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Factors associated with secondhand smoke exposure for different education levels in Turkey: a cross-sectional study

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Factors associated with secondhand smoke exposure for different education levels in Turkey: a cross-sectional study

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Abstract

Objectives: The aim of this study is to determine the factors associated with individuals' exposure to tobacco smoke according to their education level in Turkey.

Design: A cross-sectional observational design.

Participants: Data of 17,084 individuals aged 15 and over who participated in the Turkey Health Survey were used.

Settings: Participants were recruited from individuals aged 15 and over in Turkey.

Methods: Binary logistic regression analysis was used to determine the factors associated with individuals' exposure to tobacco smoke.

Primary and secondary outcome measures: It was found that the variables of age, gender, marital status, general health status, employment status, receipt of psycho-social support and tobacco use were correlated with exposure to tobacco smoke.

Results: In the study, it was determined that the exposure to tobacco smoke by the individual who are illiterate/unschooled was 32.61%, by the primary school graduates it was 34.32%, by the primary education graduates it was 41.75%, by the high school graduates it was 41.04% and by the university graduates it was 40.34%.

Conclusion: As a result of the study, it is emphasized that men, young individuals, individuals with moderate and very good general health status, using tobacco, who do not work and receive psycho-social support should be targeted. In addition, appropriate strategies should be developed to reduce SHS exposure by considering the public health strategies to raise awareness of the adverse health effects of SHS exposure and the determinants of exposure to tobacco according to the study.

Keywords: health informatics, public health, statistics & research methods

Strengths and limitations of this study

- As far as we know, this is the first known study in Turkey to determine the factors associated with exposure to tobacco smoke according to the education level of individuals.

- It is emphasized that men, young individuals, individuals with moderate and very good general health status, using tobacco, who are unemployed and receive psycho-social support should be targeted.

- The data in the study are secondary data. The variables required for statistical analysis consist of the variables existing in the data set.

-The data obtained in the study are the own answers of the individuals. Therefore, the data obtained in this data collection method may be biased.

Acknowledgements

Ethics approval

This study was accomplished by using data of the survey titled Turkey Health Survey conducted by Turkey Statistical Institute. Therefore, ethical approval was not required for this study. We used secondary data for this study. In order to use the micro dataset from the Turkey Health Survey, the official permission was obtained from the Turkish Statistical Institute. In addition, a "Letter of Undertaking" was given to the Turkish Statistical Institute for the use of the data subjected to the study.

Patient and public involvement: Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication: Not required

Consent for publication

Not applicable.

Data availability statement

The data underlying this study is subject to third-party restrictions by the Turkey Statistical Institute. Data are available from the Turkish Statistical Institute (bilgi@tuik.gov.tr) for

researchers who meet the criteria for access to confidential data. The authors of the study did not receive any special privileges in accessing the data.

Competing interests

The authors have no competing interests to report. Additionally, the authors had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

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Author Contributions

ÖA conceived and led the design and development of the study proposal. ÖA and ŞÜ supervised data collection, led the data analysis and drafting the manuscript. ŞÜ made substantial contributions to the conceptualization and design of the study, data interpretations and writing the manuscript. All authors read and approved the final version of the manuscript.

INTRODUCTION

Today, public health is considered as one of the most important indicators of the quality of life. Especially in recent years, public health has become one of the main issues laid stress on in all countries [1]. Tobacco use, a global problem, is the number one preventable cause of death worldwide and 6 million people die every year due to tobacco use [2]. The harmful impact of tobacco use is not only limited to smokers, but also include those exposed to second-hand smoke (SHS) [3].

SHS, the side stream smoke released into the air by a lit up tobacco product (cigarette, pipe or cigar), is a mixture of smoke from the product's filter and mainstream smoke that is breathed back into the air by an active smoker [4]. SHS contains more than 7000 chemicals, of which about 70 are known [5]. Indoor SHS concentration depends on the number of tobacco products smoked over a certain period of time, the volume of the room, the ventilation rate, and other processes that can remove contaminants [6].

Exposure to SHS creates significant health problems that threaten human health around the world. Exposure to SHS ranks third among the causes of preventable death worldwide [7]. Chronic exposure to SHS is at least 80-90% as harmful as chronic active smoking on an average [8]. More than 880,000 people die worldwide each year due to exposure to SHS [9]. Individuals exposed to SHS experience a 20% to 30% increase in cardiovascular disease compared to individuals not exposed to it at all [10]. Moreover, a similar increase in lung cancer was reported among individuals exposed to SHS compared to those not exposed to it as a result of a research [3]. Exposure to SHS also affects children. Children exposed to SHS are at increased risk for acute respiratory infections, auditory dysfunction and exacerbation of asthma [11, 12]. Therefore, exposure to SHS not only causes serious illness, but also creates an economic and social burden [13].

Controlling the prevalence of tobacco products and SHS is an important global public health challenge. Comprehensive smoke-free legislation is required under Article 8 of the Framework Convention on Tobacco Control (FCTC) of World Health Organization (WHO) to eliminate tobacco use in entire indoor public spaces, including workplaces [14]. In 2007, a revision was made on the Article 8 of the FCTC. Based on findings of potential health hazards, parties to FCTC have recommended smoking ban outdoors or in semi-open areas where appropriate. Turkey ratified the FCTC in 2004 [15]. In order to establish a smoke-free Turkey for protecting

passive smokers, on May 19, 2008, it was aimed to ban cigarette consumption in entire indoor areas (except restaurants, bars and cafes) and the "Smoke-Free Air Zone" campaign was launched [16]. On July 19, 2009, with the inclusion of restaurants, coffee houses, bars and cafes to the scope of the ban, it was ensured that entire indoor areas in Turkey are smoke-free. The frequency of both active and passive smoking has been positively affected through the prevention of smoking indoors. There was a significant decrease in the frequency of second-hand smoke in all indoor public areas, and the most significant decrease was observed in restaurants (55.9% in 2008, 12.9% in 2012). Although it is not within the scope of the law, there has been a serious decrease in the degree of second-hand smoke among the households. Moreover, as of 19 July 2009, Turkey has ranked the sixth country in the world and the third in Europe after Bermuda, New Zealand, Uruguay, England and Ireland, in terms of having the most comprehensive law on tobacco control according to WHO data [17].

Active smoking is a voluntary behavior; however, exposure to SHS occurs passively and can also affect nonsmokers. Therefore, in order to address SHS exposure properly, it is important to reveal the factors causing that exposure [13]. While the demographic, socioeconomic and psychosocial determinants of tobacco use have been extensively researched in the literature, studies focusing on SCC determinants are limited [13, 18, 19].

In Turkey, little is known about the exposure of individuals with different education levels to tobacco smoke in Turkey. As far as we know, this is the first known study in Turkey to determine the factors associated with exposure to tobacco smoke according to the education level of individuals. The following constitutes the research problems of this study; Does the exposure to smoke among the individuals differentiate according to their educational level?, Is there a relationship between the demographic characteristics of individuals and their exposure to tobacco smoke?, and Are the factors associated with the exposure of tobacco smoke by the individuals having different educational levels the same?

METHODS

Data

In this study, survey data obtained from the Turkey Health Survey conducted by the Turkish Statistical Institute in 2019 were used. Turkey Health Survey was conducted with the aim of closing the information gap in the current structure by obtaining information about the health indicator, constituting a significant share among the development indicators showing the

development levels of the countries. The research is important in terms of being the first study reflecting the overall situation in the country, as well as enabling the international comparisons while shedding a light on the national requirements [20].

The stratified two-stage cluster sampling method was used to obtain the data. The first stage sampling unit is randomly selected blocks from clusters (blocks) containing an average of 100 house addresses proportional to the size; the second stage sampling unit is the household addresses selected randomly from each selected cluster. The research was designed to give a total estimate for Turkey. The total sample volume has been determined as 9470 household addresses due to the design of the study [20].

Outcome Variables

The dependent variable of the study is exposure to tobacco smoke by the individuals according to their education level (illiterate/unschooled, primary school graduates, primary education graduates, high school graduates, university graduates). Individuals participating in the study received the code "1" if they were exposed to tobacco smoke and "0" if they did not. In the study, a separate binary logit model was established for each education level.

Independent variables

The independent variables included in the study are the ones that are available in the Turkey Health Survey and that come to the fore as a result of the literature review. The independent variables of the study are as follows; age (34 and under, 35–34, 45–54 and 55+), gender (male, female), marital status (never married, married, divorced/spouse died), employment status (yes, no), general health status (very good/good, moderate, poor/very bad), the status of receiving psycho-social support health services from primary care health institutions (yes, no), alcohol use (yes, no), tobacco use status (yes, no), and the ability to afford treatment (yes, no).

Ordinal and nominal variables were defined as dummy variables in order to observe the impacts of the categories of all variables to be included in the binary logistic regression model [21].

Analysis method

Survey statistics in Stata 15 (Stata Corporation) were used to account for the complex sampling design and weights. Weighted analysis was performed [22]. Primarily, the tobacco exposure of the individuals participating in the research and the frequency and percentages of the

independent variables were obtained. In this study, binary logistic regression method was used to investigate the differences in tobacco exposure according to education levels.

Binary logistic regression was conducted to determine the risk factors that were influential on the exposure to tobacco smoke. The particular analysis is used to study the relationship between the dependent variable and the independent variable(s) in cases where the result (dependent) variable has two options (binary/dichotomy). Binary logistic regression not only provides the opportunity to evaluate the statistical significance of each independent variable as a risk factor but also the opportunity to calculate the odds ratio [23].

RESULTS

Descriptive statistics

In the study, it was determined that the exposure to tobacco smoke by the individual who are illiterate/ unschooled was 32.61%, by the primary school graduates it was 34.32%, by the primary education graduates it was 41.75%, by the high school graduates it was 41.04% and by the university graduates it was 40.34%.

The findings regarding the factors related to the exposure of individuals to tobacco smoke according to their education level in Turkey are shown in Table 1.

Table 1. Findings with respect to the factors affecting individuals' exposure to tobacco smoke by education level

Variables	Entire Model f (%)	Model 1 f (%)	Model 2 f (%)	Model 3 f (%)	Model 4 f (%)	Model 5 f (%)
Age						
34 and under	5800 (33.9)	271 (12.4)	477 (8.5)	1929 (65.1)	1586 (48.9)	1537 (50.1)
35-44	3395 (19.9)	212 (9.7)	1238 (22.1)	410 (13.8)	780 (24.0)	755 (24.6)
45-54	2918 (17.1)	301 (13.7)	1527 (27.2)	320 (10.8)	402 (12.4)	368 (12.0)
55 +	4971 (19.1)	1410 (64.3)	2370 (42.2)	306 (10.3)	478 (14.7)	407 (13.3)
Gender						
Male	7784 (45.6)	392 (17.9)	2508 (44.7)	1595 (53.8)	1711 (52.7)	1578 (51.5)
Female	9300 (54.4)	1802 (82.1)	3104 (55.3	1370 (46.2)	1535 (47.3)	1489 (48.5)
Marital status						
Never married	3610 (21.1)	111 (5.1)	245 (4.4)	1263 (42.6)	1081 (33.3)	910 (29.7)

Married	11726 (68.6)	1471 (67.0)	4712 (84.0)	1579 (53.3)	1979 (61.0)	1985 (64.7)
Divorced/Spouse died	1748 (10.2)	612 (27.9)	655 (11.7)	123 (4.1)	186 (5.7)	172 (5.6)
General health status						
Very good/good	9988 (58.5)	580 (26.4)	2514 (44.8)	2129 (71.8)	2381 (73.4)	2384 (77.7)
Moderate	5214 (30.5)	870 (39.7)	2312 (41.2)	697 (23.5)	734 (22.6)	601 (19.6)
Poor/Very bad	1882 (11.0)	744 (33.9)	786 (14.0)	139 (4.7)	131 (4.0)	82 (2.7)
Employment status						
No	10557 (61.8)	1913 (87.2)	3763 (67.1)	1905 (64.2)	1873 (57.7)	1103 (36.0)
Yes	6527 (38.2)	281 (12.8)	1849 (32.9)	1060 (35.8)	1373 (42.3)	1964 (64.0)
Alcohol use						
No	14357 (85.1)	2171 (99.0)	5042 (89.8)	2558 (86.3)	2575 (79.3)	2191 (71.4)
Yes	2547 (14.9)	23 (1.0)	570 (10.2)	407 (13.7)	671 (20.7)	876 (28.6)
Psycho-social support						
No	15955 (93.4)	2057 (93.8)	5200 (92.7)	2809 (94.7)	3033 (93.4)	2856 (93.1)
Yes	11.29 (6.6)	137 (6.2)	412 (7.3)	156 (5.3)	213 (6.6)	211 (6.9)
Tobacco use						
No	11853 (69.4)	1881 (85.7)	3924 (69.9)	1968 (66.4)	1984 (61.1)	2096 (68.3)
Yes	5231 (30.6)	313 (14.3)	1688 (30.1)	997 (33.6)	1262 (38.9)	971 (31.7)
Ability to afford treatment						
No	1349 (7.9)	172 (7.8)	405 (7.2)	309 (10.4)	250 (7.7)	213 (6.9)
Yes	15735 (92.1)	2022 (92.2)	5207 (92.8)	2656 (89.6)	2996 (92.3)	2854 (93.1)
Education						
Illiterate/ Unschooled	2194 (12.8)					
Primary school graduates	5612 (32.8)					
Primary education graduates	2965 (17.4)					
High school graduates	3246 (19.0)					
University graduates	3067 (18.0)					

Model 1: Illiterate/ unschooled, Model 2: Primary school graduates, Model 3: Primary education graduates, Model 4: High school graduates; Model 5: University graduates

Model estimation

In the study, it was tested whether there was a multicollinearity between the independent variables to be included in the binary logistic regression model. It is thought that those with variance inflation factor (VIF) values of 5 and above cause moderate multicollinearity, and

those of 10 or more high degree of multicollinearity [24]. In this study, there is no variable that causes the problem of multicollinearity between the variables (Appendix 1).

The estimated binary logistic regression model results are given in Table 2. In the entire model estimated for all the individuals participating in the research, it has been observed that the education level of the individuals was correlated with exposure to tobacco smoke. According to Table 2, it has been found that the variables of age (55+), marital status (never married) and tobacco use were significant in Model 1, which was estimated for illiterate/ unschooled. In Model 2, estimated for primary school graduates, it has been observed that the variables of age, marital status (divorced/spouse died), general health status (moderate), receiving psycho-social support and tobacco use were significant. In Model 3, estimated for primary education graduates, it has been seen that the variables of age, gender, general health status (moderate), employment status and tobacco use were significant. In Model 4, estimated for high school graduates, the variables including age (45-54, 55+), gender, marital status (never married), general health status (moderate), and tobacco use found to be significant. It has been observed that the variables of age, gender, marital status (never married) and tobacco use were significant in Model 5, which was estimated for university graduates.

Table 2. Estimated model results of factors related to individuals' exposure to tobacco smoke by education level

Variables	Entire Model β	Model 1 β	Model 2 β	Model 3 β	Model 4 β	Model 5 β
Age (reference category: 34 and under)						
35-44	-0.279[a] (0.059)	-0.302 (0.230)	-0.239[c] (0.132)	-0.400[a] (0.148)	-0.120 (0.122)	-0.365[a] (0.112)
45-54	-0.388[a] (0.065)	-0.449 (0.224)	-0.334[b] (0.131)	-0.523[a] (0.159)	-0.418[a] (0.154)	-0.408[a] (0.145)
55 +	-0.919[a] (0.069)	-1.455[a] (0.205)	-0.744[a] (0.135)	-0.874[a] (0.183)	-0.502[a] (0.159)	-0.836[a] (0.161)
Gender (reference category: male)						
Female	-0.245[a] (0.044)	-0.197 (0.170)	-0.087 (0.081)	-0.421[a] (0.105)	-0.249[a] (0.096)	-0.263[a] (0.092)
Marital status (reference category: married)						
Never married	0.263[a] (0.056)	-0.552[b] (0.263)	0.240 (0.160)	0.051 (0.113)	0.466[a] (0.113)	0.451[a] (0.102)
Divorced/Spouse died	-0.129[c] (0.072)	-0.077 (0.158)	-0.289[b] (0.115)	0.321 (0.232)	0.067 (0.199)	0.076 (0.199)
General health status (reference category: very good/good)						
Moderate	0.128[a] (0.046)	-0.128 (0.152)	0.178[a] (0.077)	0.282[b] (0.112)	0.184[c] (0.104)	-0.084 (0.114)
Poor/Very bad	0.100 (0.073)	0.036 (0.160)	0.182 (0.113)	0.153 (0.209)	-0.035 (0.228)	-0.110 (0.298)
Employment status (reference category: no)						

Yes	-0.035 (0.046)	-0.01 (0.177)	0.102 (0.084)	-0.227[b] (0.108)	-0.099 (0.100)	0.123 (0.103)
Alcohol use (reference category: no)						
Yes	0.038 (0.055)	-0.807 (0.583)	0.150 (0.115)	-0.060 (0.134)	0.122 (0.105)	0.002 (0.096)
Psycho-social support (reference category: no)						
Yes	0.140[c] (0.077)	-0.286 (0.249)	0.228[c] (0.132)	0.283 (0.196)	0.143 (0.173)	0.011 (0.169)
Tobacco use (reference category: no)						
Yes	0.837[a] (0.043)	1.312[a] (0.173)	1.019[a] (0.078)	0.990[a] (0.105)	0.526[a] (0.092)	0.570[a] (0.093)
Ability to afford treatment (reference category: no)						
Yes	0.036 (0.070)	-0.163 (0.214)	0.177 (0.130)	0.005 (0.146)	0.216 (0.166)	-0.146 (0.171)
Education (reference category: illiterate/unschooled)						
Primary school graduates	-0.255[a] (0.068)					
Primary education graduates	-0.405[a] (0.081)					
High school graduates	-0.389[a] (0.079)					
University graduates	-0.364[a] (0.080)					
Constant	-0.163 (0.108)	0.383 (0.296)	-0.865[a] (0.179)	-0.365[b] (0.182)	-0.754[a] (0.200)	-0.372[b] (0.188)

[a]$p<.01$; [b]$p<.05$; [c]$p<.10$

Model 1: Illiterate/ unschooled, Model 2: Primary school graduates, Model 3: Primary education graduates, Model 4: High school graduates; Model 5: University graduates

The marginal effects of factors related to tobacco smoke exposure according to education levels are given in Table 3.

When the individuals who are illiterate/unschooled are concerned, an individual aged 45-54 is 23.3% less likely to be exposed to tobacco smoke than an individual aged 34 and under (reference group). Similarly, an illiterate person aged 55 and over is 91.6% less likely to be exposed to tobacco smoke than an individual aged 34 and younger. When the marital status variable is examined, it has been found that an illiterate individual who has never been married is 39.3% less likely to be exposed to tobacco smoke than a married individual. An illiterate tobacco user is 76.1% more likely to be exposed to tobacco smoke than a non-tobacco user.

Among primary school graduates, an individual aged 35-44 is 14.2% less likely to be exposed to tobacco smoke than an individual aged 34 and younger (reference group). Similarly, a primary school graduate aged 55 and over is 48.1% less likely to be exposed to tobacco smoke than an individual aged 34 and younger. When the marital status variable is examined, it has been observed that a divorced/spouse died, primary school graduate individual is 19.8% less likely to be exposed to tobacco smoke than a married individual. A primary school graduate

individual with a moderate general health status is 11.7% more likely to be exposed to tobacco smoke than an individual with a very good/good general health status. Similarly, a primary school graduate receiving psycho-social support is 14.5% more likely to be exposed to tobacco smoke than an individual receiving no psycho-social support. A primary school graduate using tobacco products is 63.4% more likely to be exposed to tobacco smoke than an individual who does not use tobacco products.

Among primary education graduates, an individual aged 35-44 is 23.6% less likely to be exposed to tobacco smoke than an individual aged 34 and under (reference group). Similarly, a primary education graduate aged 55 and over is 56% less likely to be exposed to tobacco smoke than an individual aged 34 and under. It has been seen that a woman who is a primary education graduate is 24.8% less likely to be exposed to tobacco smoke than a man of the same education level. It was found that the probability of being exposed to tobacco smoke is 16% higher for a primary education graduate with a moderate general health status than an individual with a very good/good general health status. An employed individual with a primary education degree is 13.4% less likely to be exposed to tobacco smoke than an unemployed individual. It has been found that a primary education graduate using tobacco products is 53.9% more likely to be exposed to tobacco smoke than an individual who does not smoke.

In high school graduates, an individual in the 45-54 range is 25.4% less likely to be exposed to tobacco smoke than an individual aged 34 and under (reference group) and an individual aged 55 and over is 31% less likely to be exposed to tobacco smoke than an individual aged 34 or younger. An unmarried high school graduate is 27.1% more likely to be exposed to tobacco smoke than a married individual. It has been found that a high school graduate with a moderate general health status is 10.6% more likely to be exposed to tobacco smoke than an individual with a very good/good general health condition. It is seen that a high school graduate using tobacco products is 30.3% more likely to be exposed to tobacco smoke than an individual who does not smoke.

When the university graduates are concerned, an individual aged 45-54 is 21.6% less likely to be exposed to tobacco smoke than an individual aged 34 and under (reference group) and an individual aged 55 and over is 54% less likely to be exposed to tobacco smoke than an individual aged 34 or younger. According to the findings a university graduate who has never been married is 26.4% more likely to be exposed to tobacco smoke than a married individual. A university graduate woman is 15.8% less likely to be exposed to tobacco smoke than a man

of the same education level. It has been observed that a university graduate individual using tobacco products is 32.7% more likely to be exposed to tobacco smoke than an individual who does not smoke.

Table 3. Marginal effects of factors associated with individuals' exposure to tobacco smoke by education level

Variables	Entire Model ME	Model 1 ME	Model 2 ME	Model 3 ME	Model 4 ME	Model 5 ME
Age (reference category: 34 and under)						
35-44	-0.161[a] (0.345)	-0.151 (0.116)	-0.142[c] (0.076)	-0.236[b] (0.091)	-0.069 (0.070)	-0.216[a] (0.069)
45-54	-0.229[a] (0.392)	-0.233[b] (0.115)	-0.201[a] (0.076)	-0.315[a] (0.102)	-0.254[a] (0.098)	-0.244[a] (0.091)
55 +	-0.596[a] (0.046)	-0.916[a] (0.112)	-0.481[a] (0.082)	-0.560[a] (0.128)	-0.310[a] (0.103)	-0.540[a] (0.113)
Gender (reference category: male)						
Female	-0.152[a] (0.027)	-0.131 (0.111)	-0.057 (0.053)	-0.248[a] (0.063)	-0.148 (0.057)	-0.158[a] (0.055)
Marital status (reference category: married)						
Never married	0.159[a] (0.033)	-0.393[b] (0.198)	0.151 (0.097)	0.030 (0.066)	0.271[a] (0.064)	0.264[a] (0.058)
Divorced/Spouse died	-0.084[c] (0.047)	-0.052 (0.107)	-0.198[b] (0.081)	0.178 (0.121)	0.042 (0.123)	0.048 (0.124)
General health status (reference category: very good/good)						
Moderate	0.079[a] (0.028)	-0.087 (0.103)	0.117[b] (0.051)	0.160[a] (0.061)	0.106[c] (0.059)	-0.051 (0.069)
Poor/Very bad	0.062 (0.045)	0.024 (0.106)	0.120 (0.073)	0.089 (0.118)	-0.021 (0.138)	-0.066 (0.184)
Employment status (reference category: no)						
Yes	-0.022 (0.029)	-0.007 (0.119)	0.067 (0.055)	-0.134[b] (0.065)	-0.058 (0.059)	0.074 (0.062)
Tobacco use (reference category: no)						
Yes	0.024 (0.034)	-0.598 (0.467)	0.096 (0.072)	-0.035 (0.079)	0.071 (0.060)	0.001 (0.057)
Psycho-social support (reference category: no)						
Yes	0.085[c] (0.046)	-0.199 (0.179)	0.145[c] (0.081)	0.157 (0.103)	0.082 (0.097)	0.006 (0.101)
Tobacco use (reference category: no)						
Yes	0.492[a] (0.024)	0.761[a] (0.084)	0.634[a] (0.046)	0.539[a] (0.054)	0.303[a] (0.052)	0.327[a] (0.052)
Ability to afford treatment (reference category: no)						
Yes	0.023 (0.044)	-0.108 (0.139)	0.119 (0.090)	0.003 (0.085)	0.132 (0.105)	-0.085 (0.097)
Education (reference category: illiterate/unschooled)						
Primary school graduates	-0.149[a] (0.039)					
Primary education graduates	-0.243[a] (0.047)					
High school graduates	-0.232[a] (0.046)					

University graduates	-0.216[a] (0.047)

[a]p<.01; [b]p<.05; [c]p<.10

Model 1: Illiterate/ unschooled, Model 2: Primary school graduates, Model 3: Primary education graduates, Model 4: High school graduates; Model 5: University graduates

DISCUSSION

Using tobacco products leads to significant health problems not only for people using them, but also for those who do not use tobacco products due to tobacco smoke spreading to the environment. Every passing year new evidence is obtained with respect to the health risks posed by the exposure of others to tobacco smoke. Therefore, it is necessary to know the determinants of tobacco smoke in order to reduce the prevalence of secondhand smoke.

In this study, data of 17,084 individuals participated in the Turkey Health Survey conducted by the Turkish Statistical Institute in 2019 were used. In the study, the factors affecting the exposure of individuals to tobacco smoke in Turkey according to their education levels were determined using binary logistic regression analysis.

In the study, it was found that the variables of age, gender, marital status, general health status, employment status, receipt of psycho-social support and tobacco use were correlated with exposure to tobacco smoke. Moreover, it was determined that the significance and effect of the variables in exposure to tobacco smoke differ according to the education level of the individuals according to the findings of the study.

In the study, it was determined that the probability of exposure to tobacco decreased as age increased. Similar results were obtained in the other studies [25-28]. As people become older, they realize that the use of tobacco products constitute a risk factor for a variety of chronical diseases and gain more awareness in terms of health such as changing negative lifestyle choices like using tobacco [29]. It has been revealed by many studies that high levels/dangerous/risky use of tobacco products leads older look than the real age for the individuals [30]. Furthermore, the reason for the decrease in the use of tobacco products by the individuals with increasing age may be the obsession of the individuals in terms of looking young which makes them more cautious with respect to the use of tobacco products [7]. On the other hand, as age increases, people take their health more seriously and have more time and energy to participate in anti-tobacco campaigns. In this context, as age increases, the prevalence of people who quit using tobacco products increases, therefore the probability of exposure to tobacco smoke decreases [29].

It has been determined that individuals who receive psycho-social support are more exposed to tobacco smoke than individuals who do not receive psycho-social support. There are studies with similar findings [31, 32]. On the other hand, in a study, it was determined that individuals who do not receive psycho-social support are more exposed to tobacco smoke than individuals who receive psycho-social support [33].

In the study, it was determined that individuals with moderate and very good general health status were exposed to tobacco smoke more than individuals with good general health status. It has been argued in the studies that individuals who care about their health are more careful in terms of eliminating the exposure to tobacco smoke [31, 32].

It has been found that individuals who are employed are less exposed to tobacco smoke than those unemployed. In a study through which a similar finding was obtained, it was argued that the risk of exposure to tobacco increases since unemployed individuals stay at home longer [34]. However, there are also studies in the literature concluding that individuals who are employed are more exposed to tobacco smoke than those unemployed [26, 27].

The people exposed to tobacco use for a certain period also experience health problems similar to those using tobacco products. According to the study, individuals using tobacco products are more exposed to tobacco smoke than individuals who do not use tobacco products. Similar findings were obtained in some studies in the literature [22, 35].

In the study, it was determined that individuals who are illiterate and have never been married are less exposed to tobacco smoke than married individuals. There are studies in the literature with similar findings [25]. On the other hand, it was also found in the study that individuals graduated from a primary school with a marital status as divorced/spouse died, were less exposed to tobacco smoke than married individuals. Similar results were obtained in some studies [36, 37]. Studies have suggested that this may be due to the fact that most of the individuals live alone and get less exposed to smoking at home [29].

According to the study, it has been determined that men are more exposed to tobacco smoke than women. Similar results were obtained in studies [26]. On the other hand, there are studies in the literature arguing that women are more exposed to tobacco smoke than men. Studies have reported that this may be highly correlated with the socioeconomic profile of women [25]. Moreover, some studies have found that women are at higher risk of SHS exposure because

they spend more time doing housework in regulated industries that are less likely to challenge SHS policies [38].

CONCLUSION

As a result of the study, it is emphasized that men, young individuals, individuals with moderate and very good general health status, using tobacco, who are unemployed and receive psycho-social support should be targeted. Such groups require more protection from SHS exposure. Appropriate strategies should be developed to reduce SHS exposure by considering the public health strategies to raise awareness of the adverse health effects of SHS exposure and the determinants of exposure to tobacco. The National Tobacco Control Program Action Plan, prepared under the coordination of the Ministry of Health, came into effect on January 27, 2015 in Turkey for this purpose. The strategies of said action plan include ensuring that the right attitudes and behaviors are displayed by the society to the violations by raising the awareness that protection from second hand smoke exposure is a right in terms of health in the society, making necessary legislative changes to expand the areas where tobacco and tobacco products are not used, simultaneously with the efforts to increase the awareness and advocacy of the society on the issue. In addition, the National Tobacco Control Program Action Plan includes strategies for establishing the necessary system for determining the level of second hand smoke exposure in the society and monitoring it regularly, and for starting and maintaining social support for the prevention of passive exposure in homes/living areas/private properties.

Policies to restrict tobacco use in public places are necessary for a variety of reasons. Primarily, the majority of the public is uncomfortable with SHS exposure and considers this exposure to be harmful to health. However, most non-smokers do not take personal action to avoid exposure to SHS. Government agencies need to act to protect non-smokers. Moreover, restricting tobacco use in public places may increase the likelihood to use less tobacco products or quit them completely.

In the future, more objective measures of SHS exposure may overcome this limitation. Future studies should further explore determinants that cannot be identified through qualitative research. Objective measurement of smoke inhalation can be helpful in avoiding reporting bias. In addition, studies must be considered within country variation and recognize that there may be large variations in prevalence and determinants between regions within the same country.

In future studies, key factors influencing the social acceptability of SHS exposure by the individuals can be identified. Identifying these factors is critical in planning and designing tobacco prevention programs targeting SHS exposure. If health risks are adequately communicated and guided by the demands of (several) target groups, the social acceptability of tobacco exposure will be further reduced.

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Appendix 1. VIF values for all models

Variables	Entire Model VIF	Model 1 VIF	Model 2 VIF	Model 3 VIF	Model 4 VIF	Model 5 VIF
Age (reference category: 34 and under)						
35-44	1.70	1.69	3.04	1.34	1.6	1.3
45-54	1.82	2.09	3.45	1.33	1.44	1.25
55 +	2.68	3.16	4.3	1.51	1.73	1.56
Gender (reference category: male)						
Female	1.38	1.24	1.42	1.44	1.35	1.16
Marital status (reference category: married)						
Never married	1.62	1.16	1.14	1.65	1.7	1.29
Divorced/Spouse died	1.17	1.19	1.09	1.09	1.1	1.09
General health status (reference category: very good/good)						
Moderate	1.26	1.71	1.23	1.14	1.12	1.07
Poor/Very bad	1.35	1.82	1.25	1.11	1.1	1.05
Employment status (reference category: no)						
Yes	1.44	1.16	1.35	1.46	1.41	1.31
Alcohol use (reference category: no)						
Yes	1.17	1.05	1.13	1.17	1.12	1.08
Psycho-social support (reference category: no)						
Yes	1.03	1.01	1.04	1.04	1.05	1.03
Tobacco use (reference category: no)						
Yes	1.19	1.18	1.2	1.29	1.16	1.08
Ability to afford treatment (reference category: no)						
Yes	1.04	1.05	1.05	1.04	1.04	1.08
Education (reference category: illiterate/unschooled)						
Primary school graduates	2.67					
Primary education graduates	2.54					
High school graduates	2.57					
University graduates	2.61					

Model 1: Illiterate/ unschooled, Model 2: Primary school graduates, Model 3: Primary education graduates, Model 4: High school graduates; Model 5: University graduates

STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	5
Objectives	3	State specific objectives, including any prespecified hypotheses	6
Methods			
Study design	4	Present key elements of study design early in the paper	6-8
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6-8
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	6-8
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6-8
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	6-8
Bias	9	Describe any efforts to address potential sources of bias	6-8
Study size	10	Explain how the study size was arrived at	6-8
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	6-8
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	6-8
		(*b*) Describe any methods used to examine subgroups and interactions	6-8
		(*c*) Explain how missing data were addressed	6-8
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	6-8
		(*e*) Describe any sensitivity analyses	6-8
Results			

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	8-14
		(b) Give reasons for non-participation at each stage	8-14
		(c) Consider use of a flow diagram	8-14
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	8-14
		(b) Indicate number of participants with missing data for each variable of interest	8-14
Outcome data	15*	Report numbers of outcome events or summary measures	8-14
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	8-14
		(*b*) Report category boundaries when continuous variables were categorized	8-14
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	8-14
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	8-14
Discussion			
Key results	18	Summarise key results with reference to study objectives	14-16
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	14-16
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	14-16
Generalisability	21	Discuss the generalisability (external validity) of the study results	14-16
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	4

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

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Secondhand smoke exposure for different education levels: findings from a large, nationally representative survey in Turkey

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Secondhand smoke exposure for different education levels: findings from a large, nationally representative survey in Turkey

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Abstract

Objectives: The aim of this study is to determine the factors that influence individuals' exposure to tobacco smoke in Turkey according to their education level.

Design: Secondary data analysis.

Participants: Altogether, 17,084 individuals aged 15 and over were included in this study.

Settings: Dataset of the Turkey Health Survey in 2019.

Methods: Binary logistic regression analysis was used to determine the factors associated with individuals' exposure to tobacco smoke.

Primary and secondary outcome measures: The variables age, gender, marital status, general health status, employment status, receipt of psycho-social support, and tobacco use were found to be correlated with exposure to tobacco smoke.

Results: The study determined that individuals who are illiterate/unschooled were exposed to tobacco smoke at a rate of 32.61%, primary school graduates at a rate of 34.32%, primary education graduates at a rate of 41.75%, high school graduates at a rate of 41.04% and university graduates at a rate of 40.34%.

Conclusion: As a result of the study, it is emphasized that men, young individuals, individuals with moderate and very good general health status, those who use tobacco, those who are unemployed and those who receive psycho-social support should be targeted. In addition, appropriate strategies for reducing SHS exposure should be developed, taking into account public health strategies for increasing awareness of the adverse health effects of SHS exposure and the determinants of tobacco exposure according to the study.

Keywords: health informatics, public health, statistics & research methods

Strengths and limitations of this study

- In this study was used data from a nationally representative sample in Turkey.

- Binary logistic regression was conducted to determine the risk factors.

- Survey statistics in Stata 15 were used to account for the complex sampling design and weights.

- This study used secondary data.

- The data for this study was collected through a self-report survey, which may have resulted in reporting bias.

Acknowledgements

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Ethics approval

This study was accomplished by using data of the survey titled Turkey Health Survey conducted by Turkey Statistical Institute. Therefore, ethical approval was not required for this study. We used secondary data for this study. In order to use the micro dataset from the Turkey Health Survey, the official permission was obtained from the Turkish Statistical Institute. In addition, a "Letter of Undertaking" was given to the Turkish Statistical Institute for the use of the data subjected to the study.

Patient and public involvement: Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication: Not required

Consent for publication

Not applicable.

Data availability statement

The data underlying this study is subject to third-party restrictions by the Turkey Statistical Institute. Data are available from the Turkish Statistical Institute (bilgi@tuik.gov.tr) for researchers who meet the criteria for access to confidential data. The authors of the study did not receive any special privileges in accessing the data.

Competing interests

The authors have no competing interests to report. Additionally, the authors had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

Funding

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Author Contributions

ÖA conceived and led the design and development of the study proposal. ÖA and ŞÜ supervised data collection, led the data analysis and drafting the manuscript. ŞÜ made substantial contributions to the conceptualization and design of the study, data interpretations and writing the manuscript. All authors read and approved the final version of the manuscript.

INTRODUCTION

Today, public health is regarded as one of the most important indicators of a person's quality of life. Especially in recent years, public health has risen to prominence as a priority issue in all countries [1]. Tobacco use, a global problem, is the leading preventable cause of death worldwide, with 6 million people dying each year due to tobacco use [2]. Tobacco use has a harmful impact on not only smokers, but also on those exposed to second-hand smoke (SHS) [3].

SHS is a mixture of side stream smoke released into the air by a lit tobacco product (cigarette, pipe or cigar) and mainstream smoke that is breathed back into the air by an active smoker [4]. SHS contains over 7000 chemicals, only about 70 of which are known [5]. Indoor SHS concentrations are dependents on the amount of tobacco smoked over time, the size of the room, the ventilation rate, and other processes that can remove contaminants [6].

Exposure to SHS causes significant health problems that endanger human health worldwide. Exposure to SHS is the third leading preventable cause of death worldwide [7]. Chronic exposure to SHS is at least 80-90% as harmful as chronic active smoking on an average [8]. Each year, over 880,000 people die as a result of exposure to SHS [9]. Individuals exposed to SHS have a 20% - 30% increased risk of in cardiovascular disease compared to those who are not exposed at all [10]. Moreover, a similar increase in lung cancer was reported among individuals exposed to SHS compared to those who were not [3]. Children are also affected by SHS exposure. Children exposed to SHS are at an increased risk of developing acute respiratory infections, auditory dysfunction and exacerbation of asthma [11, 12]. Therefore, exposure to SHS not only causes serious illness, but also imposes an economic and social burden [13].

There is significant evidence that comprehensive smoke-free policies in public spaces are associated with lower tobacco use and SHS, resulting in reduced negative health implications [14-16]. Controlling the prevalence of tobacco products and SHS is a significant global public health challenge. Comprehensive smoke-free legislation is required by Article 8 of the World Health Organization's (WHO) Framework Convention on Tobacco Control (FCTC) to eliminate tobacco use in all indoor public spaces, including workplaces [17]. In 2007, the FCTC's Article 8 was revised. Parties to the FCTC have recommended that smoking be prohibited outdoors or in semi-open areas where appropriate, based on findings of potential health hazards [14].

As of the end of 2017, 181 countries have signed the World Health Organization's Framework Convention on Tobacco Control [18]. However, progress in the fight against secondhand smoke varies greatly across countries. Less developed countries appear to benefit less from the fight against secondhand smoke [19]. This could be due to the fact that these countries are new members of the FCTC. Furthermore, in terms of compliance with the smoking ban, the execution of agreed smoking prohibitions differs substantially between countries. Failure at the political economy level, a lack of government resources to implement laws, and a lack of political will to protect public health all contribute to this [20]. As a result, the level of enforcement and compliance is regarded as at least as crucial as the implementation of smoke-free policies, particularly less developed countries [19].

Since ratifying the FCTC in 2008, the Russian government has significantly enhanced its policies addressing smoke-free environments. It prohibits smoking in closed workplaces, closed public spaces, public transportation, and some open locations (beaches, playgrounds, public building entrances, and public transportation) [18]. Thailand passed partial smoke-free legislation in 1992, prohibiting smoking in public locations where such restrictions could be effectively enforced, such as hospitals, schools, and air-conditioned workplaces [21]. Ghana, one of the first nations to ratify the FCTC in 2004, prohibited smoking in any closed portion of a workplace or any other public place that was not designated [22, 23]. Chile implemented complete nationwide smoke-free legislation in 2013. This legislation prohibits smoking in all closed and semi-closed spaces of all workplaces and public locations, including the accommodation sector [24]. In Brazil, the use of cigarettes (and other smoking products derived from tobacco) was banned in all public areas save areas designated for smoking exclusively, segregated and ventilated, in 1996 [25]. In 2005, Spain ratified the FCTC. Smoking is forbidden in all closed public spaces, workplaces, and public transportation vehicles [26]. Peru signed the FCTC in 2004. Smoking is prohibited in closed public and private buildings (bars, restaurants, movie theaters and government buildings), as well as on public transportation [27]. In Australia, smoking is prohibited in closed public places under the 2003 Smoke-Free Public Places Act (ACT) [28]. In 2004, Toronto and its neighboring municipalities prohibited smoking indoors, including bars and casinos. In 2006, the Province of Ontario enacted a similar Smoke-Free Ontario Act [29].

There are studies examining the effect of smoking bans in public areas on exposure to SHS. Air quality measurements in bars and cafes before and after smoke-free workplace laws revealed considerable post-legal decreases in fine particle air pollution. Furthermore, it has been

discovered that reductions in SHS exposure as a result of smoke-free policies improve respiratory health among bar and cafe workers [30]. A study conducted in Spain, which ratified the FCTC in 2005, discovered that, beginning in January 2006, a comprehensive ban on outdoor smoking in workplaces and a partial ban in restaurants were enforced, resulting in a reduction in workplace exposure to SHS from 40% to 9.0% [31]. In a study conducted in Mexico, which approved the FCTC in 2005, non-smoking spaces were established in public places and workplaces as part of the 2008 smoking ban. The study found that SCC exposure in closed workplaces dropped considerably compared to the previous month [32]. According to a study conducted in India, which approved the FCTC in 2005, despite the smoking prohibition in public places, 36% of the restaurants are still not smoke-free, with hookah restaurants providing the largest exposure to tobacco smoke [33].

There are additional studies examining the impact of smoke-free policies on tobacco usage prevalence. According to a study conducted in Norway, which approved the FCTC in 2005, there was a 6.8% decline in smoking among employees in the workplace after a smoking ban was implemented in indoor areas in June 2004 [34]. In a study conducted in Canada, which approved the FCTC in 2005, it was discovered that after the introduction of a comprehensive smoking prohibition policy in 2004, the prevalence of tobacco usage declined from 24.1% in 2003 to 18.2% in 2005 [35]. According to a study conducted in Italy, which approved the FCTC in 2008, the prevalence of tobacco use among all adults decreased by 7.3% before and after the approval of the comprehensive smoke-free law and the implementation of the no-smoking policy in public places [36]. According to a study conducted in Spain, which approved the FCTC in 2005, the number of smokers decreased by 2.3% after the smoking ban legislation was implemented in public places and workplaces [37]. According to a study conducted in Ireland, which approved the FCTC in 2006, there was a 4.7% decline in smoking among bar staff after the public smoking ban compared to the pre-ban period [38].

Turkey ratified the FCTC in 2004 [39]. In order to establish a smoke-free Turkey and protect passive smokers, on May 19, 2008, the goal of the "Smoke-Free Air Zone" campaign was to prohibit cigarette consumption in all indoor areas (except restaurants, bars, cafes) [40]. On July 19, 2009, the ban was expanded to include restaurants, coffee houses, bars and cafes, ensuring that all indoor areas in Turkey are smoke-free. By prohibiting smoking indoor, the frequency of both active and passive smoking has been reduced. There was a significant reduction in the prevalence of second-hand smoke in all indoor public areas, with the greatest reduction occurring in restaurants (55.9% in 2008, 12.9% in 2012). Although it is not covered by the law,

there has been a significant reduction in the prevalence of second-hand smoke in households. Moreover, as of 19 July 2009, Turkey was ranked sixth in the world and the third in Europe in terms of having the most comprehensive tobacco control legislation, behind Bermuda, New Zealand, Uruguay, England and Ireland, according to WHO data [41].

While, active smoking is a voluntary behavior, however, exposure to SHS occurs passively and can affect nonsmokers as well. Therefore, in order to properly address SHS exposure, it is critical to identify the factors that contribute to the exposure [13]. While the demographic, socioeconomic and psychosocial determinants of tobacco use have received considerable attention in the literature, research focusing on SHS determinants is scarce [13, 42, 43].

Education is frequently considered the key indication of individual socio-economic status (SES) and is one of the core determinants of health [44, 45]. Occupation, income, and education are the key indices of SES, which is a multidimensional concept. In the literature, many researchers have preferred education as the primary indicator of SES. Earnings and occupational position may fluctuate with changes in health because educational attainment tends to stable in early adulthood. Furthermore, whereas educational status may be determined for everyone, occupational status cannot be determined for those who have recently entered or never entered the labor [46].

Material, behavioral, and cognitive theories about the relationship of SES to health and death are all linked to educational attainment [47]. The relationship between education and health is well-established, with better-educated people living longer and experiencing fewer ailments throughout their lives. Individuals' income-earning abilities are directly influenced by their educational attainment, and thus their access to adequate nutrition, shelter, health care, and other material conditions that can help them live a long and healthy life. Education can also improve one's capacity to use information to make better judgments that will improve one's prospects in life [44, 48]. A protective impact of educational attainment against drug use and SHS exposure, including alcohol use and binge drinking, has been observed in the literature [49, 50]. As a result, research have been conducted in a variety of disciplines, including health [51-53], education [54-56], and the arts [57, 58]. Furthermore, there are studies in different fields of social sciences in which educational differences are discussed [59-61].

In Turkey, little is known about the extent to which individuals with varying levels of education are exposed to tobacco smoke. As far as we know, this is the first study in Turkey to examine

the factors associated with exposure to tobacco smoke according to an individual's educational level. The following constitute this study's research problems; Does the exposure to smoke vary according to an individual's educational level?, Is there a relationship between an individual's demographic characteristics and their exposure to tobacco smoke?, and Are the factors associated with the exposure of tobacco smoke for the individuals with varying educational levels the same?

LITERATURE REVIEW

Various studies on SHS exposure have been undertaken in various countries, in various fields, on various samples, and in various years. According to a Korean study, SHS exposure was associated to frequent alcohol use in young women and long-term cigarette use in men [62]. A Spanish study found that all SHS exposure indicators were moderately strongly correlated with nicotine concentrations in the air [63]. A Portuguese study examined the short-term effectiveness of a 100% smoke-free homes intervention program in avoiding passive tobacco smoke exposure in children [64]. SHS concentrations in the living room and children's bedrooms in houses with children younger than 13 years old were found to be strongly correlated in a study conducted in Barcelona [65]. According to a Chilean study, workers in smoking facilities were exposed to more SHS than those in non-smoking areas [66]. In a study conducted in Bangladesh, children aged 10-12 years were found to be exposed to SHS at home [67]. In a study conducted in China, households exposed to SHS had a higher prevalence of gifting and sharing smokes [68]. SHS exposure was reported to be common among preschool children and their mothers (50% and 7%, respectively) in a study conducted in Taiwan [69]. In a study conducted in India, it was aimed to address factors associated with current tobacco use (CTU) and SHS exposure among older adults (≥60 years) [70]. According to a study conducted in Ireland, pregnant women who lived with a smoker were approximately four times more likely to be exposed to SHS [71] .

The variables connected to education (education level, education difference, educational achievement, etc.) come to the fore in empirical studies on SHS exposure in the literature. In their study, Assari and Bazargan [49] found that persons with a higher degree were less likely to be exposed to daily SHS. All categories of the variable of educational status were found to be efficient in exposing women to SHS in a study conducted in Turkey [7]. A study among US adults indicated that those with less education were more likely to be exposed to SHS at work [72]. According to a study conducted in South Korea, the likelihood of being exposed to SHS

decreases as one's educational level rises [73]. A study conducted in Bangladesh to determine the incidence of SHS exposure at home discovered that education had a significant impact on SHS exposure at home [74]. According to a study conducted in Australia, the higher one's educational level, the less likely one is to be exposed to SHS at home and elsewhere [75]. Less educated people were shown to be more susceptible to SHS in a study conducted in Germany [76]. According to a study conducted in Spain, children whose parents have basic and secondary education have higher overall SHS exposure than children whose parents have a university degree [77]. In a study of non-smoking adult cancer survivors in the United States, it was found that less educated individuals were more exposed to SHS [78].

In the literature, there are various studies examining the relationship between SHS exposure and education. According to a study conducted in Northern China's Inner Mongolia (Inner Mongolia, Northern China), SHS exposure rates were highest among young women who had never smoked [79]. In another study conducted in Portugal, it was found that smoking prevalence was higher among parents with lower levels of education, and that children of parents with lower levels of education were more likely to be exposed to SHS at home [80]. According to a study conducted in Spain, 25.8% of children are exposed to SHS at home, 4.6% in the automobile, 8.2% on public transportation, 31.9% in kindergarten, and 48% in their free time. The study also discovered that the higher the education level at home, the lower the exposure to SHS [77]. SHS exposure was found to be relatively high in a study of women with higher education at two Jordanian institutions [81]. In a study of American adults, it was discovered that educational attainment helped individuals avoid environmental risk factors such as secondhand smoke, with Blacks and Hispanics having less protective effects against SHS exposure than Whites [49].

METHODS

Data

The survey data for this study, survey data obtained from the Turkish Statistical Institute's 2019 Turkey Health Survey. Turkey Health Survey was conducted with the aim of closing the information gap in the current structure by obtaining data on health indicators, which account for a significant portion of the development indicators used to determine a country's development level. The research is significant as it is the first to reflect the country's overall

situation and to enable international comparisons while also shedding light on national requirements [82].

The stratified two-stage cluster sampling method was used to obtain the data. The first stage sampling unit is comprised of randomly selected blocks from clusters (blocks) containing an average of 100 house addresses proportional to their size; the second sampling unit is comprised of randomly selected household addresses from each selected cluster. The research was conducted in order to provide an overall estimate for Turkey [82].

Secondary data of individuals aged 15 years and over were employed in the study. The total sample volume has been determined to be 9,470 household addresses due to the study's design. From these households, data were gathered from a total of 17,084 people.

Outcome Variables

The dependent variable in this study is individuals' exposure to tobacco smoke according to their educational level (illiterate/unschooled, primary school graduates, primary education graduates, high school graduates, university graduates).

This research looked at five different groups, ranging from the least educated to the most educated. Studies investigating educational differences in various fields in the literature were considered to determine the education categories [49, 50, 52, 56, 83, 84]. In the study, a separate binary logit model was estimated for each education level. Individuals enrolled in the study were assigned the code "1" if they had been exposed to tobacco smoke and "0" if they had not.

Independent variables

This study's independent variables are those that are available in the Turkey Health Survey and emerge as a result of the literature review. The independent variables of this study are as follows; age (34 and under, 35–44, 45–54 and 55+), gender (male, female), marital status (never married, married, divorced/spouse died), employment status (yes, no), general health status (very good/good, moderate, poor/very bad), receipt of psycho-social support health services from primary care health institutions (yes, no), alcohol use (yes, no), tobacco use status (yes, no), and the ability to afford treatment (yes, no).

In this study, the age variable was included in the model as a qualitative variable. The inclusion of age as a qualitative variable in the model allows for a more detailed examination of its

variation across age groups. [85, 86]. Most people complete their education at an early age and continue it throughout their adult lives [87]. Therefore, 34 and under is considered as a category. In order to avoid the multicollinearity problem in the models, 55 and above are considered as a category.

Ordinal and nominal variables were defined as dummy variables to examine the effects of all variables included in the binary logistic regression model on their categories [88].

Analysis method

Survey statistics in Stata 15 (Stata Corporation) were used to account for the complex sampling design and weights. Weighted analysis was conducted [89]. The primary objective was to ascertain, the tobacco exposure of the participants in the research, as well as the frequency and percentages of the independent variables. In this study, the binary logistic regression method was used to investigate differences in tobacco exposure by educational level.

Binary logistic regression was conducted to determine the risk factors associated with tobacco smoke exposure. In cases where the result (dependent) variable has two options (binary/dichotomy), this analysis is used to investigate the relationship between the dependent variable and the independent variable(s). Binary logistic regression not only enables the statistical significance of each independent variable as a risk factor to be evaluated, but also odds ratio to be calculated [90].

Patient and public involvement

Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

RESULTS

Descriptive statistics

This study determined that individuals who are illiterate/unschooled were exposed to tobacco smoke at a rate of 32.61%, primary school graduates at a rate of 34.32%, primary education graduates at a rate of 41.75%, high school graduates at a rate of 41.04%, and university graduates at a rate of 40.34%.

Table 1 summarizes the findings regarding the factors that influence an individual's exposure to tobacco smoke based on their education level in Turkey.

Table 1. Findings regarding factors affecting individuals' exposure to tobacco smoke by education level

Variables	Entire Model f (%)	Model 1 f (%)	Model 2 f (%)	Model 3 f (%)	Model 4 f (%)	Model 5 f (%)
Age						
34 and under	5800 (33.9)	271 (12.4)	477 (8.5)	1929 (65.1)	1586 (48.9)	1537 (50.1)
35-44	3395 (19.9)	212 (9.7)	1238 (22.1)	410 (13.8)	780 (24.0)	755 (24.6)
45-54	2918 (17.1)	301 (13.7)	1527 (27.2)	320 (10.8)	402 (12.4)	368 (12.0)
55 +	4971 (19.1)	1410 (64.3)	2370 (42.2)	306 (10.3)	478 (14.7)	407 (13.3)
Gender						
Male	7784 (45.6)	392 (17.9)	2508 (44.7)	1595 (53.8)	1711 (52.7)	1578 (51.5)
Female	9300 (54.4)	1802 (82.1)	3104 (55.3	1370 (46.2)	1535 (47.3)	1489 (48.5)
Marital status						
Never married	3610 (21.1)	111 (5.1)	245 (4.4)	1263 (42.6)	1081 (33.3)	910 (29.7)
Married	11726 (68.6)	1471 (67.0)	4712 (84.0)	1579 (53.3)	1979 (61.0)	1985 (64.7)
Divorced/Spouse died	1748 (10.2)	612 (27.9)	655 (11.7)	123 (4.1)	186 (5.7)	172 (5.6)
General health status						
Very good/good	9988 (58.5)	580 (26.4)	2514 (44.8)	2129 (71.8)	2381 (73.4)	2384 (77.7)
Moderate	5214 (30.5)	870 (39.7)	2312 (41.2)	697 (23.5)	734 (22.6)	601 (19.6)
Poor/Very bad	1882 (11.0)	744 (33.9)	786 (14.0)	139 (4.7)	131 (4.0)	82 (2.7)
Employment status						
No	10557 (61.8)	1913 (87.2)	3763 (67.1)	1905 (64.2)	1873 (57.7)	1103 (36.0)
Yes	6527 (38.2)	281 (12.8)	1849 (32.9)	1060 (35.8)	1373 (42.3)	1964 (64.0)
Alcohol use						
No	14357 (85.1)	2171 (99.0)	5042 (89.8)	2558 (86.3)	2575 (79.3)	2191 (71.4)
Yes	2547 (14.9)	23 (1.0)	570 (10.2)	407 (13.7)	671 (20.7)	876 (28.6)
Psycho-social support						
No	15955 (93.4)	2057 (93.8)	5200 (92.7)	2809 (94.7)	3033 (93.4)	2856 (93.1)
Yes	1129 (6.6)	137 (6.2)	412 (7.3)	156 (5.3)	213 (6.6)	211 (6.9)
Tobacco use						
No	11853 (69.4)	1881 (85.7)	3924 (69.9)	1968 (66.4)	1984 (61.1)	2096 (68.3)
Yes	5231 (30.6)	313 (14.3)	1688 (30.1)	997 (33.6)	1262 (38.9)	971 (31.7)

Ability to afford treatment						
No	1349 (7.9)	172 (7.8)	405 (7.2)	309 (10.4)	250 (7.7)	213 (6.9)
Yes	15735 (92.1)	2022 (92.2)	5207 (92.8)	2656 (89.6)	2996 (92.3)	2854 (93.1)
Education						
Illiterate/ Unschooled	2194 (12.8)	N/A	N/A	N/A	N/A	N/A
Primary school graduates	5612 (32.8)	N/A	N/A	N/A	N/A	N/A
Primary education graduates	2965 (17.4)	N/A	N/A	N/A	N/A	N/A
High school graduates	3246 (19.0)	N/A	N/A	N/A	N/A	N/A
University graduates	3067 (18.0)	N/A	N/A	N/A	N/A	N/A

Model 1: Illiterate/ unschooled, Model 2: Primary school graduates, Model 3: Primary education graduates, Model 4: High school graduates; Model 5: University graduates

Model estimation

In the study, it was tested whether there was a multicollinearity between the independent variables to be included in the binary logistic regression model. It is thought that those with a variance inflation factor (VIF) values of 5 or greater exhibit moderate multicollinearity, while those of 10 or greater exhibit a high degree of multicollinearity [59]. There is no variable in this study that causes the problem of multicollinearity between the variables (Appendix 1).

The estimated binary logistic regression model's results are given in Table 2. The entire model estimated for all participants revealed a correlation between education level and exposure to tobacco smoke. According to Table 2, the variables age (55+), marital status (never married) and tobacco use were all found to be significant in Model 1, which was estimated for illiterate/unschooled individuals. Age, marital status (divorced/spouse died), general health status (moderate), receiving psycho-social support and tobacco use were all significant variables in Model 2, which was estimated for primary school graduates. Age, gender, general health status (moderate), employment status and tobacco use were all significant variables in Model 3, which was estimated for primary education graduates. The variables age (45-54, 55+), gender, marital status (never married), general health status (moderate), and tobacco use were found to be significant in Model 4, which was estimated for high school graduates. Finally, it was observed that the variables of age, gender, marital status (never married) and tobacco use were significant in Model 5, which was estimated for university graduates.

Table 2. Estimated model results for factors affecting individuals' exposure to tobacco smoke by education level

Variables	Entire Model β	Model 1 β	Model 2 β	Model 3 β	Model 4 β	Model 5 β
Age (reference category: 34 and under)						
35-44	-0.279[a] (0.059)	-0.302 (0.230)	-0.239[c] (0.132)	-0.400[a] (0.148)	-0.120 (0.122)	-0.365[a] (0.112)
45-54	-0.388[a] (0.065)	-0.449 (0.224)	-0.334[b] (0.131)	-0.523[a] (0.159)	-0.418[a] (0.154)	-0.408[a] (0.145)
55 +	-0.919[a] (0.069)	-1.455[a] (0.205)	-0.744[a] (0.135)	-0.874[a] (0.183)	-0.502[a] (0.159)	-0.836[a] (0.161)
Gender (reference category: male)						
Female	-0.245[a] (0.044)	-0.197 (0.170)	-0.087 (0.081)	-0.421[a] (0.105)	-0.249[a] (0.096)	-0.263[a] (0.092)
Marital status (reference category: married)						
Never married	0.263[a] (0.056)	-0.552[b] (0.263)	0.240 (0.160)	0.051 (0.113)	0.466[a] (0.113)	0.451[a] (0.102)
Divorced/Spouse died	-0.129[c] (0.072)	-0.077 (0.158)	-0.289[b] (0.115)	0.321 (0.232)	0.067 (0.199)	0.076 (0.199)
General health status (reference category: very good/good)						
Moderate	0.128[a] (0.046)	-0.128 (0.152)	0.178[a] (0.077)	0.282[b] (0.112)	0.184[c] (0.104)	-0.084 (0.114)
Poor/Very bad	0.100 (0.073)	0.036 (0.160)	0.182 (0.113)	0.153 (0.209)	-0.035 (0.228)	-0.110 (0.298)
Employment status (reference category: no)						
Yes	-0.035 (0.046)	-0.01 (0.177)	0.102 (0.084)	-0.227[b] (0.108)	-0.099 (0.100)	0.123 (0.103)
Alcohol use (reference category: no)						
Yes	0.038 (0.055)	-0.807 (0.583)	0.150 (0.115)	-0.060 (0.134)	0.122 (0.105)	0.002 (0.096)
Psycho-social support (reference category: no)						
Yes	0.140[c] (0.077)	-0.286 (0.249)	0.228[c] (0.132)	0.283 (0.196)	0.143 (0.173)	0.011 (0.169)
Tobacco use (reference category: no)						
Yes	0.837[a] (0.043)	1.312[a] (0.173)	1.019[a] (0.078)	0.990[a] (0.105)	0.526[a] (0.092)	0.570[a] (0.093)
Ability to afford treatment (reference category: no)						
Yes	0.036 (0.070)	-0.163 (0.214)	0.177 (0.130)	0.005 (0.146)	0.216 (0.166)	-0.146 (0.171)
Education (reference category: illiterate/unschooled)						
Primary school graduates	-0.255[a] (0.068)	N/A	N/A	N/A	N/A	N/A
Primary education graduates	-0.405[a] (0.081)	N/A	N/A	N/A	N/A	N/A
High school graduates	-0.389[a] (0.079)	N/A	N/A	N/A	N/A	N/A
University graduates	-0.364[a] (0.080)	N/A	N/A	N/A	N/A	N/A
Constant	-0.163 (0.108)	0.383 (0.296)	-0.865[a] (0.179)	-0.365[b] (0.182)	-0.754[a] (0.200)	-0.372[b] (0.188)

[a]p<.01; [b]p<.05; [c]p<.10
Model 1: Illiterate/ unschooled, Model 2: Primary school graduates, Model 3: Primary education graduates, Model 4: High school graduates; Model 5: University graduates

Table 3 summarizes the marginal effects of factors related to tobacco smoke exposure according to education levels are given in Table 3.

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When it comes to illiterate/unschooled individuals, those aged 45-54 is 23.3% less likely to be exposed to tobacco smoke than those aged 34 and under (reference group). Similarly, an illiterate person aged 55 or over is 91.6% less likely to be exposed to tobacco smoke than someone aged 34 or under. When the marital status variable is examined, it is discovered that an illiterate individual who has never been married is 39.3% less likely than a married individual to be exposed to tobacco smoke. A tobacco user who is illiterate is 76.1% more likely to be exposed to tobacco smoke than a non-user.

Among primary school graduates, an individual aged 35-44 is 14.2% less likely to be exposed to tobacco smoke than an individual aged 34 or under (reference group). Similarly, a primary school graduate aged 55 or over is 48.1% less likely to be exposed to tobacco smoke than an individual aged 34 or under. When the marital status variable is examined, it is discovered that a primary school graduate with a marital status of divorced/spouse died is 19.8% less likely to be exposed to tobacco smoke than a married individual. A primary school graduate with a moderate general health status is 11.7% more likely to be exposed to tobacco smoke than an individual with a very good/good general health status. Similarly, a primary school graduate receiving psycho-social support is 14.5% more likely to be exposed to tobacco smoke than those who do not receive psycho-social support. A primary school graduate who uses tobacco products is 63.4% more likely to be exposed to tobacco smoke than an individual who does not.

Among primary education graduates, an individual aged 35-44 is 23.6% less likely to be exposed to tobacco smoke than an individual aged 34 or under (reference group). Similarly, a primary education graduate aged 55 or over is 56% less likely to be exposed to tobacco smoke than an individual aged 34 or under. A woman who is a primary education graduate is 24.8% less likely to be exposed to tobacco smoke than a man of the same education level. It was discovered that the probability of being exposed to tobacco smoke is 16% higher for a primary education graduate with a moderate general health status than an individual with a very good/good general health status. An employed individual with a primary education degree is 13.4% less likely to be exposed to tobacco smoke than an unemployed individual. It was discovered that a primary education graduate who uses tobacco products is 53.9% more likely to be exposed to tobacco smoke than an individual who does not.

Among high school graduates, an individual in the 45-54 age range is 25.4% less likely to be exposed to tobacco smoke than an individual aged 34 or under (reference group) and an individual aged 55 or over is 31% less likely to be exposed to tobacco smoke than an individual

aged 34 or under. An unmarried high school graduate is 27.1% more likely to be exposed to tobacco smoke than a married individual. It was discovered that a high school graduate with a moderate general health status is 10.6% more likely to be exposed to tobacco smoke than an individual with a very good/good general health condition. It is seen that a high school graduate who uses tobacco products is 30.3% more likely to be exposed to tobacco smoke than an individual who does not.

When university graduates are considered, an individual aged 45-54 is 21.6% less likely to be exposed to tobacco smoke than an individual aged 34 or under (reference group) and an individual aged 55 or over is 54% less likely to be exposed to tobacco smoke than an individual aged 34 or under. The findings demonstrate that a university graduate who has never been married is 26.4% more likely to be exposed to tobacco smoke than a married individual. A female university graduate is 15.8% less likely to be exposed to tobacco smoke than a man of the same education level. It was also observed that a university graduate who uses tobacco products is 32.7% more likely to be exposed to tobacco smoke than an individual who does not.

Table 3. Marginal effects of factors associated with individuals' exposure to tobacco smoke by education level

Variables	Entire Model ME	Model 1 ME	Model 2 ME	Model 3 ME	Model 4 ME	Model 5 ME
Age (reference category: 34 and under)						
35-44	-0.161[a] (0.345)	-0.151 (0.116)	-0.142[c] (0.076)	-0.236[b] (0.091)	-0.069 (0.070)	-0.216[a] (0.069)
45-54	-0.229[a] (0.392)	-0.233[b] (0.115)	-0.201[a] (0.076)	-0.315[a] (0.102)	-0.254[a] (0.098)	-0.244[a] (0.091)
55 +	-0.596[a] (0.046)	-0.916[a] (0.112)	-0.481[a] (0.082)	-0.560[a] (0.128)	-0.310[a] (0.103)	-0.540[a] (0.113)
Gender (reference category: male)						
Female	-0.152[a] (0.027)	-0.131 (0.111)	-0.057 (0.053)	-0.248[a] (0.063)	-0.148 (0.057)	-0.158[a] (0.055)
Marital status (reference category: married)						
Never married	0.159[a] (0.033)	-0.393[b] (0.198)	0.151 (0.097)	0.030 (0.066)	0.271[a] (0.064)	0.264[a] (0.058)
Divorced/Spouse died	-0.084[c] (0.047)	-0.052 (0.107)	-0.198[b] (0.081)	0.178 (0.121)	0.042 (0.123)	0.048 (0.124)
General health status (reference category: very good/good)						
Moderate	0.079[a] (0.028)	-0.087 (0.103)	0.117[b] (0.051)	0.160[a] (0.061)	0.106[c] (0.059)	-0.051 (0.069)
Poor/Very bad	0.062 (0.045)	0.024 (0.106)	0.120 (0.073)	0.089 (0.118)	-0.021 (0.138)	-0.066 (0.184)
Employment status (reference category: no)						
Yes	-0.022 (0.029)	-0.007 (0.119)	0.067 (0.055)	-0.134[b] (0.065)	-0.058 (0.059)	0.074 (0.062)
Tobacco use (reference category: no)						

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Yes	0.024 (0.034)	-0.598 (0.467)	0.096 (0.072)	-0.035 (0.079)	0.071 (0.060)	0.001 (0.057)
Psycho-social support (reference category: no)						
Yes	0.085[c] (0.046)	-0.199 (0.179)	0.145[c] (0.081)	0.157 (0.103)	0.082 (0.097)	0.006 (0.101)
Tobacco use (reference category: no)						
Yes	0.492[a] (0.024)	0.761[a] (0.084)	0.634[a] (0.046)	0.539[a] (0.054)	0.303[a] (0.052)	0.327[a] (0.052)
Ability to afford treatment (reference category: no)						
Yes	0.023 (0.044)	-0.108 (0.139)	0.119 (0.090)	0.003 (0.085)	0.132 (0.105)	-0.085 (0.097)
Education (reference category: illiterate/unschooled)						
Primary school graduates	-0.149[a] (0.039)	N/A	N/A	N/A	N/A	N/A
Primary education graduates	-0.243[a] (0.047)	N/A	N/A	N/A	N/A	N/A
High school graduates	-0.232[a] (0.046)	N/A	N/A	N/A	N/A	N/A
University graduates	-0.216[a] (0.047)	N/A	N/A	N/A	N/A	N/A

[a]$p<.01$; [b]$p<.05$; [c]$p<.10$

Model 1: Illiterate/ unschooled, Model 2: Primary school graduates, Model 3: Primary education graduates, Model 4: High school graduates; Model 5: University graduates

DISCUSSION

Tobacco use causes significant health problems not only for those who use them, but also for those who do not, as tobacco smoke spreads into the environment. Each year, new evidence regarding the health risks associated with the exposure of others to tobacco smoke is obtained. Therefore, it is necessary to understand the factors that contribute to tobacco smoke in order to reduce the prevalence of secondhand smoke.

This study used data from 17,084 individuals who participated in the Turkish Statistical Institute's 2019 Turkey Health Survey. The factors affecting an individual's exposure to tobacco smoke in Turkey according to their educational level were determined in this study using binary logistic regression analysis.

The variables of education level, age, gender, marital status, general health, getting psychosocial assistance, and tobacco smoking status were found to be associated with exposure to tobacco smoke in Entire Model, which included the education variable. Furthermore, it was found in the study that the importance and effect of the variables in tobacco smoke exposure change depending on the people' educational level. As a result, risk variables for tobacco smoke exposure have been determined based on educational attainment.

In all of the models, it was determined that there was a relationship between people's age and their exposure to tobacco smoke. It has been determined that people aged 45-54 and 55 and above are less likely to be exposed to tobacco smoking than people aged 34 and below (reference group) in Model 1 (illiterate/unschooled) and Model 4 (high school graduates). All age categories were found to be statistically significant in Model 2 (primary school graduates), Model 3 (primary education graduates) and Model 5 (university graduates). It has been determined that the probability of exposure to tobacco smoke decreases as age increases.

There was a relationship between individuals' gender and exposure to tobacco smoke only in Model 3 (primary education graduates) and Model 5 (university graduates). Women were found to be less likely than men to be exposed to tobacco smoke in these models.

There was a relationship between people's marital status and their exposure to tobacco smoke in all models. It has been determined that an unmarried individual is less likely to be exposed to tobacco smoke than a married individual in Model 1 (illiterate/unschooled). It has been determined that an unmarried individual is more likely to be exposed to tobacco smoke than a married individual in Model 4 (high school graduates) and Model 5 (university graduates). In Model 2 (primary school graduates), it was determined that a divorced/widowed person is less likely than a married person to be exposed to tobacco smoke.

Only in Model 2 (primary school graduates), Model 3 (primary education graduates), and Model 4 (high school graduates), it was determined that there was a relationship between the general health status of individuals and exposure to tobacco smoke. According to these models, an individual with a moderate general health status is more likely to be exposed to tobacco smoke than someone with a very good general health status.

It was determined that there was a relationship between persons' employment status and SHS exposure only in Model 3 (primary education graduates). According to this model, a working individual is less likely to be exposed to tobacco smoke than a non-working individual.

Only in Model 2 (primary school graduates), there was a relationship between receiving psycho-social support and exposure to tobacco smoke. According to this model, an individual who received psycho-social support was more likely to be exposed to tobacco smoke than an individual who did not receive psycho-social support.

It was determined in all models that there was a relationship between people's tobacco use status and their exposure to tobacco smoke. According to these models, an individual who smokes tobacco is more likely to be exposed to tobacco smoke than someone who does not smoke.

The study discovered that as one's age increased, the likelihood of being exposed to tobacco decreased. Similar results were obtained in other studies [75, 76, 91, 92]. As people age, they realize that tobacco use is a risk factor for a variety of chronic diseases and develop a greater awareness of health issues such as quitting smoking [93]. Numerous studies have revealed that individuals with high levels/dangerous/risky use of tobacco appear to be older than their actual age [94]. Furthermore, the reason for the decline in tobacco use as individuals age may be their obsession with looking young, which makes them more cautious about tobacco product use [7]. On the other hand, as people age, they take their health more seriously and have more time and energy to devote to anti-tobacco campaigns. In this context, as the prevalence of people who have given up tobacco products increases with age, the probability of being exposed to tobacco smoke decreases [93].

Individuals who receive psycho-social support are more likely to be exposed to tobacco smoke than those who do not receive psycho-social support. Similar findings have been reported in other studies [95, 96]. Interventions aimed at reducing SHS exposure can help people's mental health. Individual-level therapies, such as education regarding the dangers of SHS exposure and avoidance techniques, may also be explored as supplementary strategies for depression management [7].

In the study, individuals with a moderate general health status were found to be more exposed to tobacco smoke than those with a very good/good general health condition. According to studies, individuals who care about their health are more conscientious about avoiding exposure to tobacco smoke [95, 96].

Individuals who are employed were found to be less exposed to tobacco smoke than those who are unemployed. According to a study that reached a similar conclusion, the risk of exposure to tobacco increases as unemployed individuals stay at home longer [97]. However, there are studies that conclude that employed individuals are more exposed to tobacco smoke than unemployed individuals [76, 91].

Individuals who have been exposed to tobacco use for an extended period of time develop similar health problems to those who use tobacco products. According to the study, those who

use tobacco products are more exposed to tobacco smoke than those who do not. Several studies in the literature reported similar findings [74, 89].

Individuals who are illiterate and have never married were determined to be less likely to be exposed to tobacco smoke than married individuals. Similar findings have been reported in the literature [75]. On the other hand, the study discovered that individuals who graduated from primary school with their marital status as divorced/spouse died were less exposed to tobacco smoke than married individuals. Similar results were obtained in some studies [98, 99]. Studies have suggested that this may be due to the fact that the majority of these individuals live alone and are thus less exposed to smoking at home [93].

According to the study, men are more exposed to tobacco smoke than women are. Similar results were obtained in other studies [76]. On the other hand, some studies in the literature argue that women are more exposed to tobacco smoke than men. Studies have reported that this may be highly correlated with women's socioeconomic status [75]. Additionally, some studies have discovered that women are more likely to be exposed to SHS because they spend more time doing housework in regulated industries that are less likely to challenge SHS policies [100].

This study is not without limitations. To begin, the study relies on secondary data. The variables required for statistical analysis are those found in the data set. Additionally, some variables such as individuals' occupations, home ownership status, levels of exposure to tobacco smoke by parents, siblings, as well as other household members and friends were not included in the analysis. Furthermore, because the data set did not include information about the location of tobacco smoke exposure, this study focused on general SHS exposure. The distinction between SHS-exposed locations such as homes, public places, workplaces, restaurants, and bars was omitted. Secondly, because tests to determine individuals' exposure to tobacco smoke could not be conducted in a laboratory setting, the study relied on the women's own responses. The data obtained might be biased as a result of this data collection method.

This limitation may be overcome in the future by more objective measures of SHS exposure. Future research should further explore determinants that cannot be identified qualitatively. Objective measurement of smoke inhalation can be helpful in avoiding reporting bias. In addition, studies must account for variation within countries and acknowledge that there may

be significant differences in prevalence and determinants between regions within the same country.

Future research can identify key factors influencing an individual's social acceptability of SHS exposure. Identifying these factors is critical when planning and designing tobacco prevention programs that target SHS exposure. If health risks are communicated effectively and guided by the demands of (several) target groups, the social acceptability of tobacco exposure will be further reduced.

CONCLUSION

As a result of the study, it is emphasized that men, young individuals, individuals with moderate and very good general health status, those who use tobacco, those who are unemployed and those who receive psycho-social support should be targeted. These groups require additional protection against SHS exposure. Appropriate strategies for reducing SHS exposure should be developed, taking into account public health strategies for increasing awareness of the adverse health effects of SHS exposure and the determinants of tobacco exposure. Turkey's National Tobacco Control Program Action Plan, coordinated by the Ministry of Health, took effect on January 27, 2015. The strategies outlined in said action plan include ensuring that society exhibits the right attitudes and behaviors in response to violations by increasing awareness that protection from second hand smoke exposure is a human right in terms of health, enacting necessary legislative changes to expand the areas where tobacco and tobacco products are prohibited, and increasing public awareness and advocacy on the issue. In addition, the National Tobacco Control Program Action Plan includes strategies for establishing the necessary system for determining and regularly monitoring the level of second hand smoke exposure in society, as well as for initiating and maintaining social support for passive smoke prevention in homes/living areas/private properties.

Policies prohibiting tobacco use in public places are necessary for a variety of reasons. Primarily, the public is uncomfortable with SHS exposure and views it as harmful to health. However, the majority of non-smokers take no personal precautions to avoid exposure to SHS. Government agencies must take action to protect non-smokers. Moreover, restricting tobacco use in public places may increase the likelihood that people will use fewer tobacco products or will quit entirely.

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Appendix 1. VIF values for all models

Variables	Entire Model VIF	Model 1 VIF	Model 2 VIF	Model 3 VIF	Model 4 VIF	Model 5 VIF
Age (reference category: 34 and under)						
35-44	1.70	1.69	3.04	1.34	1.6	1.3
45-54	1.82	2.09	3.45	1.33	1.44	1.25
55 +	2.68	3.16	4.3	1.51	1.73	1.56
Gender (reference category: male)						
Female	1.38	1.24	1.42	1.44	1.35	1.16
Marital status (reference category: married)						
Never married	1.62	1.16	1.14	1.65	1.7	1.29
Divorced/Spouse died	1.17	1.19	1.09	1.09	1.1	1.09
General health status (reference category: very good/good)						
Moderate	1.26	1.71	1.23	1.14	1.12	1.07
Poor/Very bad	1.35	1.82	1.25	1.11	1.1	1.05
Employment status (reference category: no)						
Yes	1.44	1.16	1.35	1.46	1.41	1.31
Alcohol use (reference category: no)						
Yes	1.17	1.05	1.13	1.17	1.12	1.08
Psycho-social support (reference category: no)						
Yes	1.03	1.01	1.04	1.04	1.05	1.03
Tobacco use (reference category: no)						
Yes	1.19	1.18	1.2	1.29	1.16	1.08
Ability to afford treatment (reference category: no)						
Yes	1.04	1.05	1.05	1.04	1.04	1.08
Education (reference category: illiterate/unschooled)						
Primary school graduates	2.67	N/A	N/A	N/A	N/A	N/A
Primary education graduates	2.54	N/A	N/A	N/A	N/A	N/A
High school graduates	2.57	N/A	N/A	N/A	N/A	N/A
University graduates	2.61	N/A	N/A	N/A	N/A	N/A

Model 1: Illiterate/ unschooled, Model 2: Primary school graduates, Model 3: Primary education graduates, Model 4: High school graduates; Model 5: University graduates

STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	5
Objectives	3	State specific objectives, including any prespecified hypotheses	6
Methods			
Study design	4	Present key elements of study design early in the paper	6-8
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6-8
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	6-8
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6-8
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	6-8
Bias	9	Describe any efforts to address potential sources of bias	6-8
Study size	10	Explain how the study size was arrived at	6-8
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	6-8
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	6-8
		(*b*) Describe any methods used to examine subgroups and interactions	6-8
		(*c*) Explain how missing data were addressed	6-8
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	6-8
		(*e*) Describe any sensitivity analyses	6-8
Results			

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	8-14
		(b) Give reasons for non-participation at each stage	8-14
		(c) Consider use of a flow diagram	8-14
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	8-14
		(b) Indicate number of participants with missing data for each variable of interest	8-14
Outcome data	15*	Report numbers of outcome events or summary measures	8-14
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	8-14
		(b) Report category boundaries when continuous variables were categorized	8-14
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	8-14
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	8-14
Discussion			
Key results	18	Summarise key results with reference to study objectives	14-16
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	14-16
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	14-16
Generalisability	21	Discuss the generalisability (external validity) of the study results	14-16
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	4

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.