

Predictors of Beliefs About Thirdhand Tobacco Smoke Among Adult Individuals

Yetişkin Bireylerin Üçüncü El Tütün Dumanına Yönelik İnanışları ve Etkileyen Faktörler

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ABSTRACT

Objective: This study aimed to determine the predictors of the beliefs about thirdhand tobacco smoke among adult individuals.

Materials and Methods: This was a cross-sectional study. The study sample consisted of community-dwelling adult individuals living in Türkiye (n=835). The data were collected via a questionnaire and the Beliefs about Thirdhand Smoke Scale between June 10th-July 31st, 2021. The data were analyzed via IBM SPSS v.25.0. Descriptive statistics, student t-test, Mann-Whitney U, One-way ANOVA, and multiple linear regression analysis were used to present the data. The statistical significance level was accepted as p<0.05.

Results: The mean age was 29.10±9.76, 74.9% were women, 64.8% were homeowners, and 85.3% had not heard about thirdhand smoke before. The total mean score of the Beliefs about Thirdhand Smoke Scale was 4.30±0.64. The total mean score of the Beliefs about Thirdhand Smoke Scale was higher in women, those who were rural residents, who had pre-knowledge about thirdhand smoke, who were non-smokers, who preferred not to be in a smoking-allowed-place, and those who entirely banned smoking in their homes (R²= 0.079, F=7.064, p<0.001).

Conclusions: Beliefs about thirdhand smoke among adult individuals were strong. The results of this study will contribute to the studies to be conducted to increase the motivation of community-dwelling adult individuals to quit smoking. Experimental studies should be performed to increase the knowledge and awareness of adults by determining their beliefs about thirdhand smoke.

Keywords: Community-based participatory research, environmental smoke pollution, passive smoking, primary care nursing, Tobacco smoke pollution

ÖZ

Amaç: Bu araştırma yetişkin bireylerin üçüncü el tütün dumanına yönelik inanışlarını ve etkileyen faktörleri belirlemek amacıyla yapıldı.

Materyal ve Metot: Kesitsel tipteki araştırmanın örnekleme, Türkiye’de toplumda yaşayan yetişkin bireylerden oluşturuldu (n=835). Veriler, 10 Haziran-31 Temmuz 2021 tarihleri arasında anket formu ve Üçüncü El Dumana Yönelik İnançlar Ölçeği kullanılarak toplandı. Veriler, IBM SPSS v.25.0 programında tanımlayıcı istatistikler, karşılaştırmalı analizler ve çoklu doğrusal regresyon analizi kullanılarak test edildi. İstatistiksel anlamlılık düzeyi p<0,05 kabul edildi.

Bulgular: Katılımcıların yaş ortalaması 29,10±9,76 olup, %74,9’unun kadın, %64,8’inin ev sahibi ve %85,3’ünün üçüncü el duman kavramını daha önce duymadıkları belirlendi. Üçüncü El Dumana Yönelik İnançlar Ölçeği’nin toplam puan ortalamasının 4,30±0,64 olduğu bulundu. Kadınların, kırsal bölgede yaşayanların, üçüncü el duman kavramını daha önce duyanların, sigara içmeyenlerin, sigara içilmesine izin verilen yerlerde bulunmayı tercih etmeyenlerin ve evlerinde sigara içilmesi tamamen yasak olan yetişkin bireylerin Üçüncü El Dumana Yönelik İnançlar Ölçeği’nin toplam puan ortalamasının daha yüksek olduğu belirlendi (R²= 0,079; F=7,064; p<0,001).

Sonuç: Yetişkin bireylerin üçüncü el dumana ilişkin inanç düzeylerinin yüksek olduğu belirlendi. Çalışma sonuçlarının, toplumda yaşayan yetişkin bireylerin sigarayı bırakma motivasyonunu artırmak için yapılacak çalışmalara katkıda bulunacağı düşünülmektedir. Yetişkinlerin üçüncü el dumana ilişkin inançlarının belirlenerek bilgi ve farkındalıklarının artırmaya yönelik deneysel çalışmaların yapılması önerilir.

Anahtar Kelimeler: Birinci basamak hemşirelik hizmetleri, çevresel tütün dumanı kirliliği, edilgen sigara içimi, sigara dumanı kirliliği, toplum tabanlı katılımcı araştırma

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INTRODUCTION

The tobacco smoking epidemic, as one of the preventable risk factors of non-communicable diseases, is globally declared as a health threat. WHO accepts adult smoking as an indicator worldwide.^{1,2} The current global adult smoking prevalence is reported as 22.3%.¹ In the USA, smoking prevalence among adult individuals is stated as 23%.³ In the WHO European Region, the rates vary between 12%-39.8%.³ Moreover, changes in the daily routine with the COVID-19 pandemic, such as lockdowns and working at home, caused an increase in the smoking prevalence among the adult populations.⁴ Therefore, smoking has currently become an important global issue not only for individuals but also for environmental health.²

Exposure to environmental tobacco smoke, whether directly (secondhand smoke) and/or exposure to the residue of the particles in the cigarette smoke (thirdhand smoke), is as harmful to health as active smoking.⁵⁻⁶ The environmental tobacco smoke has caused approximately 600.000 premature deaths/year worldwide.⁷ Thirdhand smoke is defined as the remaining tobacco smoke and the residues of its chemicals absorbed by indoor surfaces, dust, and even the human's skin and hair after smoking indoors.⁸ It was determined that the risk of thirdhand smoke exposure continued to increase over time, though the passive smoke was removed in a smoking environment.⁹ However, the awareness of thirdhand smoke among parents was found to be not at the intended level.¹⁰ Women and children are known as the most fragile populations regarding the health effects of thirdhand smoke.¹⁰⁻¹¹ The health beliefs of individuals are one of the remarkable motivational sources for promoting health.¹² Therefore, it is thought to be important to increase community awareness by determining the beliefs about thirdhand smoke specifically among the adult individuals.¹³

The thirdhand smoke concept is relatively new to community health, and there is scarce evidence about it. Most of the evidence aimed to determine the beliefs about thirdhand smoke, especially among parents. In those studies, there was a general lack of knowledge about the concept of thirdhand smoke; the awareness about the issue was low, and thirdhand smoke was believed to be harmful to health.^{11,14,15} In a current study, a social media campaign to raise public awareness about thirdhand smoke was effective in knowledge and attitude among adult individuals but not in their behaviors about the issue.¹⁶

This study aimed to determine the predictors of the beliefs about thirdhand tobacco smoke among adult individuals.

MATERIALS AND METHODS

Ethics committee approval: Ethical approval was obtained from the University's Ethics Board before collecting the data (Approval number: 2021-55/ Date: 09.06.2021). This study followed the principles of the Declaration of Helsinki. Written informed consent was obtained from the individuals who agreed to participate in the study at the beginning of the online form.

Study design: This study adopted a cross-sectional design. The answers to the following questions were sought:

- What is the level of beliefs about thirdhand smoke among adult individuals?
- What are the predictors of beliefs about thirdhand smoke among adult individuals?

Participants: The study population consisted of community-dwelling adult individuals living in Türkiye. The sample size was calculated via G*Power 3.1.9.4 with $\alpha=0.01$, $1-\beta=95\%$, and $d=0.306$ as a minimum of 676 adults.¹¹ It was planned to include at least 20% more of the calculated sample size to prevent data loss ($n=811$). The inclusion criteria were a) having technical opportunities and the ability to fill in the online forms, b) being ≥ 18 years old, and c) participating in the research voluntarily.

Instruments: The data were collected via a questionnaire and the Beliefs about Thirdhand Smoke Scale.

The questionnaire was prepared by researchers based on the relevant literature.^{11,13,17} It consisted of 20 questions to determine the sociodemographic features, including age, sex, graduation, marital status, employment, income, place of residence, home ownership, and smoking habits of the adult individuals.

The Beliefs about Thirdhand Smoke Scale (BATHS) was developed by Haardörfer et al. to determine the beliefs about thirdhand smoke, understand their relations to smoking behavior, and define the harmful effects on health.¹⁸ Turkish validity and reliability study was conducted by Çadirci et al. as BATHS-T.¹⁹ BATHS-T is a five-point Likert-type scale (1=totally disagree-5=totally agree) with nine items and two subscales ("impact on health" and "persistence in the environment"). The total score was calculated as the arithmetic means of the sum of the scores obtained per item. The Cronbach alpha of the original form for the whole scale was 0.91 and 0.88 for each subscale.¹⁸ The Cronbach alpha of the BATHS-T was found to be 0.90 and 0.93 for the subscales.¹⁹ The Cronbach alpha was 0.85 for the total of the scale and 0.75 for each of the subscales in this study.

Data collection: The data were collected between

June 10 and July 31, 2021. Instruments were prepared using Google Forms online and sent to the individuals through various social media platforms and e-mail. The sample was constituted using a convenience sampling method through the voluntary adult individuals who shared the survey link on online platforms. The online survey was designed to reach the questions after gathering the participants' written informed consent.

Statistical analysis: The data were analyzed via IBM SPSS 25.0 (Armonk, NY: IBM Corp.). The normal distribution of the data was assessed via the Skewness-Kurtosis (± 2) values.²⁰ Descriptive statistics, student t-test, Mann-Whitney U, and One-way ANOVA were used to present the data. The predictors of thirdhand smoke beliefs were determined via multiple linear regression analysis with the “enter model”. The multicollinearity and normality of the data were analyzed before performing the regression analysis. The statistical significance level was accepted as $p < 0.05$.

RESULTS

This study was completed with 835 voluntary adult individuals who were reached between the pre-determined data collection dates ($n=835$). The mean age was 29.10 ± 9.76 , and 74.9% were women. Of the adult individuals, 64.8% were homeowners, and 85.3% had not heard about thirdhand smoke before (Table 1). In the comparison analysis, the total mean scores of BATHS-T of the women, those who were married, who lived in rural areas, and those who had pre-knowledge about thirdhand smoke were significantly higher ($p < 0.05$) (Table 1).

The total mean score of the BATHS-T was 4.30 ± 0.64 , 4.33 ± 0.60 for the impact on health subscale, and 4.25 ± 0.76 for the persistence in the environment subscale (Table 2).

Characteristics of cigarette smoking habits and their relationship to the mean score of BATHS-T of the adults are depicted in Table 2. Of the adult individuals, 28.7% were smokers, 20.8% preferred to be in smoking-allowed places, 64.3% had a partial home smoking ban, and 39.8% had a partial private car

Table 1. Sociodemographic characteristics and their associations with the BATHS-T ($n=835$).

Sociodemographic characteristics		n (%)	The BATHS-T		
			Mean±SD	test	p
Age [Mean±SD] 29.10±9.76					
Sex	Women	625 (74.9)	4.34±0.63	t=3.040	0.002
	Men	210 (25.1)	4.18±0.68		
Graduation	Secondary school	61 (7.3)	4.39±0.64	F=1.196	0.303
	High school	311 (37.2)	4.26±0.67		
	University and above	463 (55.4)	4.31±0.63		
Marital status	Married	310 (37.1)	4.37±0.61	t=2.369	0.018
	Single	525 (62.9)	4.26±0.66		
Having kids	Yes	556 (66.6)	4.35±0.63	t=-1.495	0.136
	No	279 (33.4)	4.28±0.65		
Employment	Employed	389 (46.6)	4.32±0.61	t=0.974	0.330
	Not employed	446 (53.4)	4.28±0.67		
Income	Less than expense	276 (33.1)	4.31±0.67	F=0.539	0.584
	Equal to expense	403 (48.3)	4.28±0.65		
	More than expense	156 (18.7)	4.34±0.58		
Place of residence	Urban	556 (66.6)	4.25±0.65	t=-2.908	0.004
	Rural	279 (33.4)	4.39±0.62		
Homeownership	Owner	541 (64.8)	4.29±0.64	t=-0.296	0.768
	Resident	294 (35.2)	4.31±0.64		
Pre-knowledge about the thirdhand smoke	Yes	123 (14.7)	4.41±0.56	t=2.087	0.037
	No	712 (85.3)	4.28±0.66		

t: independent sample's t-test; F: One-way ANOVA.

smoking ban (Table 2). In the comparison analysis, the total mean scores of BATHS-T of the non-smokers, those who did not prefer to be in a smoking-allowed place, who did not live with another smoker, who entirely banned smoking in the home and their private cars, and those whose daily smoked cigarette consumption was unchanged, were significantly higher ($p<0.05$) (Table 2).

The variables significant in the comparison analysis were included in the multiple regression analysis

(Table 3), and they were found to explain 7.9% of the variance for the BATHS-T ($R^2=0.079$, $F= 7.064$, $p<0.001$). The mean score of the BATHS-T was higher in women ($\beta=0.079$), those who were rural residents ($\beta=-0.078$), who had pre-knowledge about thirdhand smoke ($\beta=0.068$), who were non-smokers ($\beta=-0.092$), those who preferred not to be in a smoking-allowed place ($\beta=0.005$), and those who entirely banned to smoke in their homes ($\beta=-0.089$) (Table 3).

Table 2. Characteristics of smoking habits and their associations with the BATHS-T (n=835).

Scale and subscales	Mean±SD	Min-Max
Total BATHS-T	4.30±0.64	2.67-5
Impact on health subscale	4.33±0.66	2.20-5
Persistence in the environment subscale	4.25±0.76	2-5

Characteristics of the smoking habit	n (%)	Mean±SD	The BATHS-T		
			test	p	
Cigarette smoking status	Smoker	240 (28.7)	4.11±0.71	t=-0.412	<0.001
	Non-smoker	595 (71.3)	4.39±0.60		
Preference to be in a smoking-allowed place	Yes	174 (20.8)	4.05±0.73	t=-5.910	<0.001
	No	661 (79.2)	4.37±0.60		
Smoking around the children at home	Yes	18 (2.2)	4.06±0.75	Z=-1.328	0.184
	No	817 (97.8)	4.30±0.64		
Living with another smoker	Yes	494 (59.2)	4.26±0.66	t=2.003	0.046
	No	341 (40.8)	4.37±0.62		
Allowing to smoke around children at home	Yes	17 (2.0)	4.09±0.67	Z=-1.492	0.136
	No	818 (98.0)	4.30±0.64		
Home smoking ban	Full ban	278 (33.3)	4.43±0.58	F=8.579	<0.001
	Partial ban	537 (64.3)	4.23±0.67		
	No ban	20 (2.4)	4.30±0.50		
Private car smoking ban (n=455)	Full ban	259 (56.9)	4.40±0.59	F=8.911	<0.001
	Partial ban	181 (39.8)	4.15±0.65		
	No ban	15 (3.3)	4.10±0.73		
The number of daily smoked cigarettes after having COVID-19 (n=227)	Unchanged	12 (5.3)	3.62±0.83	Z=-2.945	0.003
	Decreased	215 (94.7)	4.34±0.62		

t=independent sample's t-test; F=One-way ANOVA; Z=Mann-Whitney-U test.

Table 3. The predictors of the thirdhand smoke beliefs among adult individuals.

Independent variable	Unstandardized coefficients B	Standardized coefficients SE	β	t	p	95% CI	
						Lower Bound	Upper Bound
Age	0.003	0.003	0.047	1.092	0.275	-0.002	0.009
Sex (ref: Men)							
Women	0.118	0.052	0.079	2.273	0.023	0.016	0.220
Marital status (ref: Married)							
Single	-0.098	0.057	-0.073	-1.721	0.086	-0.210	0.014
Place of residence (ref: Rural)							
Urban	-0.107	0.049	-0.078	-2.178	0.030	-0.203	-0.011
Pre-knowledge about thirdhand smoke (ref: No)							
Yes	0.125	0.062	0.068	2.021	0.044	0.004	0.246
Smoking status (ref: Non-smoker)							
Smoker	-0.132	0.066	-0.092	-1.996	0.046	-0.262	-0.002
Preference to be in a smoking-allowed place (ref: No)							
Yes	-0.194	0.068	-0.121	-2.845	0.005	-0.327	-0.060
Living with another smoker (ref: No)							
Yes	0.074	0.054	0.056	1.365	0.173	-0.032	0.180
Home smoking ban (ref: Full ban)							
Partial ban	-0.121	0.051	-0.089	-2.356	0.019	-0.221	-0.020
No ban	0.068	0.153	0.016	0.446	0.656	-0.232	0.368

Constant; Durbin-Watson= 1.877; F= 7.064, $p<0.001$, R= 0.281, $R^2= 0.079$, Adjusted $R^2= 0.068$, CI=confidence interval; SE=standard error; β=standardized regression coefficient.

DISCUSSION AND CONCLUSION

The predictors of the beliefs about thirdhand tobacco smoke among adult individuals were determined in the present research. The beliefs about thirdhand smoke levels of adult individuals were found to be strong in this study. This finding is supported by the literatures.^{11,15} The daily cigarette consumption among adults is known to increase in the lockdown among the general population during COVID-19.^{4,13,21} This has inevitably caused a more significant risk regarding environmental tobacco smoke exposure.²² Therefore, proactive determination of adult individuals' beliefs about thirdhand smoke is considered crucial to ensure the continuity of interventions regarding the smoke-free home initiative in public health emergencies like pandemics.^{16,22}

In the regression analysis, the "preference to be in a smoking-allowed place" variable, which was one of the significant predictors of thirdhand smoke beliefs, was first in order of importance. The total mean score of the BATHS-T of the adults who prefer to be in the smoking-allowed places was found to be lower than that of those who did not prefer in this study. The second variable in order of importance was "smoking status." The total mean score of the smokers' BATHS-T was lower than that of the non-smokers in the present study. Considering that smokers are more likely to prefer to be in smoking-allowed places, a lower level of beliefs about thirdhand smoke among them is an expected result. However, in a study conducted in China, there was no significant difference between smokers and non-smokers regarding their beliefs about thirdhand smoke scale total mean scores.¹¹ Although smokers and non-smokers accept the harmful effects of thirdhand smoke, COVID-19 may have affected the awareness and belief that cigarette smoke is detrimental to health on any occasion, especially among non-smokers.

In order of importance, the third variable was the "home smoking ban." The total mean score of the BATHS-T of the adults who entirely banned smoking at home was higher than those who partially banned in this study. Accordingly, the beliefs about thirdhand smoke among parents who had strict home smoking bans were found to be significantly more potent in a Kuwait-based study.¹⁵ Additionally, approximately one out of every two adults who had strict rules about smoking in their private cars were found to have higher beliefs about thirdhand smoke in this study. In a study conducted in China, less than half of parents with private cars were found to have a specific policy of a private car smoking ban.²³ Indoor smoking is known to adversely affect especially the health of children and non-smokers.^{11,24} Although smoking has been banned in most indoor public places and workplaces in line

with Article 8 in the WHO Framework Convention on Tobacco Control in Türkiye since 2009, home smoking is not firmly framed by Turkish laws.²⁵ Therefore, political regulations to strengthen the beliefs about thirdhand smoke among adults will provide more health-friendly living environments for vulnerable groups, even during pandemic emergencies.

The fourth variable in order of importance was "sex." The total mean score of the BATHS-T was higher in women in this study. In the literature, women's beliefs about thirdhand smoke were also found to be stronger than men's.^{11,15,26} Considering that smoking directly affects the beliefs about thirdhand smoke, the smoking prevalence is known to be much higher in men than in women globally, and factors including pregnancy and motherhood roles of women,²⁷⁻²⁹ they are expected to have stronger beliefs about the issue.

"Place of residence" was the fifth variable in order of importance. The total mean score of the BATHS-T was found to be lower in the urban adult residents than in the rural residents. No study has been found in the literature comparing the relationship between the beliefs about thirdhand smoke among adults during the COVID-19 pandemic and the place of residence. The stringent implementation of stay-at-home restrictions in urban areas may have negatively affected the beliefs about thirdhand smoke among adult individuals by causing them to smoke in their home environments compulsorily.

The sixth variable in order of importance was "pre-knowledge about the thirdhand smoke." Approximately eight out of every 10 adults in this study had not heard about the thirdhand smoke issue before, and their total mean score of the BATHS-T was found to be lower. A study determined that six out of 10 adults living in California had not heard about thirdhand smoke before.¹⁶ In a systematic review conducted before the COVID-19 pandemic, knowledge of the general population about thirdhand smoke and its hazardous impacts on health was not at the intended level. Moreover, the health effects of thirdhand smoke were defined to be poorly understood.¹⁷ Increasing the knowledge level of adults about thirdhand smoke is stated to affect their attitude toward smoking.¹⁶ Therefore, raising the general health literacy level of adult individuals is crucial to increasing their knowledge about the effects of thirdhand smoke on health and the environment.³⁰ Accordingly, empowering knowledge and increasing awareness at the community level will encourage adult individuals not to smoke in indoor places, including homes, even in compulsory situations like lockdowns in prospected pandemics.

This is one of the leading studies in the literature determining the beliefs about thirdhand smoke and

the predictors among community-dwelling adult individuals during the COVID-19 pandemic, to the best of our knowledge. However, because of its cross-sectional design, the results only reflected the data collection situation. Additionally, the online data collection based on self-reports of the individuals may have affected the quality of the obtained data. The low rate of explained variance in the regression model may stem from the variables that were not included in the constructed model. This may indicate that the excluded variables could also predict the total mean score of the BATHS-T. Future studies could run more comprehensive regression models to uncover the predictive effects of additional variables.

In conclusion, the beliefs about thirdhand smoke among adult individuals were found to be strong in this study. Sex, place of residence, pre-knowledge about thirdhand smoke, smoking status, preference to be in a smoking-allowed place, and home smoking ban were the significant determinants of the adults' beliefs about thirdhand smoke. Raising public awareness about thirdhand smoke can motivate individuals to change their behavior and promote their health by reducing the potential health hazards related to thirdhand smoke. The results of this study will contribute to the studies to be conducted to increase the motivation of community-dwelling adult individuals to quit smoking. In this context, interventional studies are recommended to be performed to increase knowledge and awareness of adult individuals via determining the beliefs about thirdhand smoke in the general population.

Ethics Committee Approval: This study was approved by the Ufuk University Ethics Committee (Approval number: 2021-55/Date: 09.06.2021). This study followed the principles of the Declaration of Helsinki. Written informed consent was obtained from the individuals who agreed to participate in the study at the beginning of the online form.

Conflict of Interest: No conflict of interest was declared by the authors.

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