

The Knowledge and Attitude about New Generation Tobacco Products among Physicians

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Abstract

OBJECTIVE: Health hazards of e-cigarettes including “e-cigarette or vaping product use-associated lung injury” are better understood today. Just as e-cigarettes, heated tobacco products release toxic emissions. We aimed to determine the knowledge and attitude about new generation tobacco products among physicians who were the members of an organization for health care professionals, the majority of whom are pulmonologists.

MATERIAL AND METHODS: In this cross-sectional study, a self-administered online questionnaire-based survey was conducted among the physicians from April to October 2019. The survey included questions about demographics (gender, age, graduation date from medical institution, and academic title), their smoking status, their knowledge and attitudes toward new generation tobacco products, and additionally about whether new generation tobacco products can be used to aid in smoking cessation.

RESULTS: Among the 506 members who responded to the survey, 56.7 % were female; the mean age was 42.4 ± 10.9 years (20-74). About 74.5% were pulmonologists, 5.5% were thoracic surgeons, and 20% were other physicians. Among the responders, the frequency of those who have not heard of new generation tobacco products before was determined as 9.5%, 24.5%, and 41.3%. At least 58.9% of participants lacked the knowledge necessary to discuss these products with their patients and the rate reached 76.7% for the heated tobacco product. To the question of whether new generation tobacco products can be used in smoking cessation, 68.4% responded “I never agree that they can be used.” Non-current smokers ($P = .003$), elders ($P = .001$), those who had training on smoking cessation assistance ($P = .001$), and those who had experience in smoking cessation assistance ($P = .009$) were significantly more prevalent in the group who answered: “I never agree that they can be used.”

CONCLUSION: Physicians must become considerably more knowledgeable about the new generation tobacco products and hazards. Otherwise, these new tobacco products may pose new threats to national and global tobacco control efforts.

KEYWORDS: Turkish, physicians, e-cigarette, electronic nicotine delivery systems, ENDS, smoking cessation

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INTRODUCTION

Electronic cigarette (e-cigarette) use is dramatically increasing in many countries, especially among the young population in the last decade.¹⁻³ Very recent evidence, from 26 national surveys representing 69 countries and territories, shows a strikingly high ever use (defined as any lifetime use) prevalence rate of electronic nicotine delivery system (ENDS) or electronic non-nicotine delivery system (ENNDS) as 17.2% (95% CI: 15-20, $I^2 = 99.9\%$), whereas for current use (defined as use in past 30 days), the pooled prevalence estimate was 7.8% (95% CI: 6-9, $I^2 = 99.8\%$).⁴ The tobacco industry adopts the same strategies used to disseminate cigarette smoking for e-cigarette advertisement and marketing and even applies more invasive strategies for producing new generation products that appeal to youth. Growing evidence shows that e-cigarettes may serve as a gateway to the maintenance of nicotine addiction.⁵

E-cigarettes deliver nicotine, flavorings, and other additives by an inhaled aerosol. They contain ultrafine particles, volatile organic compounds, and heavy metals. Hazardous chemical compounds such as propylene glycol, glycerol, ethylene alcohol, polyethylene glycol, diacetyl, diethylene glycol, amino-tadalafil, rimonabant, cannabidiol, nitrosamines, formaldehyde, acetaldehyde ketone, mercury, and tetramethyl pyrazine and heavy metals such as lead, nickel, and chromium have been found in e-cigarettes.⁶ Moreover, recent findings show that flavors cause cytotoxicity in human embryonic cells in relevant experimental models.^{7,8} Health hazards of nicotine dependence and e-cigarettes, including a life-threatening acute lung injury and e-cigarette or vaping product use-associated lung injury, the EVALI, are better understood today.⁹ Just as e-cigarettes, heated tobacco products (HTPs) release toxic emissions, many of which are carcinogenic. Today, there is insufficient evidence to suggest that HTPs are less harmful than conventional cigarettes. According to the World Health Organization and European Respiratory Society, HTPs are addictive and harmful similar to regular cigarettes.^{10,11}

Both e-cigarettes and HTPs are promoted as “harm-reduced” products by claiming that they do not produce the same harmful combustion as the conventional cigarettes.¹² There is a debate whether ENDS and ENNDS can be used for smoking

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cessation. Kalkhoran et al¹³ concluded that the odds of quitting cigarettes were 28% lower in those who used e-cigarettes compared to those who did not use e-cigarettes (odds ratio (OR): 0.72, 95% CI: 0.57-0.91) in a meta-analysis including 2 randomized controlled trials and 18 observational studies' results. Moreover, many evidence shows that the use of ENDS is a predictor of future cigarette smoking.^{14,15} Besides, youth ENDS initiation rates are associated with the rise in ever tobacco users.¹⁶ A large United States cohort study, Population Assessment of Tobacco and Health, demonstrated that 180 000 ever smokers and 45 000 current smokers have initiated smoking after using ENDS.¹⁷

E-cigarettes have been promoted for smoking cessation, despite the fact that, as of November 2020, no e-cigarette has been accepted by the United States Food and Drug Administration's Center for Drug Evaluation and Research as a smoking cessation medication or by the local authorities of many other countries worldwide.^{18,19} This study sought to highlight the debate on whether new generation tobacco products can be used for smoking cessation and to determine the level of knowledge and attitude about new generation tobacco products among physicians who were members of the Turkish Thoracic Society (TTS).

MATERIAL AND METHODS

From April to October 2019, a self-administered online questionnaire-based survey was conducted among TTS members, which is an organization for health care professionals, the majority of whom are pulmonologists.

The findings of this study were obtained by reanalyzing data from a TTS scientific research project entitled "Knowledge, attitudes, and behavior of TTS pulmonologists regarding tobacco and new tobacco products." The TTS Scientific

Project Committee accepted the study protocol (No: Y-184-2021, Date: June 25, 2021). Following a pretest which is performed among the members of Tobacco Control Study Group of TTS, all other TTS members were invited to participate in the survey by e-mail. The total number of pulmonologist members during the study period was 2941. Invitation mail also included a link to the online questionnaire performed by Survey Monkey. Due to the nature of the survey, informed

Table 1. Descriptive Characteristics of the Members of the Turkish Thoracic Society Who Answered the Web Questionnaire

	TTS Members N = 506 (%)
Sex	
Female	287 (56.7)
Male	219 (43.3)
Age, mean ± SD (min-max)	42.4 ± 10.9 (20-74)
Specialists	
Pulmonologists	377 (74.5)
Chest surgeon	28 (5.5)
Pediatricists	18 (3.6)
Public health physicians	15 (3.0)
Family practitioners	18 (3.6)
All others	50 (9.9)
Title	
Residents	94 (18.6)
Specialists	224 (44.3)
Family practitioners	17 (3.4)
Instructors	18 (3.6)
Assistant professors	29 (5.7)
Associated professors	54 (10.7)
Professors	70 (13.8)
Current smoking frequency	
Among pulmonologists (n = 377)	37 (9.8)
Among chest surgeons (n = 28)	9 (32.1)
Among all (n = 506)	77 (15.8)
Frequency of other tobacco products*	
Cigar	82 (16.3)
Pipe	32 (6.3)
Hookah	115 (22.7)
Fine-cut tobacco/roll your own cigarette	4 (0.8)
Frequency of new tobacco products*	
Electronic cigarette (closed tank system)	8 (1.6)
Electronic cigarette (open tank system with liquid)	19 (3.8)
Heated tobacco products	1 (0.2)
Chewing tobacco	4 (0.8)
Snooze/snus	2 (0.4)

*The pooled prevalence for ever user.
TTS, Turkish Thoracic Society; SD, standard deviation.

MAIN POINTS

- Although the vast majority of participants have heard of new generation tobacco products and a sizable proportion have had patients who used them, the fact that the positive response to the question "Are you knowledgeable enough to discuss the aforementioned tobacco products?" is 40% or less is a situation worth considering.
- Training and experience in smoking cessation assistance were the only 2 variables making a significant difference in the knowledge about new generation tobacco products.
- When it was asked whether new generation tobacco products can be used to aid in smoking cessation, 68.4% responded "I never agree that they can be used."
- In this survey, those who answered "I never agree with the opinion that new generation tobacco products can be employed in smoking cessation" were substantially more likely to be non-current smokers, elders, and those with training and experience in smoking cessation help.
- The frequency of respondents responding "Absolutely I agree" to the following 2 statements: "E-cigarette emissions are also considered second-hand smoke" and "E-cigarette harms the denormalization of tobacco use, as it resembles cigarettes." were 55.7% and 65.9%, respectively, and these are consequences to consider.

consent was waived, and all participants were considered to consent after willingly completing and returning the questionnaire. Every week during the study period, reminders were e-mailed to participants to encourage them to participate. The response rate was calculated as the number of fully answered questionnaires divided by the number of all pulmonologist members of TTS. The survey included questions about demographics (gender, age, graduation date from medical institution, and academic title) and the current smoking status of responders. We asked respondents about their knowledge and attitudes toward new generation tobacco products and obtained responses regarding their awareness of and use of new generation tobacco products among their patients. Additionally, the questionnaire included a question about whether new generation tobacco products can be used to aid in smoking cessation.

The smokers who have smoked 100 cigarettes in their lifetime and who currently smokes cigarettes are categorized as active smokers, including daily smokers and non-daily smokers (also known as occasional smokers). The pooled prevalence for ever use (defined as any lifetime use) was defined as being once a smoker for all tobacco products (cigars, pipes, hookah, and new generation tobacco products) in their lifetime. The electronic nicotine delivery systems such as e-cigarettes and HTPs were defined as new generation tobacco products.

Statistical Analysis

A descriptive analysis was performed for demographic features. Differences in proportion were assessed by Pearson's chi-square test. For statistical analyses, an independent samples *t*-test was used for continuous data with normal distribution, and the Mann-Whitney *U* test was used for the data not normally distributed. Logistic regression was used to assess the association between practicing in a smoking cessation outpatient clinic and having smoking cessation care education after controlling for the potential confounders. Odds ratios and corresponding 95% CI were computed to assess the strength of associations. A *P*-value < .05 was considered statistically significant. All analyses were conducted with the Statistical Package for Social Sciences version 26.0 software (IBM Corp.; Armonk, NY, USA).

RESULTS

Among 506 TTS members who responded to the web survey sent at regular intervals, between April and October 2019, 56.7% were female; the mean age was 42.4 ± 10.9 years (20-74). About 74.5% were pulmonologists, 5.5% were thoracic surgeons, and 20% were other physicians. About 44.3% were specialists without academic titles, 33.8% were academicians, 18.6% were residents, and 3.4% were general practitioners (Table 1). The response rate among all members was 17.2% (506/2941).

Among responders, 8.3% were active occasional smokers and 6.9% were active daily smokers; the active smoking rate was 15.2% totally. Active smoking was 9.8% among pulmonologists. While 4.0%, 0.8%, and 5.3% of responders were active users of cigars, pipes, and hookahs, respectively. The rate of responders being once a user of these tobacco products in their lifetime (pooled prevalence) was recorded as 16.3%, 6.3%, and 22.7% in the same order. The frequency of use of e-cigarettes, liquid e-cigarettes, and HTPs at some point in their lives was 1.6%, 0.6%, and 0.2%, respectively (Table 1).

The responses of the participants about awareness and use of new generation tobacco products were shown in Table 2. The answers to the 5 questions asked to evaluate the knowledge of the responders about new generation tobacco products are represented in Table 3. The rates of the answer "yes, I know" were significantly higher in the group who had experience on smoking cessation assistance (*P* < .05 for all 5 questions). Training and experience in smoking cessation assistance were the only 2 variables making a significant difference in the distribution of the answers.

The answers for the 3 sentences asked for the thoughts to evaluate the attitude of the responders about new generation tobacco products are shown in Table 4.

To the question of whether new generation tobacco products can be used in smoking cessation, 68.4% responded "I never agree that they can be used;" 11.1% responded as "I don't know enough about this subject, I can't comment;" 5.1% responded "I am undecided because of some parts in the scientific community recommending its use;"

Table 2. Responses of the Participants About the Awareness and Use of New Generation Tobacco Products

	E-cigarette (Closed Tank System)		Liquid e-Cigarette (Open Tank System)		Heated Tobacco Products	
	Yes n (%)	No n (%)	Yes n (%)	No n (%)	Yes n (%)	No n (%)
Have you heard of the aforementioned new generation tobacco product before?	458 (90.5)	48 (9.5)	382 (75.5)	124 (24.5)	297 (58.7)	209 (41.3)
Are you knowledgeable enough to discuss the aforementioned tobacco product?	208 (41.1)	298 (58.9)	131 (25.9)	375 (74.1)	118 (23.3)	388 (76.7)
Have you encountered a patient who is currently abusing the tobacco product mentioned above?	254 (50.2)	252 (49.8)	174 (34.4)	392 (65.6)	115 (22.7)	391 (77.3)
Have you recommended the aforementioned tobacco product to a patient?	6 (1.2)	500 (98.8)	5 (0.9)	501 (99.0)	5 (0.9)	501 (99.0)

Table 3. The Answers for the 5 Sentences Asked for Their Knowledge About New Generation Tobacco Products and the Frequency Difference in Answers According to Having Experience on Cessation Assistance or Not

Do You Know About These Statements?	Having Experience on Smoking Cessation Assistance Column %	Not Having Experience on Smoking Cessation Assistance Column %	Total	P
The import and sale of electronic cigarettes and heated tobacco products are prohibited in our country.				
Yes, I know	68.5	49.0	58.1	<.001
No, I do not know	31.5	51.0	41.9	
Electronic cigarettes contain water, nicotine, propylene glycol, glycerol, and flavors (tobacco, mint, and fruit flavors).				
Yes, I know	90.4	83.4	86.7	.025
No, I do not know	9.6	16.6	13.3	
The liquid used in electronic cigarettes usually contains more nicotine than conventional cigarettes.				
Yes, I know	58.4	41.6	50.4	.001
No, I do not know	43.5	56.3	49.6	
There may also be nicotine-free liquid use in liquid-filled e-cigarettes.				
Yes, I know	39.3	28.1	33.3	.01
No, I do not know	60.7	71.9	66.7	
In heated tobacco products, tobacco is heated to 250-300°C without burning and using pressed carbon				
Yes, I know	50.2	34.4	41.7	<.001
No, I do not know	49.8	65.6	58.3	

5.1% responded “I agree that it can only be used in special groups (pregnant women, psychiatric patients, etc.);” 3.6% (n = 18) said, “I absolutely agree with the opinion that it can be used.” While 9% of responders who gave the answer “I never agree that they can be used” were current smokers, this rate was 19% for the rest (P = .02). As shown in Table 5, non-current smokers (P = .003), elders ($t_{0.05; 470} = -3.704$; P = .001), those who had training on smoking cessation assistance (P = .001), and who had experience on smoking cessation assistance (P = .009) were significantly more prevalent in the group who answered: “I never agree that they can be used.”

When the variables identified in the 1-way analysis and those found to be effective on participants’ responses “I never agree

that they can be used” were evaluated using logistic regression analysis as potential confounders (current smoking, elder age, having training on cessation assistance, and having experience in smoking cessation assistance), we discovered that having training on smoking cessation assistance increased (95% CI = 1.30-3.69) the likelihood of participants responding “I never agree with the opinion that it can be used” by 2.19 times; however, being a current smoker decreased the likelihood by half (OR = 0.54; 95% CI = 0.29-0.98) (Table 6).

DISCUSSION

In this study, we highlighted the knowledge and attitude of the physicians who were the members of TTS about new generation tobacco products. Although the vast majority of

Table 4. The Answers for the 3 Sentences Asked for the Thoughts to Evaluate the Attitude of the Responders About New Generation Tobacco Products

Do You Agree With These Statements?	I Absolutely Agree %	I Am Undecided %	I Strongly Disagree %	I Do Not Know %
E-cigarettes and heated tobacco products are a safer alternative to traditional cigarettes as they provide a potential reduction in exposure to toxic substances.	3.4	15.9	72.5	8.3
E-cigarette emissions are also considered second-hand smoke.	55.7	16.9	9.1	18.2
E-cigarette harms the denormalization of tobacco use, as it resembles cigarettes.	65.9	15.5	6.4	12.3

Table 5. The Characteristics of Participants Who Answered the Question Whether New Generation Tobacco Products Can Be Used in the Smoking Cessation, as “I Never Agree That They Can Be Used” Compared to Those of Other Participants

	The Answer as “I Never Agree That They Can Be Used” n= 346%	All the Other Answers n = 160 %	P
Sex			.5
Female	72.1	27.9	
Male	74.9	25.1	
Age, mean ± SD (min-max)	44.8 ± 11	40.4 ± 12	.001
Academic/educational Staff	72.1	27.9	.5
Non-academic/educational Staff	74.1	25.2	
Having training on smoking cessation assistance	83.4	16.6	<.001
Not having training on smoking cessation assistance	64.7	35.3	
Having experience in smoking cessation assistance	79.0	21.0	.009
Not having experience in smoking cessation assistance	68.4	31.6	
Smoking status			
Current smokers	56.4	43.6	.003
Non-current smokers	75.5	24.5	.2

SD, standard deviation.

participants have heard of new generation tobacco products and a sizable proportion have had patients who used them, the fact that the positive response to the question “Are you knowledgeable enough to discuss the aforementioned tobacco products?” is 40% or less is a situation worth considering. At least 58.9% of participants lacked the knowledge necessary to discuss these products with their patients and the rate reached 76.7% for HTPs. To incorporate new generation tobacco products screening and counseling into their routine clinical assessment, the physicians must be knowledgeable about the pros and cons of them and must be comfortable discussing the subject with patients. However, most respondents in some studies stated that they learned about e-cigarettes from anecdotal information sources such as media and advertisements or conversations with patients rather than through professional scientific resources and reported low levels of comfort discussing e-cigarette with the patients.^{20,21}

In this context, we found that the rates of the physicians who knew some general statements about the harmful effects of these products were higher in the group who had training on smoking cessation assistance and who had experience with it. Training and experience in smoking cessation assistance

were the only 2 variables making a significant difference in the distribution of the opposite answers (I know/I do not know) for the statements shown in Table 3 in the results.

There is a dearth of research on this subject in the literature, but 1 study from Korea found that the majority of physicians (pulmonologists, thoracic surgeons, radiation oncologists, and medical oncologists) practicing in a university hospital or cancer center setting disapproved of e-cigarettes as a smoking cessation treatment (78.3%) and would not recommend them to smokers who failed to quit using conventional smoking cessation treatment (74.1%).²¹ Our study found slightly lower rates. When it was asked whether new generation tobacco products can be used to aid in smoking cessation, 68.4% responded, “I never agree that they can be used.” Also in our study, they responded “I strongly disagree” in a frequency of 72.5% to this statement: “E-cigarettes and heated tobacco products are a safer alternative to traditional cigarettes because they provide a potential reduction in exposure to toxic substances.” Similarly, in Shin’s study²¹, respondents believed e-cigarettes were no safer than traditional cigarettes (75.7%) or smokeless tobacco (83.2%) but feared discussing them with patients would increase usage (65.4%). Despite the

Table 6. Logistic Regression Analysis of the Factors Affecting the Opinion of Responders on the Use of New Generation Tobacco Products in the Smoking Cessation Process as Saying That “I Never Agree That They Can Be Used”

	B	SE	OR	95% CI	P
Current smoking	-0.616	0.304	0.540	0.297-0.981	.043
Elder age	0.026	0.010	1.027	1.006-1.048	.009
Having training on smoking cessation assistance	-0.788	0.266	2.198	1.306-3.699	.003
Having experience in smoking cessation assistance	-0.048	0.253	1.049	0.639-1.721	.850

SE, standard error; OR, odds ratio.

fact that most US primary care physicians believe e-cigarettes are safer than tobacco cigarettes and smokeless tobacco, only a minority believe that discussing them with patients will encourage their usage.²² Except for a few of these studies, many other studies have demonstrated that e-cigarettes are unsuccessful in quitting smoking, and the evidence for quitting smoking is well known. E-cigarettes do not aid in the cessation of smoking according to a meta-analysis of 55 observational studies and 9 randomized trials.²³ Tobacco industry and allied companies pitch and promote ENDS as “less dangerous” substitutes for conventional cigarettes, and many users believe they are significantly “less harmful” than tobacco products, particularly cigarettes.²⁴ The fact that some of our study participants are apprehensive about utilizing new generation tobacco products to quit smoking implies that the industry’s marketing efforts are particularly effective among some young physicians who also smoke. In our survey, those who answered “I never agree with the opinion that new generation tobacco products can be employed in smoking cessation” were substantially more likely to be non-current smokers, elders, and those with training and experience in smoking cessation help.

While many of the long-term health consequences of new generation tobacco products are unknown, there is mounting evidence that these drugs are not innocuous. E-cigarettes have a significant impact on the respiratory and cardiovascular systems, as well as the liver, kidneys, and nervous system. E-cigarettes have been shown to cause oxidative stress, inflammation, and DNA damage in the lungs.^{25,26} E-cigarette or vaping use-related lung damage has been linked to a substantial number of hospitalizations and deaths in the United States. Lung health is negatively impacted by excessive quantities of metals in the e-cigarette aerosol. So increasing research at various levels demonstrates that new generation tobacco products are dangerous. Vaping is associated with an increase in inflammation, altered lipid homeostasis, and mitochondrial dysfunction, as well as an increase in microbial susceptibility, although the long-term effects are unknown. The scientific evidence is mounting that e-cigarette vaping, like traditional tobacco cigarette smoking, is not a safe practice.^{9,27}

In a review regarding the epigenetic effects of e-cigarette aerosols and additionally, discussing the effects of several common e-cigarette ingredients on DNA methylation, histone modifications, and noncoding RNA expression (nicotine, tobacco-specific nitrosamines, volatile organic compounds, carbonyl compounds, and toxic metals), it was concluded that these epigenetic effects may account for some of the diseases associated with e-cigarette use, and similar to traditional cigarettes, inhaling e-cigarette aerosols may cause epigenotoxicity in the human body.²⁸

The frequency of respondents responding “Absolutely I agree” to the following 2 statements: “E-cigarette emissions are also considered second-hand smoke” and “E-cigarette harms the denormalization of tobacco use, as it resembles cigarettes” was 55.7% and 65.9%, respectively, and these are consequences to consider. Lobbying for an exception for the use of ENDS has been an attempt to undercut indoor smoking

restrictions. It is difficult to tell the difference between ENDS and HTPs, which both include tobacco because the ENDS produce an aerosol that resembles tobacco smoke.²⁹

It has been noted that the new generation tobacco products have potential risks of dual use with conventional cigarettes, although they do not induce people to stop smoking.³⁰ Smoking tobacco has been “denormalized” in many social circumstances, particularly in public indoor areas. Allowing HTP use in smoke-free areas may re-normalize smoking, resulting in dual use of HTP and cigarettes and continued nicotine dependence. Regrettably, this may make smoke-free policies more difficult to implement.

Due to our study’s low response rate, it is difficult to draw definitive findings concerning all members of TTS. Our data were collected through self-reporting, and we do not have information on nonresponders in order to compare the 2 populations’ differences (responders and nonresponders). However, this circumstance may not be a source of bias for some of our findings. To be specific, respondents in our study may have been chosen from a self-selected cohort with heightened awareness of tobacco and tobacco control issues. We discovered that in the population projected to be more sensitive, the positive response to the question “Are you aware enough to discuss the new tobacco products?” is 40% or less. Given the possibility that this rate is underreported due to selection bias, this circumstance has no influence on our discourse but rather emphasizes its importance.

In conclusion, the use of the new generation tobacco products could lead to a resurgence of smoking, especially among youngsters, causing tobacco industries to sell new generation tobacco products with a marketing strategy using the statement “less dangerous” in order to maintain the continuation of nicotine addiction. There is no evidence for less damaging but new health hazards such as EVALI are becoming more obvious with each passing day. It is the responsibility of physicians to protect and educate the general public about the tobacco industry’s marketing strategies and products, so physicians must become considerably more knowledgeable about these new tobacco products and hazards. Otherwise, these new tobacco products may pose new threats to national and global tobacco control efforts.

Ethics Committee Approval: The TTS Scientific Project Committee accepted the study protocol (No:Y-184-2021, Date: 25.06.2021).

Informed Consent: All participants were considered to consent after willingly completing and returning the questionnaire.

Peer-review: Externally peer-reviewed.

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