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Electronic Cigarette-Related Attitudes and Behaviors of Patients Presenting to the Pulmonology Clinic

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ABSTRACT

Objective: Electronic cigarettes (e-cigs) are electric-powered devices that deliver nicotine with flavours and other additives. The popularity of e-cig is increasing gradually. In this study, we aimed to evaluate patients that presented to our clinic in terms of their smoking and vaping habits, views on e-cigs, and how demographic features influenced their views on e-cigs. **Materials and Methods:** The study included 150 male patients that were divided into three groups: Group I (control group) comprised 50 healthy participants, Group II consisted of 50 patients with chronic bronchitis, and Group III contained 50 patients with chronic obstructive pulmonary disease. We recorded the patients' demographic features, pulmonary function test results and smoking and/or vaping habits. **Results:** Among the patients that had previously attempted to quit smoking, the vaping rate was higher in Group III (n=19), compared to Group II (n=17) ($p<0.05$). In all three groups, the patients had mostly heard about e-cig mainly through media and considered conventional cigarettes to be more dangerous than e-cig. **Conclusion:** Our study showed that strict cautions must be taken against the sale, promotion and advertisement of e-cig because there is a common belief that e-cig is less harmful than conventional cigarettes.

Keywords: Cigarette, Electronic Cigarette, Social Media, Tobacco.

Göğüs Hastalıkları Polikliniğine Başvuran Hastaların Elektronik Sigara Kullanımı ile İlgili Tutum ve Davranışları

ÖZ

Amaç: Elektronik sigara (e-sigara), elektrik gücü ile çalışan içinde çeşitli maddeler, aroma vericiler ile birlikte nikotinin kullanıcı tarafından inhale edilmesini sağlayan cihazlardır. Popülerliği gün geçtikçe artmaktadır. Biz bu çalışmada hastanemiz Göğüs hastalıkları kliniğine başvuran bireylerin, hem e-sigara hem de geleneksel sigara içme alışkanlıklarını, e-sigaraya bakış açılarını ve demografik özelliklerinin e-sigara ile ilgili düşüncelerine nasıl yansıdığını değerlendirmeyi amaçladık. **Gereç ve Yöntem:** Kliniğimize başvuran 150 erkek hasta çalışmaya alındı. Grup I, kontrol grubu olup, sigara içmeyen sağlıklı bireyler (n:50); Grup II, kronik bronşitli (n:50) ve Grup III, KOAH (Kronik obstruktif akciğer hastalığı) olan (n:50) hastalardan oluşturuldu. Hastaların demografik verileri ve solunum fonksiyon testi değerleri ile sigara içme alışkanlıkları kayıt altına alındı. **Bulgular:** Grup III' de e-sigara kullanma oranı Grup II' deki 17 hastaya göre daha yüksekti ($p<0.05$). Üç grupta e-sigarayı ağırlıklı olarak medya aracılığı ile öğrendiğini ifade etti ve geleneksel sigaranın daha zararlı olduğunu düşünmekteydi. Grup II ve III hastalar ev içi ortamında e-sigarayı daha zararsız gördükleri için rahatça içtiklerini belirtti. **Sonuç:** Çalışmamız e-sigaranın geleneksel sigaraya göre daha masum olduğu görüşü nedeniyle satış, sunum ve reklamları konusunda daha sıkı tedbirler alınması gerçeğini göstermektedir.

Anahtar Kelimeler: Sigara, Elektronik Sigara, Sosyal Medya, Tütün.

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INTRODUCTION

Electronic cigarettes (e-cig) were first patented in 2003 by a Chinese pharmacist and entered the United States market four years later (Flouris et al., 2013; Harrell et al., 2014). Especially in recent years, the popularity of e-cigs has increased gradually under the influence of social media and celebrities. E-cig converts liquid nicotine to vapor to be inhaled by the user through a battery-powered mechanism. The fluid in e-cigs contains mainly nicotine (up to 24-100 mg/ml), followed by water, propylene glycol, glycerin, flavors and/or other additives (Cheng, 2014; Grana et al, 2014). E-cigs are produced in attractive colors and flavors to target young population. Today, the popularity of e-cigs among adolescents and young adults is increasing. Especially, most of young adults believe that vaping is healthier than smoking and can help with smoking cessation.

Cigarette smoking is an important public health problem and is seen to have decreased through stronger policies and anti-smoking campaigns. Due to the high smoking rate among adolescents and young adults, new methods are sought to help smoking cessation, with the most controversial being vaping (Abrams, 2014). There are many people using e-cig to help them quit smoking or reduce the number of conventional cigarettes smoked. Another reason why people prefer vaping is smoke-free laws that prohibit smoking in all indoor areas (Caponnetto et al., 2012). In South Korea, e-cigs were introduced as 'healthy cigarettes' and advertised as a way to quit smoking (Lee et al., 2011). However, in 2008, the World Health Organization (WHO) reported that e-cigs could not be used as a way of smoking cessation since there were not enough studies providing their effectiveness (Pellegrino et al., 2012). In addition, WHO advised e-cig users to be careful about the potential harms of the substances contained in these devices considering that the effectiveness of this method in smoking cessation was not yet proven. After WHO recommendations, some studies evaluated e-cigs but there is still very little information concerning the short- and long-term pulmonary and systemic effects of e-cigs. In a study investigating effects of e-cig on health, it was shown that the chemical substances flavouring e-cigs vapor induced inflammatory response via oxidative stress in lung tissue (Lerner et al., 2015). Furthermore, several studies revealed that nicotine inhaled through e-cig was associated with the development of immune system abnormalities against viral and bacterial infections and allergic airway hyperresponsiveness (Javed et al., 2017; Lim & Kim, 2014; Wu et al., 2014). The common belief that e-cigs reduce the potential harms of conventional cigarettes may be the main reason for its increasing popularity and use. However, although e-cigs are considered as tobacco products according to the United States laws, their production is not under the control of the Food and Drug Administration (FDA). Such legal gaps lead to unstandardized and uncontrolled applications in the production and marketing of e-cigs (Breland et al., 2017). In the current study, we aimed to determine the attitudes and behaviours of the participants concerning e-cigs and how they were affected by demographic features.

MATERIAL AND METHODS

Study type

A chart review was conducted on 150 patients aged over 18 years who presented to our pulmonology outpatient department between August 2017 and December 2019. During this period, only three of the patients that admitted to smoking cessation outpatient clinic were female. Therefore, to constitute a homogeneous study group we did not include female participants. The patients were divided into three groups: Group I (control group) consisted of 50 healthy individuals that had never smoked, Group II comprised 50 patients with chronic bronchitis, and Group III contained 50 patients with chronic obstructive pulmonary disease (COPD). Following the 2019 guidelines of the Global Initiative for Chronic Obstructive Lung Disease (GOLD) (Singh et al., 2019), COPD was classified based on the forced expiratory volume in one second (FEV1) and forced vital capacity (FVC) ratio as follows: FEV1/FVC < 0.70 mild if FEV1 ≥ 80%; moderate if 50% ≤ FEV1 < 80%, severe if 30% ≤ FEV1 < 50%, and very severe if FEV1 < 30% . The pulmonary function test was performed with the Jaeger Master Lab pro® device. The patients were also classified according to the mMRC dyspnea scale based on their symptoms.

Procedures

We analyzed data collected from a 10-item survey inquiring about age, e-cig use, occupation, income level, and other demographic features. The survey questions mostly aimed to understand the reasons why participants were using e-cigs and how they were introduced to vaping and to evaluate their perception/awareness of e-cigs. The survey was administered using the face-to-face method by directing multiple-choice, closed-ended questions to the participants.

Statistical analysis

All statistical analyses was performed using the Statistical Package for the Social Sciences (SPSS) v. 23.0 for Windows (SPSS Inc. Chicago, IL, USA). The quantitative data were presented as mean ±standard deviation, and the qualitative data as number and percentages. In order to compare the qualitative data, chi-square and the quantitative data, one-way analysis of variance was used. The obtained were statistically analysed, and $P \leq 0.05$ was considered statistically significant at a 95% confidence interval.

Ethical considerations

This prospective, cross-sectional study was approved by the local ethics committee on June 28, 2019 (number: 66/19) and conducted in accordance with the tenets of the Declaration of Helsinki.

RESULTS

The mean age of the patients included in the study was 43.06±15.57 years for Group I, 45.10±10.98 years for Group II, and 59.80±11.30 years for Group III ($p<0.001$).

In all group, the majority of the patients worked full time and had at least high school education, the educational level of the participants was similar (p=0.555). The smoking history for Groups II and III was 14.40±3.39 and 32.91±23.11 pack-years, respectively. When we questioned vaping, 17 participants in Group II and 19 in Group III had a vaping history of 1.02±2.1 and 1.1±1.2 years, respectively. The demographic, smoking and spirometric data of the participants are shown in Table 1.

Table 1. Patient data.

Variables	**Group I (n = 50)**	**Group II (n = 50)**	**Group III (n = 50)**
Age (years)	43.06±15.57	45.10±10.98	59.80 ±11.30
Education level			
Illiterate	4	4	3
Secondary school	13	9	11
High school	27	22	24
University	3	11	9
Master	3	4	3
Work			
Full time	29	22	11
Part time	9	9	10
Unemployed	5	7	16
Looking for a job	5	8	4
Retired	2	4	9
Income level, TL			
Below 1000	10	11	16
1000-5000	33	34	32
5000-10000	7	5	2
More than 10000	-	-	-
Conventional cigarette use (pack/years)	-	14.40±3.39	32.91±23.11
E-cigarette use (n)	-	17 (34%)	19 (38%)
E-cigarette use (years)	-	1.02±2.1	1.1±1.2
BMI (kg/m^2)	28.29±5.09	27.34±3.70	24.49±4.64
FEV1/FVC (%)	92.45±2.75	82.45±1.65	60.34±12.08
FEV1 (%)	92.36±2.47	83.36±1.48	65.20±6.30

Values are expressed as mean ± standard deviation.
BMI: Body mass index, FEV1: Forced expiratory volume in 1 second, FVC: Forced vital capacity

The results showed that 31 of the patients with chronic bronchitis intended to quit smoking, of whom 17 used e-cigs to help smoking cessation and 11 used medical treatment. When we analysed the patients with COPD, 34 intended to quit smoking, of whom 19 used e-cigs and seven referred to medical treatment (Table 2).

Table 2. Patients' cigarette cessation methods.

Variables	**Group II (n = 31)**	**Group III (n = 34)**
E-cig	17	19
Supportive treatment (education)	3	4
Medical treatment	11	7
Supportive and medical treatment	15	9
Individual attempts	2	7
Medical treatment and e-cigarette use	-	2

Only two patients in each of these groups stated that they intended to quit smoking with the help of medical treatment together with e-cig use. For Groups II and III, the most common reasons why the participants started to vape indoor vaping not being prohibited, e-cigs being cheaper than other tobacco products, and intention to stop smoking. The remaining reasons included e-cigs being easier to use, having a good taste, and being less harmful

than tobacco smoking for the vapor and people around. Lastly, some participants mentioned that their decision to start vaping was influenced by other e-cig users. The reasons for vaping are summarized in Table 3.

Table 3. Reasons for e-cigarette use.

Variables	Group II (n=17)	Group III (n=19)
Influenced by family members	5	5
Influenced by friends	5	6
Lower cost	11	10
Easy to use	7	11
Good taste (Different flavours, e.g., mint, fruit, chocolate, etc.)	7	10
Less harmful	6	10
No ban on indoor vaping	12	11
Helps quit tobacco smoking	9	11

Table 4. Awareness/perception of e-cigarettes.

Variables	Group I (n = 50)	Group II (n = 50)	Group III (n = 50)	p
Have you ever attempted to quit smoking before?				
Yes	-	31	36	0.287
No		19	14	
Have you ever heard of e-cigarettes?				
Yes	45	41	46	0.279
No	5	9	4	
Where did you hear about e-cigarettes?				
Friends	46	35	29	**0.001**
Media	39	39	44	
Health workers	4	4	1	
Do you want to use e-cigarettes?				
Yes	0	25	28	
No	50	25	22	0.548
When compared with conventional cigarettes, e-cigarettes are…				
More harmful	5	4	2	
Equally harmful	20	6	6	
Less harmful	21	31	36	**0.012**
Not harmful	2	4	4	
Don’t know	2	5	2	
Is vaping addictive?				
Yes	24	15	12	
No	11	21	28	**0.01**
Maybe/don’t know	15	14	10	
Do e-cigarettes help quit smoking?				
Yes	19	26	29	
No	31	24	21	0.12
Can e-cigarettes cause cancer, COPD, asthma, and heart diseases?				
Yes	11	13	12	
No	25	23	28	0.819
Maybe/don’t know	14	14	10	

Table 4 shows the awareness/perception of the participants concerning e-cigs. The participants in all groups stated that they had become aware of e-cigs mostly through social media and considered that tobacco smoking was more dangerous than vaping (p = 0.001 and p= 0.012 respectively). In Group III, among the participants that previously attempted to quit smoking, vaping was more common compared to Group II (p<0.05). The participants in both groups stated that they felt more comfortable vaping indoors since they thought it was less harmful. There was no relation between thinking that e-cig may be dangerous and the education level of the participants in Groups II and III (p= 868).

DISCUSSION

The vaping rate is increasing gradually. Although FDA has never officially approved vaping, there is a common public opinion that it is safe (Etter et al., 2011). E-cig use is common among adolescents and young adults, which makes the situation more threatening. In 2019, the rate of e-cig use was reported to be 10.5% among secondary school students and 27.5% among high school students, and these rates are increasing exponentially (Cullen et al., 2019). Since the social media use of this population is very high, manufacturers are running very aggressive campaigns to increase the popularity of vaping, mostly through the promotion of celebrities. The participants of our study stated that they had been introduced to e-cigs mostly through social media. Most of the participants also considered that tobacco smoking was more dangerous than vaping, regardless of their education level. Cigarette smoke contains many carcinogens, including formaldehyde, free radicals, toxic gases, heavy metals, and cigarette-specific nitrosamines (Goniewicz et al., 2014). These toxins are nine to 450 times less in e-cigs than in conventional cigarettes (Drummond & Upson, 2014). Cigarette smoking is an important public health problem, and more scientific methods are being investigated for quitting. There are claims that e-cig can be used in smoking cessation. In a study conducted with 657 smokers that intended to quit smoking, Bullen et al. investigated the effects of e-cigs and nicotine patches on smoking cessation (Bullen et al., 2013). As a result, the authors showed that e-cigs had no advantage in this process. In contrast, some studies showed the significant contribution of e-cigs to smoking cessation (Farsalinos et al., 2014; Hitchman et al., 2015). On the other hand, recent studies state that the long-term carcinogenic and pulmonary effects of e-cigs remain unclear (Drummond & Upson, 2014). Thus, there is a clear need to assess the reliability of e-cigs and their role in smoking cessation in further studies. As shown in our study, the belief that vaping is less harmful than tobacco smoking is very common in society regardless of education level (Friedman & Horn, 2019), and some people consider e-cigs as a way of smoking cessation.

Short and long-term health problems that can be caused by e-cigs are the main concern for health professionals. These problems may arise directly from inhaling the vapor in e-cigs or second-hand exposure to vapor in the same room, as well as third-hand exposure due to residual harmful substances left on surfaces. Among our participants, some stated that they felt using e-cigs more comfortably at home believing that there were less harmful. The smoking ban in public areas and indoors aims to decrease the smoking rate in population. However, some smokers that have started to use e-cigs in indoor environments are actually leading to increased second- and third-hand exposure. Pellegrino et al. detected increased levels of particulate matter after vaping in indoor environments (Pellegrino et al., 2012). In addition to the toxic substances in the e-cig liquid, some chemicals may change their structure during the evaporation process, releasing other potentially harmful substances (Goniewicz et al., 2014). Many factors influence the emergence of these toxic products, such as the design of e-cigs, battery power of the device, liquid content, nicotine concentration, and flavors (Breland et al., 2017). Another concern is that some e-cig manufacturers use custom formulations without any regulation or control (Goniewicz et al., 2015). Hence, there are a wide variety of e-cigs. For all these reasons, the short- and long-term effects of e-cigs on human health and whether they helps quit smoking should be evaluated in extensive studies. The current study has some important limitations. First, we included the participants that admitted to smoking cessation outpatient clinic. Therefore, the number of the participants was not large. Second, due to insufficient number of the female participants we only included the male participants to our study. Considering these limitations, we think that our results are needed to be confirmed by further studies with larger population and evaluating both genders.

CONCLUSION

Today, the importance of electronic cigarettes is not well known among healthcare professionals and practically not questioned. There is a common misbelief among people that electronic cigarettes are harmless and can be used to quit smoking, which increases their use. Electronic cigarettes should be considered as tobacco products, and whether they lead to addiction should be investigated. There should be strict regulations to prevent the promotion of electronic cigarettes, especially on social media.

Conflict of Interest

The authors declare no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

Author Contributions

Plan, design: SDA; **Material, methods and data collection:** SDA; **Data analysis and comments:** MYS, SDA; **Writing and corrections:** MYS, SDA, BK.

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