

Effectiveness of Behavioral and Pharmacological Smoking Cessation Treatment in Patients with Failed Attempt at Quitting with E-cigarettes

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Cite this article as: Duru Çetinkaya P, Turan A, Deniz PP. Effectiveness of behavioral and pharmacological smoking cessation treatment in patients with failed attempt at quitting with e-cigarettes. Turk Thorac J 2020; 21(6): 404-8.

Abstract

OBJECTIVE: The tobacco industry has introduced electronic cigarettes (e-cigarettes) as a less harmful substitute to cigarettes and as an aid to smoking cessation. This study aimed to evaluate the success of evidence-based pharmacological treatments and behavioral/cognitive training in patients who failed to quit smoking with e-cigarettes.

MATERIAL AND METHODS: A total of 109 consecutive patients with failed attempts at smoking cessation by e-cigarettes were admitted. A questionnaire was administered to evaluate the demographic characteristics and smoking habits. Nicotine dependence scores of the smokers were obtained using the Fagerström addiction test. Appropriate pharmacological therapy and behavioral/cognitive training were given to each patient who failed to quit smoking with e-cigarettes.

RESULTS: The mean age of the participants was 35.2±10.4 years, and 89 (81.7%) were men. Education level was high school or university for 92 (84.4%) patients; only 17 (15.6%) graduated from middle school. The mean number of cigarettes smoked per day was 25.8±10.8, and the mean nicotine dependence score was 6.7±1.9. Only 6 (5.5%) individuals quit smoking temporarily after using e-cigarettes, with a mean restarting time of 3.3±2.0 months in all 6 patients. The smoking cessation rate in our study was 43.1% (47 patients) with medical treatment. The remaining individuals were unable to quit smoking with pharmacological treatment, and the mean restarting time for these patients was 10.4±2.2 months.

CONCLUSION: It has been shown that the success rate of smoking cessation increases with pharmacological treatment and behavioral/cognitive training in individuals who failed to quit smoking with e-cigarettes.

KEYWORDS: E-cigarette, nicotine replacement therapy, smoking cessation, varenicline

Received: August 18, 2020

Accepted: September 21, 2020

INTRODUCTION

Smoking is an important public health hazard worldwide. Compelling evidence about the negative health effects of smoking has led many smokers to consider quitting. In recent times, tobacco companies have changed their tactics owing to the concern over reduction in sales because of the tobacco control framework convention and smokeless airspace activities. These companies have launched electronic cigarettes (e-cigarettes) as smokeless tobacco products, claiming that they are less harmful than cigarettes and have been promoted as an aid to smoking cessation [1-3]. An e-cigarette is a battery-operated smokeless tobacco product that contains various chemicals, nicotine, and a sweetener. A wide variety of chemicals, including propylene glycol, glycerol, ethylene glycol, polyethylene glycol (PEG400), amino-tadalafil, rimonabant, cannabinoid, nitrosamines, formaldehyde, acetaldehyde ketone, mercury, tetramethylpyrazine, nicotine, artificial flavors, and various other carcinogenic chemicals, have been identified in e-cigarettes [4-8]. It generates vapor instead of smoke and resembles a cigarette in shape [9].

Although the potential harm of e-cigarettes has been proven, some healthcare workers have the tendency to use e-cigarette for "harm reduction" and "quitting smoking." Only a few studies suggest that e-cigarettes are as effective as nicotine patches in helping smokers quit or that they may be used for harm reduction, although the final results are inconclusive [10, 11]. Although many healthcare providers think e-cigarettes can reduce smoking [12, 13], the concern is that e-cigarettes may be a transition product to classical cigarettes and may increase smoking among youngsters, which would lead to a serious setback in the fight against tobacco-related diseases [14].

This study aimed to evaluate the rate of smoking cessation with evidence-based pharmacological treatments and behavioral/cognitive training in patients who used e-cigarettes to quit smoking and failed.

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MATERIAL AND METHODS

A total of 109 consecutive patients admitted with failed attempts at smoking cessation using e-cigarettes were included in this study between February 2017 and October 2018. Patients less than 18 years old, those with severe psychiatric disorders, those who were pregnant or breast-feeding, or those who were unwilling to give informed consent were excluded from the study. Ethics committee approval was obtained for conducting the study (19.06.2019;36/473). The study plan was made in accordance with the World Medical Association Declaration of Helsinki.

A questionnaire was administered to evaluate the demographic characteristics of the study population, smoking habits, the reason for using e-cigarettes, and untoward effects of e-cigarettes. Nicotine dependence scores of the smokers were obtained using the Fagerström addiction test [15]. Behavioral/cognitive training was given to each patient who failed to quit smoking with e-cigarettes, and appropriate pharmacological recommendations were made depending on the nicotine addiction level and concomitant drug use owing to other comorbidities. Varenicline (51 patients), nicotine replacement therapy (NRT) (56 patients), or combined varenicline and NRT (2 patients) were suggested as pharmacological treatment. Patients were evaluated during follow-up visits to the outpatient clinic in the 1st, 3rd, 6th, 9th, and 12th months. During the control visits, patients were questioned about their smoking status and any adverse effects of the medications (Figure 1). The success of smoking cessation was based on the declaration by the patient at the end of the follow-up visit.

Statistical Analysis

Our study was an observational study. The data were analyzed using the Statistical Package for the Social Sciences version 19.0 statistical package (IBM SPSS Corp.; Armonk, NY, USA). The Chi-squared test was used for comparison of categorical variables between the groups. To compare the means between the groups, the t-test was used; descriptive statistics were given as mean±standard deviation, and $p < 0.05$ was accepted as statistically significant.

RESULTS

A total of 109 patients were included in the study. The mean age of the participants was 35.2 ± 10.4 years, and 89 (81.7%) were men. Education level was high school or university for 92 (84.4%) patients, and only 17 (15.6%) were middle-school graduates. The mean number of cigarettes smoked was 25.8 ± 10.8 cigarettes/day, and the mean nicotine de-

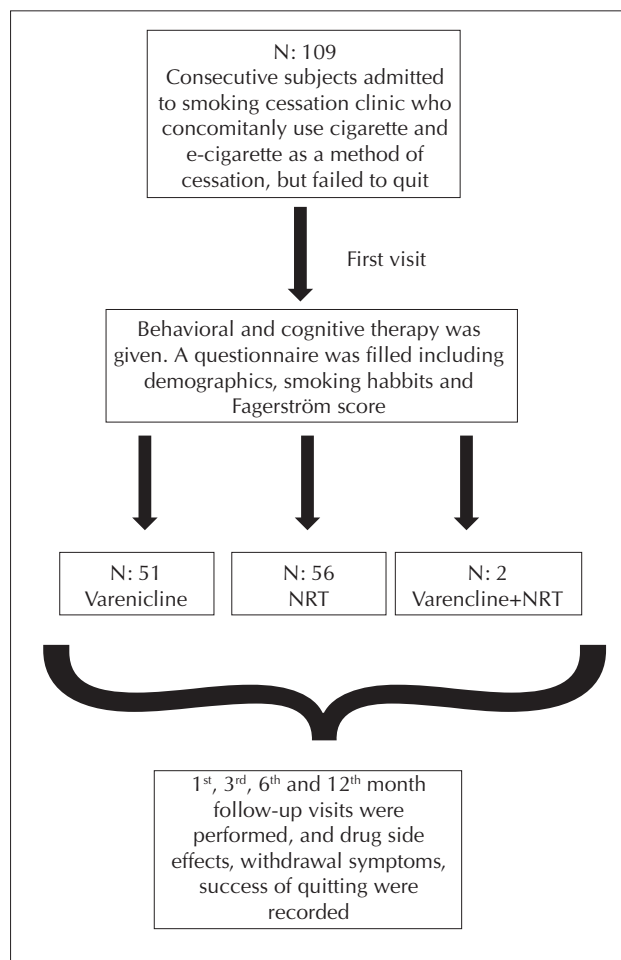


Figure 1. Study design

pendence score was 6.7 ± 1.9 points. Baseline characteristics of all the patients and the comparison between quitters and non-quitters are shown in Table 1.

The preferred nicotine content in e-cigarette liquids was 5.0 ± 1.9 mg/mL. In patients with Fagerström score ≥ 5 points, the nicotine content of the liquid was 5.5 ± 1.9 mg/mL; and in those with score < 5 , it was 3.7 ± 1.3 mg/mL ($p < 0.001$). Of the 109 patients who were admitted to the smoking cessation outpatient clinic, only 6 (5.5%) quit smoking temporarily after using e-cigarettes; the mean restarting time was 3.3 ± 2.0 months in all 6 patients. The remaining patients used both e-cigarettes and cigarettes; of these 13 (11.9%) reduced, 2 (1.8%) increased, and 88 (80.7%) neither reduced nor increased the number of cigarettes smoked per day. In patients who reported a decrease in the number of cigarettes smoked, the average number of cigarettes smoked per day was 10.2 ± 6.2 .

The average time of e-cigarette use was 5.3 ± 4.6 months. E-cigarettes caused dry mouth and irritation of the throat (45.0%), increased sputum production (27.5%), impaired the sense of taste (24.8%), and induced cough (22.9%), shortness of breath (22.9%), smoking desire (15.6%), and chest pain (14.7%). The reasons for quitting e-cigarettes smoking are listed as follows. 34 (31.2%) participants stated that e-cigarettes did not reduce the number of cigarettes smoked per day, 50 (45.9%) participants said that e-cigarettes were not

MAIN POINTS

- E-cigarette is not a smoking cessation method.
- Nicotine content of e-cigarettes increases as the Fagerström dependency score increases. Thus, e-cigarettes are thought to be responsible for the continuation of nicotine addiction.
- Pharmacological treatment is an effective method for smoking cessation for both e-cigarette and cigarette users. In this study quitting rate for one year was found 43%.

Table 1. Baseline and demographic characteristics of the study group and comparison of the quitters and non-quitters according to the pharmacological treatment

	Total patients (n=109)	Non-quitters (n=62)	Quitters (n=47)	p
Age (years)	35.2±10.4	35.3±10.6	35.0±10.1	0.886
Sex, n (%)				
Women	20 (18.3)	12 (19.4)	8 (17)	0.807
Men	89 (81.7)	50 (80.6)	39 (83)	
Number of cigarettes smoked per day	25.8±10.8	24.5±10.2	26.7±11.5	0.307
Liquid nicotine content, mg/mL	5.0±1.9	4.7±1.9	5.3±1.9	0.166
Fagerström score	6.7±1.9	6.4±1.9	7.0±2.0	0.131
Marital status, n (%)				
Married	53 (48.6)	29 (46.8)	24 (51)	0.702
Single	56 (51.4)	33 (53.2)	23 (49)	
Occupation, n (%)				
Employee	30 (27.5)	8 (12.9)	10 (21.2)	0.859
Civil servant	27 (24.8)	18 (29)	12 (25.5)	
Retired	18 (16.5)	2 (3.2)	2 (4.3)	
Housewife	20 (18.3)	6 (9.7)	4 (8.6)	
Student	4 (3.7)	13 (21)	7 (14.9)	
Tradesman	10 (9.2)	15(24.2)	12 (25.5)	
Education level, n (%)				
Middle school	17 (15.6)	10 (16.1)	7 (14.8)	0.846
High school	43 (39.4)	23 (37.1)	20 (42.6)	
University	49 (45.0)	29 (46.8)	20 (42.6)	
Fagerström score, n (%)				
≥5	73 (67.0)	39 (62.9)	34 (72.3)	0.314
<5	36 (33.0)	23 (37.1)	13 (27.7)	
Drug used, n (%)				
Varenicline	51 (46.8)	27 (43.5)	24 (51)	0.159
NRT	56 (51.4)	35 (56.5)	21(44.7)	
Combined treatment	2 (1.8)	0	2 (4.3)	
Drug side effects, n (%)				
Present	35 (32.1)	18 (29)	17 (36.2)	0.535
Absent	74 (67.9)	44 (71)	30 (63.8)	
Comorbidities				
Present	35 (32.1)	18 (29)	17 (36.2)	0.535
Absent	74 (67.9)	44 (71)	30 (63.8)	

NRT: nicotine replacement therapy

effective in quitting smoking, 16 (14.7%) participants were worried about e-cigarette addiction and 41 (37.6%) participants stated that explosion/combustion risk of e-cigarettes. Among the reasons for quitting e-cigarettes, problems with vapor, taste aversion, high cost and difficulties in liquid supply were found to be minimal.

Varenicline alone, NRT (nicotine, gum form) alone, and combined varenicline and NRT were used by 51 (46.8%), 56 (51.4%), and 2 (1.8%) patients, respectively. Varenicline was used for 55.5±26.6 days and NRT for 34.5±31.9 days. A total of 35 (32.1%) patients reported side effects related to drug use for smoking cessation (23 with varenicline and 12 with NRT). There was no statistically significant difference in the adverse effects of the different treatment methods ($p=0.05$).

Withdrawal symptoms were reported by 31.9% of smokers. These symptoms included smoking desire, sleep disturbance, constipation, mouth-gingival complaints, increased appetite, and concentration disorder.

The smoking cessation rate was 43.1% (47 patients) with accepted medical treatment at the end of the study. A total of 62 (56.9%) patients were unable to quit with pharmacological treatment, and the mean restarting time was 10.4±2.2 months. The differences between the quitters and non-quitters according to the pharmacological and behavioral treatment, demographic characteristics, comorbidities, nicotine dependence level, drugs used for quitting, drug side effects, and withdrawal symptoms were statistically non-significant (Table 1).

DISCUSSION

The main finding of our study was the high effectiveness of the pharmacological and behavioral treatment in patients who failed to quit smoking with e-cigarettes.

E-cigarette use is becoming increasingly common among young people. More than 20% of adults aged 18-20 years try e-cigarettes, and 3.7% of adults use e-cigarettes daily or for several days a week [16]. Usually, youngsters prefer using e-cigarettes, and the mean age was 35 years in our study. It has been reported that the level of education among e-cigarette users is high [17]. In our study, 45.0% of the 109 participants were university graduates.

E-cigarette users generally stated that they reduced or quit smoking [18, 19]. Some studies have emphasized that although e-cigarettes are not known for their safety and long-term consequences, they might be effective in reducing or helping quit smoking [20-22]. The fact that e-cigarette use is very similar to smoking behavior, the continuation of hand-mouth coordination will cause the continuation of behavioral dependence. The amount of nicotine in the liquid used in e-cigarettes was found to be higher in those with higher addiction scores than those with lower addiction scores. Granada et al. [23] found that e-cigarettes were not effective in reducing or helping quit smoking. Many studies supporting this finding have been reported in the literature [24-29]. Leduc et al. [30] demonstrated in their meta-analysis that the role of e-cigarette in smoking cessation was significantly low. It is reported that the likelihood of relapse is high after smoking e-cigarettes and quitting smoking [31]. In our study, only 5.5% of patients were able to quit temporarily for a short period of time with all of them relapsing; thus, our study confirmed the ineffectiveness of e-cigarette use in helping quit smoking.

E-cigarettes have been reported to cause cough, shortness of breath, chest pain, pulmonary edema, acute respiratory fail-

ure, nephrotoxicity, and neurotoxicity [32-34]. In this study, irritation and dryness of the mouth and throat, cough, shortness of breath, chest pain, and an impaired sense of taste were reported with e-cigarette use. In addition to the exposure to toxic substances with the use of e-cigarettes, there are risks of explosion and burns; fortunately, no one in our study population suffered any explosions or burns.

Although smokers reported that they reduced the number of cigarettes smoked by using e-cigarettes, they might actually have replaced the nicotine deficit with e-cigarettes. Studies advocating “harm reduction” also focus solely on smokers but not on the continuation of nicotine addiction. Nicotine is known to cause adverse health effects, especially in pregnant women, children, and adolescents [35]. In this study, the average amount of nicotine preferred in e-cigarette liquids was found to be 5.0 ± 1.9 mg/mL; the amount of nicotine in liquids increases with increasing dependence level. Thus, the main target of treatment should be the treatment of nicotine dependence instead of “harm reduction.” All the patients should be questioned about the use other tobacco products, such as e-cigarettes, and informed that e-cigarettes are an ineffective for smoking cessation.

This study had several limitations. Bupropion treatment was not given to the patients because it was not reimbursed by the social security system. Smoking status was based on the data reported by e-cigarette users and not biochemically verified. Validation studies have shown that smoking interrogation statements and behavior among adults are consistent and reliable [36]. This study does not provide data about non-smokers who started smoking after e-cigarette use.

In conclusion, it has been shown that the success rate of smoking cessation increases with pharmacological treatment and behavioral/cognitive training in individuals who failed to quit smoking with e-cigarettes. There is not sufficient evidence to suggest that e-cigarettes help in smoking cessation; they also pose the risk of continuation of nicotine addiction.

Ethics Committee Approval: Ethics Committee approval for the study was obtained from the Ethics Committee of University of Health Sciences Adana City Training and Research Hospital (19.06.2019; 36/473).

Informed Consent: Verbal consent was obtained from the participants.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept - A.T., P.D.Ç.; Design - A.T., P.D.Ç.; Supervision - P.D.Ç, P.P.D, A.T.; Resources - A.T., P.D.Ç, P.P.D.; Materials - A.T., P.D.Ç.; Data Collection and/or Processing - A.T., P.D.Ç.; Analysis and/or Interpretation - A.T, P.D.Ç.; Literature Search - A.T., P.D.Ç, P.P.D.; Writing Manuscript - A.T., P.D.Ç, P.P.D.; Critical Review - A.T., P.D.Ç, P.P.D.

Conflict of Interest: The authors have no conflicts of interest to declare.

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

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