

Thirdhand Smoke Beliefs of Parents

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Main Points

- Most parents do not know the concept of THS.
- Parents' beliefs about THS could play an important role in creating smoke-free homes and smoke-free cars.
- Parents who smoke are less likely to believe in the THS impact on health and its persistence in the environment.

Abstract

Parents are responsible for protecting their children from the harmful effects of thirdhand smoke (THS). The purpose of this descriptive study was to examine parents' beliefs about third-hand smoke. Data were collected using the "Introductory Information Form" and the "Turkish Version of the Beliefs About Third-Hand Smoke Scale." The sample consisted of 895 parents living in Ankara. Data were analyzed using Mann – Whitney *U* and Kruskal – Wallis-*H* tests. Eighty-two percent of the participants did not know the concept of THS. The mean scale score of the participants was 4.01 ± 0.82 . Scale score means were higher for participants who banned smoking in their homes and cars ($p < .05$). The results show that most parents do not know the concept of THS. Parents' awareness should be increased to protect children from THS exposure.

Keywords: Parents, smoke, smoke-free policy

Introduction

While smoking leads to the loss of lives of millions every year, passive exposure to cigarette smoke is also associated with illnesses and deaths (Tobacco Atlas, 2022). On the one hand, it is true that there is no safe level of exposure to cigarette smoke and, on the other hand, evidence that exposure does not end when the smoke goes out and that the effect continues even in the absence of cigarettes is increasing day by day (U.S. Department of Health and Human Services, 2014). After the cigarette is extinguished and the second-hand smoke disperses, thirdhand smoke (THS) is formed when the smoke residues permeate the surfaces and mix with the air again.

Since THS cannot be completely eliminated by ventilation or wiping and can remain on surfaces for weeks, individuals can be exposed to THS through inhalation, swallowing, and the skin (Becquemin

et al., 2010). Thirdhand smoke particles can accumulate on hands, clothes, hair, carpets, curtains, surfaces, toys, and even the hair and fur of pets (Ferrante et al., 2013). It has also been proven that residual nicotine on surfaces can react with nitrous acid in the environment to form carcinogenic substances that are not found in freshly emitted cigarette smoke (Sleiman et al., 2010). Evidence shows that THS exposure can damage human cells and DNA and is associated with short- and long-term health problems such as asthma and cancer (Hang et al., 2013; 2018).

Although the long-term effects of THS exposure are not yet fully known, it can pose a serious health threat to children at the beginning of their lives. Along with physiological factors such as children's high respiratory rate, underdeveloped immune systems, and low metabolic capacity, the fact that they spend most of their time at home and are in frequent

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Received: October 24, 2023

Revision Requested:

January 21, 2024

Last Revision Received:

February 16, 2024

Accepted: August 13, 2024

Publication Date: March 15, 2025



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Cite this article as: Odacı, N., & Kitiş, Y. (2025). Thirdhand smoke beliefs of parents. *Addicta: The Turkish Journal on Addictions*, 12(1), 20-26.

contact with surfaces, and are vulnerable increases the risk of THS exposure (Ferrante et al., 2013; Hang et al., 2018; Díez-Izquierdo et al., 2018). Parents' beliefs about THS gain importance so that they can protect their children from this exposure and support them. In previous studies conducted with parents, it was found that parents' beliefs about THS exposure were associated with smoking ban practices in their homes and cars and smoking cessation attempts (Drehmer et al., 2014; Shehab and Ziyab, 2021; Xie et al., 2021). Accordingly, it is important to identify parents' THS beliefs. No study has been found in Türkiye that reveals parents' THS beliefs. Therefore, our study aimed to detect parents' beliefs about thirdhand smoke and related factors.

Material and Methods

This study was conducted descriptively.

Sample

One primary school was randomly selected from the list of primary schools in three districts of Ankara, which were chosen considering the difference in socioeconomic status among the central districts. Parents of a total of 2800 students studying in three selected primary schools formed the sample of the research. One of the parents was asked to respond to the surveys sent to the family through the students. The research was completed with 895 parents who responded to the surveys (Table 1).

Measures

"Introductory Information Form" and "Turkish Version of the Beliefs About Thirdhand Smoke Scale" were used to collect the data for the study.

Introductory Information Form

It was created by the researcher, using the literature, in order to question the descriptive characteristics of the parents participating in the study and their knowledge about environmental cigarette smoke. In this form, which consists of a total of 20 questions, introductory characteristics such as the parents' age, gender, marital status, education status, employment status, perceived income level, homeownership status, how many children they have, and the age groups of their children were asked. In addition, individuals' smoking status, smokers' thoughts about quitting smoking, the number of people smoking in their homes, and their knowledge of the concept of thirdhand smoke were questioned.

Turkish Version of the Beliefs About Thirdhand Smoke Scale

To measure the participants' beliefs about thirdhand smoke, the scale called "Beliefs About Thirdhand Smoke Scale (BATHS)" developed by Haardörfer et al. in 2017 was used (Haardörfer et al., 2017). The Turkish validity and reliability study of the scale was conducted (Odacı and Kitiş, 2021). The scale consists of 9 items in total. It consists of two factors: "THS Persistence in the Environment" and "THS Impact on Health". Cronbach's alpha value of the scale is 0.83. In the scale scoring using a five-point Likert, it is scored as 5: totally agree, 4: agree, 3: not sure, 2: disagree, 1: totally disagree. The score is obtained by dividing the total score by the number of items. The highest score on the scale is 5 and the lowest score is 1. As the score from the scale approaches 5, it is interpreted as the individual believing in the effects of THS on the environment and health, and as it

approaches 1, it means that the individual does not believe in the effects of THS on the environment and health.

Collection of Research Data

The research was conducted between December and February of the 2019 – 2020 academic year. In cooperation with teachers at schools, informed consent forms and surveys were sent to parents through students. Parents returned the completed survey form through the student. One single parent from each family participated in the research.

The study was approved by the Gazi University Ethics Commission (Date: April 5, 2019; no. 2019-055) and permission from the Ministry of National Education was obtained for the study. The study was executed in accordance with the Declaration of Helsinki.

Statistical Methods

Data were analyzed with the IBM SPSS Statistics 17 (SPSS Inc.; Chicago, IL, USA) package program. Frequency tables and descriptive statistics were used to interpret descriptive findings. The distribution property of the data set was evaluated by means of Kolmogorov – Smirnov and Shapiro – Wilk tests. Since it was determined that the data did not comply with normal distribution, non-parametric Mann – Whitney *U* and Kruskal – Wallis-*H* tests were employed. If a significant difference was detected between the groups in the Kruskal – Wallis-*H* test, Post-Hoc (Multiple Comparison) tests were used to determine which groups caused the difference. The relationship between variables was evaluated with the Pearson correlation coefficient. Statistical significance was accepted as $p < .05$.

Results

The average age of the parents participating in the research is 38, with 72.5% of them being mothers and most of them (95.3%) being married. Most of the participating mothers and fathers have a high school education or higher. More than half of the parents (59.9%) had a middle-income level. Parents with two children were in the majority (Table 1).

Among the parents who participated in the study 30.7% were smokers. Among parents who were current smokers, 41.5% smoked an average of 5 – 10 cigarettes per day. Almost 70% of parents reported that they planned to quit smoking now or in the future. More than half of the participants (53.5%) had at least one smoker at home. While 14.2% of parents reported that their children had been exposed to cigarette smoke at home in the last 2 weeks. In addition, 23% of parents reported that their child had been exposed to cigarette smoke outside the home in the last 2 weeks. More than half of parents (57.8%) reported that a strict smoking ban in their homes. Additionally, 75.8% of the car-owning parents stated that there was no smoking in their cars (Table 2). It was observed that most of the parents (82.3%) did not know the concept of THS. When the scale scores were examined, it was seen that the parents had a very good level of belief in THS (4.01 ± 0.82) and THS impact on health (4.24 ± 0.84), and a good level of belief in the THS persistence in the environment (3.83 ± 0.88) (Table 3).

When the relationship between descriptive information and scale scores was examined, it was observed that the scores received from the scale differed according to the educational background of the parents. It was determined that parents with undergraduate or

graduate degrees had higher scale total score ($p = .011$), “Effect of THS on Health” sub-dimension ($p = .005$), and “Persistence of THS in the Environment” sub-dimension ($p = .002$) than others (Table 3).

The total score of the beliefs scale on THS ($p = .001$), the “Effect of THS on Health” sub-dimension ($p = .015$), and the “Persistence of THS in the Environment” sub-dimension ($p = .001$) scores of smoking parents were lower than those of non-smoking parents or parents who quit smoking. It was found that the “Effect of THS on Health” subscale scores of parents who were considering quitting smoking were higher than those of parents who were not considering quitting ($p = .049$) (Table 3).

Table 1.
Introductory Characteristics of the Parents Participating in the Research

	Number	%
Age		
$\bar{x} = 38.05 \pm 5.96$ min-max=25 – 61		
Gender		
Female/Mother	649	72.5
Male/Father	246	27.5
Marital status		
Single	42	4.7
Married	853	95.3
Education status		
Illiterate	3	0.3
Did not finish school	2	0.2
Primary school graduate	72	8
Secondary school graduate	117	13.1
High school graduate	288	32.2
University graduate	360	40.2
With master’s degree/PhD degree	53	5.9
Employment status		
Employed	494	55.2
Not working	358	40
Retired	25	2.8
Unemployed	18	2
Perceived income status		
Income less than expenses	191	21.3
Income equals expenses	536	59.9
Income exceeds expenses	168	18.8
Number of children		
1	172	19.2
2	506	56.5
3	167	18.7
4 or more	50	5.6
Smoking status		
Smoking	275	30.7
Quit smoking	142	15.9
Never smoked	478	53.4

The scale total score ($p = .006$), “Effect of THS on Health” sub-dimension ($p = .009$), and “Persistence of THS in the Environment” sub-dimension ($p = .027$) scores of parents who did not allow smoking at home were seen to be higher than others. Similarly, it was observed that parents who did not allow smoking in their cars had higher scale total scores ($p = .001$) and both subscale scores than others ($p = .001$; $p = .001$). In addition, it was found that the scale total score ($p = .000$), “Effect of THS on Health” sub-dimension ($p = .001$), and “Persistence of THS in the Environment” sub-dimension ($p = .001$) scores of parents who knew the concept of THS were higher than those who did not know (Table 3).

Discussion

Children’s exposure to cigarette smoke is closely related to parental smoking. It was observed that three out of every ten

Table 2.
Characteristics of the Parents Participating in the Study Regarding Cigarette Smoke Exposure at Home

Characteristics	Number	%
Number of people smoking at home		
No body	416	46.5
1 person	328	36.6
2 people	146	16.3
3 people or more	5	0.6
Has anyone smoked at home near the child in the last 2 weeks?		
Yes	127	14.2
No	750	83.8
Do not know	18	2
Has anyone smoked near the child outside the home in the last 2 weeks?		
Yes	206	23
No	584	65.3
Do not know	105	11.7
Are there rules against smoking in your home?		
Strict rules*	517	57.8
Partial rules**	349	39
No rule	18	2
Do not know	11	1.2
Are there rules about smoking in your car?***		
Strict rules	533	75.8
Partial rules	146	20.8
No rule	7	1
Do not know	17	2.4

Note: *Smoking is prohibited in all parts of the house.

**Smoking is prohibited in certain parts of the house.

***78.5% of the participants have a car.

Table 3.
Relationship between BATHS Total and Sub-Dimension Mean Scores and Some Variables

	BATHS total					THS Impact on Health					THS Persistence in the Environment				
	n	Mean	SD	Min	Max	n	Mean	DS	Min	Max	n	Mean	SD	Min	Max
Education Status	77	4.07	1.05	1-5	77	3.62	1.01	1-5	77	3.82	.96	1-5	77	3.82	.96
Primary school graduate															
Secondary school graduate	117	4.04	1.03	1-5	117	3.66	.98	1-5	117	3.83	.95	1-5	117	3.83	.95
High school graduate	288	4.18	.89	1-5	288	3.76	.92	1-5	288	3.95	.86	1-5	288	3.95	.86
University graduate	360	4.37	.69	1-5	360	3.96	.80	1-5	360	4.14	.71	1-5	360	4.14	.71
With Master's/PhD degree	53	4.40	.63	3-5	53	4.03	.78	2-5	53	4.19	.67	2-5	53	4.19	.67
Kruskal Wallis χ^2 ; p; difference		13.042; p = .011*				14.97; p = .005*	Difference: 1-4;2-4;3-5				16.551; p = .002*	Difference: 1-4;2-4;3-5			
Smoking status	275	3.90	.78	1-5	275	4.16	.82	1-5	275	3.70	.85	1-5	275	3.70	.85
Current user															
Ex-user	142	4.06	.74	1-5	142	4.29	.81	1-5	142	3.87	.77	1-5	142	3.87	.77
Life-time nonuser	478	4.07	.86	1-5	478	4.28	.87	1-5	478	3.90	.94	1-5	478	3.90	.94
Kruskal Wallis χ^2 ; p; difference		13.589; p = .001*	*;Difference: 1-2; 1-3			8.255; p = .015**;	Difference: 1-2; 1-3			13.385; p = .001*	Difference: 1-2; 1-3				
Current or future smoking cessation	184	3.96	.76	1-5	184	4.22	.81	1-5	184	3.77	.82	1-5	184	3.77	.82
Consider quitting															
Do not consider quitting	16	3.51	1.00	1-5	16	3.69	1.09	1-5	16	3.38	1.03	1-5	16	3.38	1.03
Undecided	75	3.83	.76	2-5	75	4.12	.75	2-5	75	3.60	.86	1.80-5	75	3.60	.86
Kruskal Wallis χ^2 ; p; difference		5.388; p = .42*	Difference: 1-2			5.219; p = .049;	Difference: 1-2			4.078; p = .13					
Smoking rules at home	517	4.08	.80	1-5	517	4.31	.83	1-5	517	3.90	.87	1-5	517	3.90	.87
Strict rules															
Partial rules	349	3.94	.84	1-5	349	4.17	.87	1-5	349	3.75	.90	1-5	349	3.75	.90
No rule	18	3.80	.74	2,33-5	18	4.13	.67	2,50-5	18	3.54	.95	1,60-5	18	3.54	.95
Do not know	11	3.71	1.04	1,78-5	11	3.82	.96	1,75-5	11	3.62	1.16	1,80-5	11	3.62	1.16
Kruskal Wallis χ^2 ; p; difference		12.464; p = .006**;	Difference: 1-2; 1-3; 1-4			11.502; p = .009**;	Difference: 1-2; 1-3; 1-4			9.216; p = .027**;	Difference: 1-2; 1-3				
Smoking rules in the car	533	4.12	.77	1-5	533	4.33	.78	1-5	533	3.95	.83	1-5	533	3.95	.83
Strict rules															
Smoking is sometimes allowed in the car	70	3.92	.76	1,89-5	70	4.16	.78	1-5	70	3.72	.84	1,80-5	70	3.72	.84
Smoking is allowed if the windows are open	76	3.82	.66	2,22-5	76	4.15	.68	1,75-5	76	3.55	.79	1,80-5	76	3.55	.79
No rule	7	3.13	1.69	1-5	7	3.25	1.75	1-5	7	3.03	1.71	1-5	7	3.03	1.71
Do not know	17	3.63	1.07	1-5	17	3.82	1.16	1-5	17	3.47	1.06	1-5	17	3.47	1.06
Kruskal Wallis χ^2 ; p; difference		24.538; p = .001*	Difference: 1-3; 1-4; 1-5			17.343; p = .001*	Difference: 1-4; 2-4; 3-4; 5-4			24.538; p = .001*	Difference: 1-3; 1-4; 1-5				
Knowing the THS Concept before	158	4.30	.61	2-5	158	4.48	.58	2-5	158	4.16	.70	2-5	158	4.16	.70
Yes															
No	737	3.95	.85	1-5	737	4.19	.88	1-5	737	3.76	.91	1-5	737	3.76	.91
Mann - Whitney U test Z value ;p		-4.736; p = .000*				-3.59; p = .001*				-5.125; p = .001*					

Note: *indicates statistical significance.

parents participating in our study smoked. This rate is similar to the frequency determined in the Global Adult Tobacco Survey in Türkiye (31.6%) (GATS, 2016). The implementation of the indoor smoking ban has created awareness in society to prevent second-hand smoke. However, since homes and cars are private property, rules regarding smoking depend on personal preferences. Smoking bans in these areas where children spend most of their time are of great importance in reducing exposure. Our research results show that at least one family member smokes in more than half of the houses with children. In addition, it has been determined that one in every seven children has been directly exposed to second-hand smoke in the home environment in the last 2 weeks. Direct second-hand smoke exposure can be prevented by not smoking near children. However, THS exposure can occur by ingesting particles that settle on surfaces in the body through various means, even if there is no active burning cigarette in the environment. Since THS particles can remain on surfaces for weeks and cannot be completely removed from the environment by ventilation or wiping, the only way to prevent exposure is to create completely smoke-free environments (Ferrante et al., 2013; Hang et al., 2018; Díez-Izquierdo et al., 2018). Smoking only in some parts of the house, such as the kitchen and balcony, is not sufficient to prevent THS exposure because studies have proven that THS particles can also be carried by hand (Northrup, 2019). Approximately 40% of the parents who participated in our research allow smoking in some parts of their homes, although not everywhere. This rate shows that we need to make efforts to create smoke-free homes.

Our study has revealed that ¼ of the parents allowed smoking in their cars. This is important as it shows that children are exposed to second-hand and thirdhand smoke in areas where they are expected to be safest together with their families. In the studies of Nabi-Burza et al. (2012) and Sendzik et al. (2009), it was reported that half of the parents did not have a smoking ban in their vehicles. Another study conducted in Türkiye found that approximately one-third of smoking parents smoked in their cars, but most of these parents did not allow smoking when there were children in the car (Akçay and Özcebe, 2018). The cigarette smoke in cars can reach dangerous levels even under ventilation conditions (windows open, air conditioner running, etc.). It is envisaged that informing parents about the permanence of THS in the environment may enable them to implement a smoking ban in their cars. What is more, our study showed that parents who implemented a complete smoking ban at home and in the car had higher THS beliefs. This result shows that creating smoke-free homes and cars is possible if parents believe in the health effects of THS and its permanence in the environment.

Parents' smoking at home and in the car paves the way for their guests to smoke as well. In our study, some of the non-smoking families (11%) reported that their children were exposed to second-hand smoke at home in the last 2 weeks. This suggests that in some houses, guests are allowed to smoke even though smoking is not permitted. In two different studies conducted in Türkiye (Dülger, 2017; Topçu et al., 2017), it was reported that more than half of the participants allowed their guests to smoke in their homes. This situation is important in terms of estimating the extent of children's indoor THS exposure and showing the necessity of creating smoke-free homes.

THS is a less well-known condition than second-hand cigarette smoke. In Winickoff et al.'s (2009) study, almost all participants (93%) agreed that second-hand smoke is harmful to children's health, while fewer (61%) agreed that THS exposure is harmful to children's health. Roberts et al. (2017) emphasized that adults' awareness of the dangers posed by tertiary exposure to cigarette smoke is not sufficient. In a study conducted in Spain with parents of children under the age of 3, it was found that approximately seven out of ten parents had not heard of the concept of THS before (Diez-Izquierdo et al., 2018). Studies show that adults have insufficient awareness of THS, but after the concept is explained to them, they believe in the health risks caused by the exposure (Diez-Izquierdo et al., 2018; Escoffery et al., 2013; Rendon et al., 2017). Although most of the participants in our study have not heard of the concept of THS before, the majority believe in the health effects of THS and its permanence in the environment (Table 3). These results suggest that parents are sensitive to children's health and that informative studies about THS can have a significant impact.

It has been shown in the literature that there is a relationship between parents' THS beliefs and their tendency to allow smoking in their vehicles and homes (Drehmer et al., 2012; Drehmer et al., 2014; Baheiraei et al., 2018; Winickoff et al., 2009). In our study, the fact that parents who stated that they implemented a complete smoking ban at home and in their private vehicles had higher beliefs about the effects of cigarette smoke on THS coincides with the literature findings in this direction (Table 3). These findings are important as they show that if parents gain knowledge and belief about the effects of THS, especially on children, their efforts to create a smoke-free environment will increase. Therefore, it can be said that while combating smoking, the negative effects of THS exposure should also be included in addition to second-hand cigarette smoke exposure.

When looking at the factors affecting THS belief, the literature shows that those with higher education levels have higher THS awareness (Baheiraei et al., 2018; Díez-Izquierdo et al., 2018; Johansson et al., 2004). In our study, the fact that the belief in THS is higher in parents with higher education levels indicates the necessity of educational activities focusing on parents to protect children from THS and the importance of prioritizing informing parents with low education levels.

It is noteworthy that those who are considering quitting smoking have higher THS health impact subscale scores in this study. Health belief is an important determinant of people's health behavior. It is known that health beliefs (perceived susceptibility, perceived seriousness, perceived benefit, perceived obstacle, and perceived self-efficacy) are related to smoking cessation (Pribadi and Devy, 2020; Dillard, McCaul, and Klein, 2006; Costello et al., 2012). It is also emphasized that educational interventions about THS have a positive effect on individuals changing their smoking policies, reducing the number of cigarettes smoked, and quitting smoking (Drehmer et al., 2014; Patel et al., 2012). Increasing awareness of THS in parents may not only reduce children's exposure but also motivate them to quit smoking.

Limitations and Directions/Suggestions for Future Research

Since the non-probability sampling method was used in this research, the results can only be generalized to the research

population. Another limitation is that not all parents in the schools could be reached.

In conclusion, this study reveals that most parents do not know the concept of THS. It has been found that parents who have a smoking ban at home and in the car are more likely to believe in the health effects and environmental permanence of THS. Therefore, educational activities should be organized for parents so that they can protect their children from THS exposure. Parents who smoke are an important target group for education due to their low THS beliefs.

Data Availability Statement: The data that support the findings of this study are available on request from the corresponding author.

Ethics Committee Approval: This study was approved by the Ethics Committee of Gazi University (Approval No: 2019-055; Date: April 5, 2019).

Informed Consent: Written informed consent was obtained from the patients/patient who agreed to take part in the study.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept – N.O., Y.K.; Design – N.O., Y.K.; Supervision – N.O., Y.K.; Resources – N.O., Y.K.; Materials – N.O., Y.K.; Data Collection and/or Processing – N.O., Y.K.; Analysis and/or Interpretation – N.O., Y.K.; Literature Search – N.O., Y.K.; Writing – N.O., Y.K.; Critical Review – N.O., Y.K.

Declaration of Interests: The authors have no conflict of interest to declare.

Funding: The authors declared that this study has received no financial support.

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