



Research Article

Use of and Awareness about Electronic Cigarette among Medical School Students

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Abstract

Objectives: Nicotine is an addictive alkaloid agent. Electronic cigarette (e-cigarette) is a product that contains nicotine and various ingredients while producing steam. Its usage is spreading among people in Turkey like in other countries. The aim of this study is to find out the frequency of e-cigarette usage among medical students, their views on e-cigarette and their awareness.

Methods: To find out the smoking habits of medical students, the frequency of their e-cigarette usage, as well as their level of knowledge on the issue, a survey composed of 36 questions is applied among the students of Ufuk University Faculty of Medicine.

Results: The percentage of cigarette usage among the students is 22.8% while 11.5% of these students tried e-cigarette. The percentage of male students who tried e-cigarette is significantly higher than the female students (63.9% vs. 36.1%) ($p=0.004$). 43.7% ($n=31$) of 71 active smokers are using e-cigarettes as well. In the survey, 75% of the e-cigarette users claim that their cigarette deprivation stayed unchanged and 52.8% of the smokers state that they did not experience any side effects depending on e-cigarette usage. Both the students who never smoke and the ones who are active smokers state that they received information about e-cigarette generally from their friends (35.8% and 47.9%, respectively). Both groups think that e-cigarette is less harmful than cigarette. The active smokers have more information about the contents of e-cigarette when compared to the group of non-smokers (25.9% vs. 46.5%) ($p=0.004$). Neither of these groups know that e-cigarette is banned by the Ministry of Health ($p=0.377$).

Conclusion: The percentage of e-cigarette usage among the medical school students cannot be underestimated. This study reveals that students do not have sufficient information about the potential harms of e-cigarette. In addition to the informative and anti-smoking studies on cigarette usage, studies on the harms of e-cigarettes must also be carried out.

Keywords: Awareness, electronic cigarette, medical students

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Electronic cigarette (e-cigarette) is an alternative tool that is developed to help the smokers quit smoking. Although e-cigarettes are produced in different kinds, all of them are composed of a liquid cartridge, an energy source, a pipe stub, and an electronic circuit that evaporates the liquid in the refillable cartridge consisting of propylene glycol and/or glycerol. Nicotine and various tastes can be added into the evaporative liquid.^[1] In recent years, the number of e-ci-

garette users among youth has significantly increased.^[2]

In a review study, based on the studies conducted in six different countries between 2011 and 2014, awareness about e-cigarette among the adolescents has increased from 10.2% to 67%.^[3] Accordingly, the percentage of awareness about e-cigarette is 54% in England, 40% in Canada, and 20% in Australia.^[4, 5] In 2016, e-cigarette is the most common tobacco product among the middle as well as the

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high school students in the US.^[6] Another study shows that the adolescents addicted to e-cigarette have higher potential to start traditional cigarette smoking in the future.^[7] Many studies point out that the use of e-cigarette has been becoming commonplace in recent years, influencing the adolescent population all over the world.^[8,9]

Although some studies argue that e-cigarette is safe and can be used longer than the nicotine replacement therapy, the fact that e-cigarette is not innocent is being understood day by day. Different from traditional cigarettes, tobacco does not burn in e-cigarettes, but there may be various amounts of nicotine (0–26 mg) in their cartridges.^[10] An analysis covering 44 studies highlighted that the serum nicotine level of e-cigarette users is similar to the traditional cigarette users and the level is risky especially for children.^[11] Another study showed that e-cigarette includes some carcinogenic and toxic materials such as nitrosamine and diethylene glycol of e-liquids.^[12]

E-cigarettes have gained popularity in part due to availability in a wide variety of flavorings that may be appealing to adolescents and young adults, the perception that e-cigarettes is less harmful than smoking, absence or poor enforcement of regulations on indoor use, and the recent popularity of product-specific venues that encourage use of these products in social situations, such as vape shops.^[13] In a recent review, male gender, older age, higher amount of pocket money, and tobacco smoking-related characteristics, such as regular and heavier smoking, and having peers who smoke, are the most common trends in characteristics of adolescent e-cigarette users.^[14] Another study shows that the majority of adolescents knew about many of the risks of e-cigarettes, with no differences between never and ever users and prior combustible cigarette use, mother's education, and addiction emerged as significant predictors of adolescents' e-cigarette use.^[15]

There has not been conducted any study on the frequency of e-cigarette usage among students in Turkey, since the product is not legally sold in the country but can be purchased only on the internet. This study aims to determine the frequency of e-cigarette usage among medical school students and their views on as well as their awareness about the subject.

Methods

Study Design and Setting

In this study, a questionnaire composed of 38 questions was conducted among the 1st, 2nd, 3rd, 4th, 5th, and 6th class students studying at Faculty of Medicine of Ufuk University. The questionnaire was optional and the students were in-

formed about its aim. At least one cigarette per day was accepted as the criterion for tobacco usage. The demographic qualities of cases, the smoking habits of family members, smoking and addiction to nicotine levels (Fagerström test), and the year of active smoking were questioned. Active smokers' view on quitting smoking and whether the exsmokers received any medical support and/or applied to any health institution during the quitting process were questioned. Both the active smokers and the exsmokers were inquired about their e-cigarette experience and their awareness about the side effects or harms of e-cigarette. The students' personal views on e-cigarette and the necessity of public service ads as well as their awareness about the content of e-cigarette, and the Turkish Ministry of Health's decision on the product and indoor smoking were asked and recorded. Approval of the ethics committee of the same hospital was obtained.

Statistical Analysis

Statistical analysis was carried out through the IBM SPSS for Windows Version 22.0 pack. Numeric variables are shown through the approximate±standard deviation or median values (minimum-maximum) while categorical variables are given through numbers and percentages. Whether there was difference between the groups in terms of categorical variables searched, using Chi-square test or Fisher exact test. Whether the numerical variables had normal distribution were checked by Kolmogorov–Smirnov test while the homogeneity of variances was analyzed by the Levene test. In case, the parametric test estimations were fulfilled, the differences between the two independent groups were analyzed by the t-test. When the parametric test estimations were not fulfilled, Mann–Whitney U-test was employed to compare two groups. When the parametric test estimations were fulfilled, the numerical variable differences between more than two independent groups were determined by one-way analysis of variance analysis, but when the estimations were not fulfilled, the differences were analyzed by the Kruskal–Wallis test. $P < 0.05$ was considered to be statistically significant.

Results

In total, 312 of 316 Ufuk University Faculty of Medicine from the 1st to the 6th class answered the questions. The average age of the survey participants was 21 ± 2.1 years, and 107 of them (34.3%) were male while 205 of them (65.7%) were female. 22.8% of the students were active smokers (Table 1). 30.8% of the males ($n=33$) and 18.5% of the females were active smokers ($p=0.044$). There was no difference between the classes among the smokers ($p=0.165$). Both the non-smokers 64.2% and the smokers 40.8% were living with

Table 1. Demographic data

Characteristics	n (%)		
Sex			
Male	107 (34.3)		
Female	205 (65.7)		
Class			
1	94 (30.1)		
2	58 (18.6)		
3	57 (18.3)		
4	38 (12.2)		
5	29 (9.3)		
6	36 (11.5)		
Pulmonary illness			
No	292 (93.6)		
Asthma	20 (6.4)		
Living space			
Family home	182 (58.3)		
Dormitory	61 (19.6)		
Alone in the flat	42 (13.5)		
In the flat with friends	27 (8.7)		
Level of smoking			
Never tried	212 (67.9)		
Exsmoker	29 (9.3)		
Active smoker	71 (22.8)		
	Mean±SD	Min-Max	
Age	21.2±2.1	18–27	
Monthly allowance	1034.9±635.7	200–3900	

SD: Standard deviation.

their families. The monthly allowance of the smokers or the exsmokers was higher than the allowance of the non-smokers ($p < 0.001$). 36.6% of the smokers stated that they could not quit smoking although they were aware about its harms. In the Fagerström dependence test, there appeared no difference between the smokers with e-cigarette experience and the ones without the experience. There was no difference in terms of experience between the pre-clinic (1st to 3rd classes) and the clinic (4th to 6th classes) students ($p = 0.122$). 2.9% of the smokers tried to quit smoking by the help of e-cigarette (Table 2).

There was no use of e-cigarette in students who were non-smoker. 43.7% of students that active smokers were also using e-cigarette. 17.2% of students who quitted smoking tried to use e-cigarette. The smoking frequency level among the 36 students who tried e-cigarette was 11.5% when compared to the total number of students. It was significantly higher among the males ($p = 0.004$). There was no difference between the pre-clinic and the clinic students in terms of their experience of e-cigarette ($p = 0.444$) (Table 3). The majority of the students using e-cigarettes (75%)

Table 2. E-cigarette experience

Characteristics	E-cigarette experience		p
	No n=66 (%)	Yes n=36 (%)	
Sex (M/F)	21/45 (31.8/68.2)	23/13 (63.9/36.1)	0.004
Class			
1	17 (25.8)	14 (38.9)	0.122
2	12 (18.2)	7 (19.4)	
3	12 (18.2)	5 (13.9)	
4	7 (10.6)	1 (2.8)	
5	12 (18.2)	2 (5.6)	
6	6 (9.1)	7 (19.4)	
Asthma	6 (9.1)	3 (8.3)	1.000
Living space			
Family home	32 (48.5)	16 (44.4)	0.245
Dormitory	16 (24.2)	5 (13.9)	
Alone in the flat	13 (19.7)	8 (22.2)	
In the flat with friends	5 (7.6)	7 (19.4)	
Age	21.5±2.3	21.1±2.2	0.350
Monthly allowance	1000 (200–3500)	1200 (500–2900)	0.145
Fagerström test			
Very low	22 (55)	12 (30)	0.418
Low	12 (30)	7 (22.6)	
Moderate	2 (5)	2 (6.5)	
High	4 (10)	4 (12.9)	
Very high	–	2 (6.5)	

Table 3. E-cigarette smoking level

E-cigarette consumption	n (%)
Exsmoker (n=29)	5 (17.2)
Active smoker (n=71)	31 (43.7)
Total (n=100)	36 (36)

claimed that e-cigarette did not change tobacco deprivation. 13.9% of these students argued that e-cigarette increased the deprivation while 11.1% of the students argued the opposite. 11.1% of the students stated that they used e-cigarette to decrease their smoking levels. 52.8% of the students claimed that they did not experience any health problems while smoking e-cigarette. Among its side effects, throat irritation, dry cough, and dry mouth were, respectively, the most common ones (respectively, 33.3%, 30.6%, and 16.7%) (Table 4).

Non-smokers, exsmokers, and active smokers replied the question inquiring the source of information about e-cigarette and all of them cited the circle of friends as the source (respectively, 35.8%, 37.9%, and 47.9%, $p = 0.105$). In terms of personal views on e-cigarette, 46.2% of non-smokers, 51.7% of exsmokers, and 53.5% of active smokers

Table 4. Questions about e-cigarette awareness among the active smokers, exsmokers, and non-smokers

Questions	Smoking experience			P
	Non-smokers (%)	Exsmokes (%)	Active smokers (%)	
Friends	76 (35.8)	11 (37.9)	34 (47.9)	0.105
Family	8 (3.8)	1 (3.4)	7 (9.9)	
Internet	36 (17)	6 (20.7)	5 (7)	
Lectures/class discussions	2 (0.9)	–	–	
No idea	80 (37.7)	8 (27.6)	19 (26.8)	
Friends, family, and lectures	2 (0.9)	1 (3.4)	1 (1.4)	
Friends and internet	5 (2.4)	2 (6.9)	5 (7)	
Friends and family	3 (1.4)	–	–	
Your individual view about e-cigarette				
Harmless	5 (2.4)	1 (3.4)	4 (5.6)	
Less harmful than traditional smoking	98 (46.2)	15 (51.7)	38 (53.5)	
Beneficial	2 (0.9)	–	2 (2.8)	
No idea	89 (42)	10 (34.5)	24 (33.8)	
Harmful	18 (8.5)	3 (10.3)	3 (4.2)	
Is there any carcinogen ingredients inside e-cigarette?				0.004
Yes	55 (25.9)	11 (37.9)	33 (46.5)	
Is there an active e-cigarette smoker around you?				0.006
No	108 (50.9)	16 (55.2)	19 (26.8)	
Friends	84 (39.6)	12 (41.4)	45 (63.4)	
Family members	12 (5.7)	–	5 (7)	
Friends and family members	8 (3.8)	1 (3.4)	2 (2.8)	
Is e-cigarette approved by the Ministry of Health?				0.377
No	69 (32.5)	7 (24.1)	26 (36.6)	
Yes	28 (13.2)	4 (13.8)	14 (19.7)	
No idea	115 (54.2)	18 (62.1)	31 (43.7)	
Are public service ads necessary?				0.480
No	24 (11.3)	4 (13.8)	14 (19.7)	
Yes	158 (74.5)	22 (75.9)	48 (67.6)	
No idea	30 (14.2)	3 (10.3)	9 (12.7)	
Can the indoor e-cigarette usage be allowed?				<0.001
No	182 (86.3)	22 (75.9)	45 (63.4)	
Yes	10 (4.7)	3 (10.3)	20 (28.2)	
No idea	19 (9)	4 (13.8)	6 (8.5)	

thought that e-cigarette was less harmful than traditional cigarette ($p=0.534$).

About 25.9% of the non-smoker group, 37.9% of the exsmokers, and 46.5% of the active smokers answered “yes” to the question do you know that e-cigarettes include carcinogenic material including antifreeze, diethylene glycol, and nitrosamines? And the difference was statistically significant ($p=0.004$). 63.4% of active smokers and 39.6% of non-smokers answered the question, Is there anyone smoking e-cigarette around you? Mostly as “friends,” the answer was statistically significant ($p=0.006$). All three groups said “I have no idea” in reply to the question whether e-cigarette was approved by the Ministry of Health (54.2%, 62.1%, and 67.6% $p=0.3777$). All three groups mostly answered “yes”

to the question if the public service ads on e-cigarettes should be broadcast like the ads against traditional cigarettes (74.5% of non-smokers, 75.9% of exsmokers, and 67.6% of active smokers). 9% of non-smokers, 13.8% of exsmokers, and 28.2% of active smokers said “yes” to the question whether e-cigarette could be allowed indoors ($p<0.001$). When the groups are classified as pre-clinic and clinic, the statistical differences between answers to the questions about the e-cigarette are shown in Table 5.

Discussion

In our study, the average age of the students was 21 ± 1.2 , and 11.5% of them tried e-cigarette at least once or were still using. E-cigarette smoking experience was higher

Table 5. Questions about awareness among the preclinic (1st–3rd classes) and clinic (4th–6th classes) students

Questions	Group		P
	Preclinic (%)	Clinic (%)	
What do you think about e-cigarette?			
I do not think it is harmful	6 (2.9)	4 (3.9)	0.792
I think it is harmful and I do not use it	158 (75.6)	74 (71.8)	
I think it is harmful, but I cannot quit it	27 (12.9)	17 (16.5)	
I think it is harmful, but I do not want to quit	18 (8.6)	8 (7.8)	
Where do you get information about smoking?			
Lectures/textbooks	93 (44.5)	58 (56.3)	0.008
Internet	67 (32.1)	17 (16.5)	
No idea	36 (17.2)	15 (14.6)	
Lecture and internet	13 (6.2)	13 (12.6)	
Your knowledge about e-cigarette			
Friends	83 (39.7)	38 (36.9)	0.093
Family	12 (5.7)	4 (3.9)	
Internet	35 (16.7)	12 (11.7)	
Lectures/textbooks	1 (0.5)	1 (1)	
No idea	70 (33.5)	37 (35.9)	
Family, friends, and lectures	1 (0.5)	3 (2.9)	
Friends and internet	7 (3.3)	5 (4.9)	
Friends and family	–	3 (2.9)	
Your personal view on e-cigarette?			
Harmless	9 (4.3)	1 (1)	0.047
Less harmful than traditional smoking	95 (45.5)	56 (54.4)	
Beneficial	3 (1.4)	1 (1)	
No idea	81 (38.8)	42 (40.8)	
Harmful	21 (10)	3 (2.9)	
Does e-cigarette contain carcinogen materials?			
Yes	55 (26.3)	44 (42.7)	0.003
Anyone using e-cigarette around you?			
No	96 (45.9)	47 (45.6)	0.478
Friends	96 (45.9)	45 (43.7)	
Family members	12 (5.7)	5 (4.9)	
Friends and family members	5 (2.4)	6 (5.8)	
Is it approved by the Ministry of Health?			
No	65 (31.1)	37 (35.9)	0.199
Yes	36 (17.2)	10 (9.7)	
No idea	108 (51.7)	56 (54.4)	
Is a public service ad necessary for e-cigarette?			
No	30 (14.4)	12 (11.7)	0.481
Yes	154 (73.7)	74 (71.8)	
No idea	25 (12)	17 (16.5)	
Can e-cigarette be smoked indoors?			
No	173 (83.2)	76 (73.8)	0.009
Yes	23 (11.1)	10 (9.7)	
No idea	12 (5.8)	17 (16.5)	

in the group of active smokers as well as and among the males. 72.3% of non-smokers, 82.4% of exsmokers, and 83.2% of active smokers had information about e-cigarette. There was no difference between the pre-clinic and the

clinic students in terms of e-cigarette awareness. Participants mostly received information about e-cigarette from their friends. Active smokers were more informed about the carcinogen content of e-cigarettes. Still, more of them

were supporting indoor e-cigarette use. The most common side effects of e-cigarette in the study group were throat irritation, dry cough, and mouth dryness. Most of the participants agreed that the public service ads against e-cigarette should be broadcast.

In a Finland-based study, 85.3% of the participants ranging between 12 and 18 years old have information about e-cigarette and 17.4% of them state that they tried it.^[16] In a Poland-based study conducted among high school students at the ages of 15–19 years, the rate of awareness is determined as 86.4% while the use of e-cigarette among the students ranging between 20 and 24 years old is 5.9%, and among the students between 15 and 18 years old is 8.2%.^[17] In a Korea-based study conducted among 75,643 students whose ages ranged between 13 and 18 years, it is seen that >75% of the e-cigarette smokers use traditional cigarette and e-cigarette together. The same study reveals that the possibility of becoming an e-cigarette user is 1.58 times higher among those who tried quitting smoking when compared to those who never tried.^[18]

As far as we know, in this study conducted for the 1st time among university students in Turkey, 43.7% of e-cigarette users were available in the group of active smokers and the percentage, like in some other studies, was higher among the males.^[16] In the US-based study conducted among high school and secondary school adolescents, the awareness about e-cigarette and its usage rates are higher when compared to 2 years older study conducted among the same target group. Besides, the usage of e-cigarette is seen prevalent among the adolescents who did not use traditional cigarettes.^[19] It is evident that e-cigarette increases the interest in traditional smoking.^[20] In contrast, our study resulted that e-cigarette use was more prevalent among students who are currently traditional smoking.

Berg showed that 53–84% of the participants were thinking that e-cigarette was less harmful than traditional cigarettes.^[21] In an internet survey conducted among 3587 participants, the reasons for e-cigarette usage are listed as the participants' belief that e-cigarette is less harmful than the traditional cigarette, it prevents traditional smoking, and it is cheaper and less toxic.^[22]

In our study, the students smoking e-cigarette state that the reasons for their preference of e-cigarette are that it helps quitting traditional smoking, its side effects are lesser than those of traditional cigarette, it is less harmful than cigarette, and it can be used in enclosed public spaces. Accordingly, it is seen that our students tend to reduce their level of smoking rather than quitting it. Indeed, one-third of the active smokers stated that they wanted to continue smoking in reply to the question whether they would think

about quitting smoking.

Another study argues that e-cigarette reduces the frequency of smoking and helps quitting smoking. Moreover, it is preferred because it can be used in enclosed public spaces where smoking is banned.^[23] Some studies show that adolescents use e-cigarette to quit smoking.^[24] In a review, it is argued that the rate of quitting smoking among the e-cigarette users is 28% less frequent when compared to the traditional smokers.^[25] In a Finland-based study, the use of cigarettes and the consumption of alcohol and energy drinks are cited as the most common determining factors for e-cigarette usage.^[26] In another study, it has been found out that e-cigarettes are preferred because they reduce stress, decrease the cost, and help quitting smoking.^[27] A review showed that there is a relationship between e-cigarette and the increase in traditional smoking rates.^[7] In our study, the students stated that they acquire information about e-cigarette mostly through their friends, and students who were active smokers were the most common group using e-cigarette. It showed that students exchange their ideas about e-cigarettes with their smoking friends and they influence each other about its usage. It was seen that e-cigarette was preferred not to quit smoking but to reduce it. During the lectures, emphasis should not be only on traditional smoking but also on e-cigarette smoking. Like in our study, peer influence is listed as one of the reasons for e-cigarette usage among the adolescents.^[7] Supporting the claims of our study, another study lists irritation in throat and mouth dryness as the most common side effects of e-cigarette.^[28] Almost ½ of the active smokers sometimes or frequently continue smoking traditional cigarette in addition to e-cigarette, and it helps quitting smoking only in small amount of them. Therefore, only the quarter of e-cigarette users stated that they could recommend it to a friend. In the studies about e-cigarette, it is found out that e-cigarette vapor damages pulmonary structure, has potential to increase sensitivity toward pneumococcus infection, and causes emphysematous changes in the lungs.^[29]

E-cigarette contains toxic ingredients such as e-liquids, carcinogenic mutations, and diethylene glycol.^[12] Our study reveals that active smokers have higher knowledge level about e-cigarettes when compared to non-smokers while one-third of them do not have any idea about the topic. The ban on e-cigarette usage varies according to countries. The selling, usage, and advertising of e-cigarette are allowed in some states of the US although there are some restrictions. Its usage is free in Germany, England, and Italy.^[30] Whereas Turkey's Ministry of Health does not allow its usage in the country, since it is addictive and prevents the

endeavors to quit smoking.^[31] Public service ads against e-cigarette are not available, because its access is not as easy as other tobacco products. Projects to raise awareness about e-cigarette can be conducted using imagery on the internet and broadcasting public service ads. In our study, it was seen that the majority of our participants were not aware that e-cigarette was banned in our country and they agreed that public service ads could be beneficial to raise awareness.

The limitations of our study were as follows: A small group of students were included in the study. Besides, the participants' school success, socioeconomic levels, other tobacco habits (water pipe, hand-rolled cigarette, etc.), period of e-cigarette addiction, as well as their preference of nicotine and aroma as ingredients were not questioned. The duration of traditional and e-cigarette smoking, and the reasons of active smokers who quit e-cigarette were not recorded.

Conclusion

The level of e-cigarette usage cannot be underestimated even among the medical school students although its usage is not legal in Turkey. The active e-cigarette smokers have more information about the content of e-cigarette when compared to the others, the e-cigarette usage is higher in this group and the smokers use it to reduce traditional smoking. Still, it is evident that the medical school students do not have enough information about the content and harms of e-cigarette. Harmful effects of e-cigarette may be included such as educational programs of medical students from beginning to the end of their education life. Moreover, educational strategies focused on educating adolescents about the risks of e-cigarettes may be particularly useful. The youth must be educated not only about conventional cigarette but also about e-cigarette. The purchase of e-cigarette on the internet must be restricted. More extensive studies to raise awareness about e-cigarette among the youth are needed.

Disclosures

Ethics Committee Approval: The study was approved by the local Ethics Committee (Ethics no: 20180215/10).

Peer-review: Externally peer-reviewed.

Conflict of Interest: None declared.

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