,20-5,00)
	Sometimes	111 (34,5)	4,11 (1,11-5,00)	4,25 (1,00-5,00)	4,20 (1,20-5,00)
	Generally	78 (24,2)	4,00 (1,00-5,00)	4,00 (1,00-5,00)	4,00 (1,00-5,00)
	Always	99 (30,7)	4,67 (1,00-5,00)	4,75 (1,00-5,00)	4,60 (1,00-5,00)
P value			0,027	0,010	0,090
KW			9,16	11,41	6,48
Would you warn the guest who smokes without permission?	None	60 (18,6)	4,11 (1,00-5,00)	4,00 (1,00-5,00)	4,00 (1,00-5,00)
	Sometimes	72 (22,4)	4,11 (1,11-5,00)	4,00 (1,00-5,00)	4,10 (1,20-5,00)
	Generally	69 (21,4)	4,33 (1,00-5,00)	4,00 (1,00-5,00)	4,20 (1,00-5,00)
	Always	121 (37,6)	4,44 (1,00-5,00)	4,50 (1,00-5,00)	4,40 (1,00-5,00)
P value			0,320	0,198	0,418
KW			3,50	4,66	2,83

69.6% of the participants stated that smoking is prohibited inside the house. The mean BATHS-T total score of those who stated that smoking was prohibited at home was 4.20 ± 0.84 , those who stated that smoking could be allowed in some rooms/sometimes was 3.97 ± 1.02 , and those who stated that smoking could be anywhere in the house was BATHS-T. T total score is 3.73 ± 1.11 . There was no statistically significant difference between the participants' mean BATHS-T total, BATHS-T environmental permanence subscale, BATHS-T health impact subscale scores according to the variable of smoking rules at home (KW=4.44, $p > 0.05$; KW=4.75, $p > 0.05$; KW=5.19, $p > 0.05$).

"Do your guests who come to the house ask permission to smoke?" 10.6% of the participants never; 34.5% sometimes; 24.2% generally; 30.72% always gave the answer.

The mean BATHS-T total score of the always responders was 4.31 ± 0.78 ; the mean BATHS-T total score of those who responded generally was 3.94 ± 0.93 ; the mean BATHS-T total score of sometimes responders was 4.07 ± 0.95 ; The mean BATHS-T total score of those who gave no response was 4.13 ± 1.01 . While it was determined that the mean BATHS-T total and persistence in the environment sub-domain score of the always responders were higher than the participants who responded generally, sometimes or never (KW=9.16, $p < 0.05$; KW=11.41, $p < 0.05$); it was determined that the mean scores obtained from the health effect sub-domain of the scale did not differ between the groups (KW=6.48, $p > 0.05$). "Would you warn the guest who smokes without permission?" 18.6% of the participants never; 22.4% sometimes; 21.4% generally; 37.6% always gave the answer. The mean BATHS-T total score of the

always responders was 4.21 ± 0.90 ; the mean BATHS-T total score of those who responded generally was 4.07 ± 0.97 ; the mean BATHS-T total score of sometimes responders was 4.14 ± 0.81 ; The mean BATHS-T total score of those who gave no response was 3.98 ± 0.96 . There is no statistically significant difference between the participants' mean BATHS-T total, BATHS-T environmental persistence subscale, BATHS-T health impact subscale scores according to the variable of warning the unauthorized smoker (KW=3.50, $p > 0.05$; KW=4.66, $p > 0.05$; KW=2.83, $p > 0.05$).

Table 4 shows the distribution of the participants' BATHS-T scores according to some characteristics of smoking in their personal vehicles. 74.7% of the participants stated that there is a smoking ban in their personal vehicle.

The mean BATHS-T total score of those who stated that smoking was prohibited in the vehicle was 4.20 ± 0.88 ; The BATHS-T total score of those who stated that smoking could be smoked in the vehicle at some times was 4.11 ± 0.76 ; The BATHS-T total score of those who stated that smoking could always be in the vehicle was 3.72 ± 1.15 .

There was no statistically significant difference between the participants' mean BATHS-T total, BATHS-T environmental permanence subscale, BATHS-T health impact subscale scores according to the variable of smoking rules in the vehicle (KW=4.26, $p > 0.05$; KW=4.65, $p > 0.05$; KW=4.97, $p > 0.05$).

"Do the people you take in your car ask for permission to smoke?" 18.8% of the participants never; 13.5% sometimes; 21.8% generally; 45.9% always gave the answer. The mean BATHS-T total score of the always responders was 4.24 ± 0.78 ; the mean BATHS-T total score of those who responded generally was 3.97 ± 1.10 ; the mean BATHS-T total score of sometimes responders was 4.10 ± 0.86 ; The mean BATHS-T total score of those who gave no response was 4.11 ± 0.96 . There is no statistically significant difference between the participants' mean BATHS-T total, BATHS-T environmental permanence subscale, BATHS-T health effect subscale scores according to the variable of asking for permission to smoke (KW=1.46, $p > 0.05$; KW=0.70, $p > 0.05$; KW=1.92, $p > 0.05$).

Table 4: Distribution of participants' BATHS-T scores according to some characteristics of smoking in their personal cars

CHARACTERISTIC		N* (%)	Scale (Total) median (min-max)	Scale (Persistence in the environment) median (min-max)	Scale (Health effect) median (min-max)
Are there rules regarding smoking in your home?	No, smoking is always allowed inside the car.	23(10)	3,67 (1,33-5,00)	3,75 (1,50-5,00)	3,80 (1,20-5,00)
	Yes, only some times smoking is allowed.	35(15,3)	4,11 (2,44-5,00)	4,00 (2,75-5,00)	4,00 (2,20-5,00)
	Yes, smoking is prohibited inside the car.	171(74,7)	4,44 (1,00-5,00)	4,50 (1,00-00)	4,40 (1,00-5,00)
P value			0,118	0,098	0,083
KW			4,26	4,65	4,97
Do people you take in your car ask for permission to smoke?	None	43(18,8)	4,22 (1,78-5,00)	4,50 (1,75-5,00)	4,20 (1,40-5,00)
	Sometimes	31(13,5)	4,22 (1,67-5,00)	4,25 (1,75-5,00)	4,00 (1,60-5,00)
	Generally	50(21,8)	4,17 (1,22-5,00)	4,25 (1,00-5,00)	4,00 (1,20-5,00)
	Always	105(45,9)	4,33 (1,00-5,00)	4,25 (1,00-5,00)	4,40 (1,00-5,00)
P value			0,689	0,871	0,588
KW			1,46	0,70	1,92
Do you warn anyone who smokes in your car without permission?	None	19(8,30)	3,89 (2,00-5,00)	4,00 (2,00-5,00)	3,80 (2,00-5,00)
	Sometimes	32(14,00)	3,94 (1,33-5,00)	4,00 (1,50-5,00)	4,00 (1,20-5,00)
	Generally	29(12,70)	4,11 (1,89-5,00)	4,00 (2,00-5,00)	4,00 (1,80-5,00)
	Always	149(65,00)	4,44 (1,00-5,00)	4,50 (1,00-5,00)	4,40 (1,00-5,00)
P value			0,164	0,138	0,177
KW			5,10	5,50	4,93

*93 people who do not have a car are excluded from the analysis in this table.

“Would you warn anyone who smokes in your vehicle without permission?” 8.3% of the participants never; 14% sometimes; 12% usually; 65% always gave the answer. The mean BATHS-T total score of the always responders was 4.22 ± 0.89 ; the mean BATHS-T total score of those who responded generally was 4.13 ± 0.77 ; the mean BATHS-T total score of sometimes responders was 3.88 ± 1.02 ; The mean BATHS-T total score of those who gave no response was 3.90 ± 0.93 . There is no statistically significant difference between the participants' mean BATHS-T total, BATHS-T environmental permanence subscale, and BATHS-T health impact subscale scores according to the variable of warning an unauthorized smoker in the vehicle (KW=5.10, $p<0.05$; KW=5.50, $p<0.05$; KW=4.93, $p<0.05$).

Table 5 shows the distribution of the participants' scores on the BATHS-T scale according to some characteristics of some purchasing/renting behaviors. “Does smoking in the car before while buying or renting a vehicle create a negative belief in you?” 16.5% of the participants never; 24.8% sometimes; 24.2% generally; 34.5% always gave the answer.

The mean BATHS-T total score of the always responders was 4.29 ± 0.81 ; the mean BATHS-T total score of those who responded generally was 4.16 ± 0.87 ; the mean BATHS-T total score of sometimes responders was 4.06 ± 0.95 ; The mean BATHS-T total score of those who gave no response was 3.78 ± 1.01 . It was found that the mean BATHS-T total and environmental persistence sub-domain and health impact sub-domain scores of the always responders were higher than the participants who responded generally, sometimes, or never (KW=10.97, $p<0.05$; KW=1.93, $p<0.05$; KW=10.60, $p<0.05$).

“While choosing a room at the hotel, does the presence of smoking affect your choice negatively?” 21.4% of the participants never; 26.7% sometimes; 22.7% generally; 29.52% of them always gave the answer. The mean BATHS-T total score of the always responders was 4.46 ± 0.69 ; the mean BATHS-T total score of those who responded generally was 4.00 ± 1.01 ; the mean BATHS-T total score of sometimes responders was 3.95 ± 0.92 ; The mean BATHS-T total score of those who gave no response was 3.99 ± 0.94 .

Table 5: Distribution of participants' BATHS-T scores according to some characteristics of some purchasing/renting behaviors

CHARACTERISTIC		N (%)	Scale (Total) median (min-max)	Scale (Persistence in the environment) median (min-max)	Scale (Health effect) median (min-max)
Does smoking in the car before while buying or renting a car create a negative belief in you?	None	53(16,5)	4,00 (1,00-5,00)	4,00 (1,00-5,00)	4,00 (1,00-5,00)
	Sometimes	80(24,8)	4,17 (1,00-5,00)	4,00 (1,00-5,00)	4,20 (1,00-5,00)
	Generally	78(24,2)	4,33 (1,00-5,00)	4,25 (1,00-5,00)	4,30 (1,00-5,00)
	Always	111(34,5)	4,66 (1,00-5,00)	4,75 (1,00-5,00)	4,40 (1,00-5,00)
P value			0,012	0,012	0,014
KW			10,97	10,93	10,60
When choosing a room in the hotel, does the previous smoking affect your choice negatively?	None	69(21,4)	4,11 (1,00-5,00)	4,00 (1,00-5,00)	4,00 (1,00-5,00)
	Sometimes	86(26,7)	4,00 (1,00-5,00)	4,00 (1,00-5,00)	4,00 (1,00-5,00)
	Generally	73(22,7)	4,22 (1,00-5,00)	4,25 (1,00-5,00)	4,20 (1,00-5,00)
	Always	94(29,2)	4,78 (2,00-5,00)	5,00 (2,00-5,00)	4,70 (2,00-5,00)
P value			<0,001	<0,001	<0,001
KW			22,02	18,67	23,11
Does the previous use of cigarettes affect your choice while renting or buying a house?	None	119(37)	4,11 (1,00-5,00)	4,00 (1,00-5,00)	4,00 (1,00-5,00)
	Sometimes	86(26,7)	4,06 (1,00-5,00)	4,00 (1,00-5,00)	4,00 (1,00-5,00)
	Generally	58(18)	4,33 (1,00-5,00)	4,25 (1,00-5,00)	4,40 (1,00-5,00)
	Always	59(18,3)	4,89 (2,00-5,00)	5,00 (2,00-5,00)	5,00 (2,00-5,00)
P value			<0,001	<0,001	<0,001
KW			27,62	25,59	26,15

It was found that the mean BATHS-T total and environmental persistence sub-domain and health impact sub-domain scores of the always responders were higher than the participants who responded generally, sometimes, and never (KW=22.02, $p<0.05$; KW=18.67, $p<0.05$; KW=23.11, $p<0.05$).

Does the previous use of cigarettes affect your choice while renting or buying a house? 37% of the participants never; 26.7% sometimes; 18% usually; 18.3% always gave the answer. The mean BATHS-T total score of the always responders was 4.61 ± 0.56 ; the mean BATHS-T total score of those who responded generally was 4.05 ± 1.00 ; the mean BATHS-T total score of sometimes responders was 3.95 ± 0.96 ; The mean BATHS-T total score of those who gave no response was 4.03 ± 0.89 . It was found that the mean BATHS-T total and environmental persistence sub-domain and health impact sub-domain scores of the always responders were higher than the participants who responded generally, sometimes, and never (KW=27.62, $p<0.05$; KW=25.59, $p<0.05$; KW=26.15, $p<0.05$).

DISCUSSION

As a result of this study, it was found that the sixth grade students of the medical faculty had a good level of beliefs about third-hand smoke; It has been seen that he believes in its effect on health and its permanence in the environment. Female gender, living with family, having good or higher academic achievement were associated with higher BATHS-T scores.

In our study, female participants were found to be more successful than men in the total score of the belief scale about THS according to gender. While the scores of female participants in the health effect sub-dimension of the scale were higher than that of male participants, no difference was found in the scores obtained in the sub-dimension of permanence in the environment. In a study in our country in which family physicians' beliefs about THS were evaluated with the BATHS-T scale, it was found that female family physicians had higher beliefs about THS than their male colleagues, both according to the whole scale and in terms of health and permanence (6). Although no significant relationship was found between THS knowledge level and gender in patients, it was associated with attitude and behavior (5). Xie et al. revealed that women are more likely to believe that THS affects the health of their children (16). In addition, in previous studies, male gender was associated with a lower probability of believing that THS is harmful (9, 10, 17), lower intention

to quit smoking (18), and a lower perceived probability of developing lung cancer (19).

In our study, no statistically significant relationship was found between income status and BATHS-T score. Our finding is consistent with the existing literature (7,14). In the study, the BATHS-T total score of the participants living with their families and living in the student dormitory was found to be statistically higher than the participants living in the student dormitory. It was found that the 6th grade students of medical school, who defined their academic achievement as good and above, had higher BATHS-T scores. In the study by Haardörfer et al., it was found that more educated people had higher scores on the permanence of THS. However, in the same study, it was shown that the effect of THS on health and the total score of the scale of beliefs about THS did not differ according to the education level of the participants (14). 28.6% of the participants stated that they smoke. According to a study conducted at the same faculty, 14.3% of 6th grade students smoke (20). The prevalence of smoking among medical school students in our country is 15.1-36.6% (21).

In this study, the BATHS-T scale total score of non-smokers was found to be higher than that of non-smokers. Non-smoker participants scored higher in both the health impact and environmental permanence sub-dimensions of the scale. A previous study with family physicians revealed that non-smokers' beliefs about THS were higher than those who smoked, both in terms of the whole scale and in terms of health and permanence (6). In another study, current smokers and former smokers were found to be less likely to perceive the negative effects of smoking than those who have never smoked (22). Within the scope of the tobacco control framework agreement, 6 basic policies, abbreviated as MPOWER, were established to reduce the demand for tobacco products. The majority of the participants stated that they support the ban on smoking indoors, increasing the tax on tobacco products, bans on advertising, and not selling under the age of 18 within the scope of the anti-tobacco policy. Participants mostly supported the ban on the sale of tobacco products to individuals under the age of 18. The least supported policy was to increase the tax on tobacco products. More research is needed to reveal the reasons for this.

Considering the distribution of the participants' scores from the BATHS scale according to some characteristics of smoking at home; It was found that the awareness of third-hand smoke was lower in the participants who stated that there was someone else smoking at home than those who did not smoke at home.

In our study, it is noteworthy that there is no significant difference in the beliefs of the families who apply a strict smoking ban in their homes and cars towards THS compared to the others. In only one study, no statistically significant difference was found in the percentage of no smoking rules at home among participants who knew THS before compared to those who did not (23). Previous studies have shown that there is a statistically significant relationship between parents who believe that THS has an impact on their children's health and a smoking ban at home (24).

Existing studies have proven that belief in the health effects of THS has a statistically significant relationship with smoking ban at home(11). The scale scores of the parents who applied a complete smoking ban at home and in the car were found to be significantly higher than the others (4). Additionally, in one intervention study, belief in third-hand smoke harm was associated with having a strictly enforced smoke-free home and car policy. Parents with harmful beliefs about third-hand smoke were more likely to seek help to quit smoking. Parents who changed their third-hand smoking beliefs in favor of believing that third-hand smoke is harmful were found to be more likely to make at least one quit attempt (25). In our study, the participants stated that while renting a car and house, while choosing a hotel room, the possibility of smoking in these places would adversely affect their choices. In the literature, THS deposits have been found in previously smoking rental houses (3), cars and hotel rooms (13).

Our study is the only study in Turkey in which THS exposure and awareness was measured in medical school students. In this respect, young doctors' awareness of the long-term effects of smoking, which is known to have negative effects on health, will enrich the content of preventive medicine practices. There are also some limitations of our study. The study sample was applied only to sixth grade students of a university medical school, and does not represent all university students. The collection of data by online survey method may have caused information bias. THS exposure was assessed by the presence of tobacco use rules at home and in the vehicle. Therefore, the distinction between THS and THS exposure is weak. The content of the questionnaire focused on the use of cigarettes as a tobacco product, and the use of electronic cigarettes, cigars, pipes and hookahs was not questioned.

CONCLUSION

This study showed that THS awareness is high in sixth year students of AYBU Faculty of Medicine. It is important to determine the awareness of THS in the whole population and, if necessary, to increase it in terms of understanding the harms of smoking and making the decision to quit. The subject is especially important for young adults. It is not as important as first and second hand cigarette exposure. It is important to evaluate the long-term consequences of the health effects of this issue in additional studies with larger samples.

DECLARATIONS

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None.

Conflicts of Interest/Competing Interests

None.

Ethics Committee Approval

Our study was approved by the Local Ethics Committee of Ankara Yıldırım Beyazıt University Rectorate Medical Research Ethics Committee (board decision dated 14.06.2021 and numbered 76).

Availability of Data

Available upon request.

Authors' Contributions

Emine AKBAL, Egemen ÜNAL, Mehmet Enes GÖKLER, Salih MOLLAHALİLOĞLU conducted this study and wrote the article.

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