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Original Research

Awareness, Perception and Behaviors Related to Electronic Cigarettes in Lebanon: A Survey Study

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Background: Electronic cigarettes (E-cigarettes) are gaining momentum worldwide. They are looked at as an effective way to cease smoking with reduced harm. Since Lebanon is a country with a high smoking prevalence, it is of interest then to analyze the current and expanding role of E-cigarettes among the Lebanese population.

Aim: The objective of our study was to evaluate the awareness, perception, and behaviors related to E-cigarettes in Lebanon.

Methods: A cross-sectional survey of Lebanese pedestrians chosen from random sectors of Beirut was recruited in our sample study. A self-administered questionnaire was distributed to examine their awareness, perception, and behaviors related to E-cigarettes. SPSS was used for analysis. The main outcome was to assess the awareness of E-cigarettes in the Lebanese population and evaluate their perception as an effective smoking cessation tool.

Results: Of the 364 respondents, 53% were males, 84% were aware of E-cigarettes, and 16% never-tried them. E-cigarettes helped 56% of users to cut down on tobacco smoking, and among all respondents, 60% believed that it is less harmful than tobacco cigarettes. Moreover, 30% perceived it as an effective way to quit smoking. The majority of participants (61%) who tried it were between 18 and 25 years of age, and 36% of them were nonsmokers.

Conclusion: Our study is the first in Lebanon to assess the awareness, perception, and behaviors related to E-cigarettes. The majority of our population was aware of E-cigarettes, and some perceived them as a less harmful replacement compared to tobacco smoking. Additionally, non-smokers may be attracted to E-cigarette smoking which may lead to developing a new attraction and gateway for smoking. Therefore, awareness about E-cigarette's correct use, benefits, and harms need to be highlighted among the public, particularly the young generation in Lebanon.

Keywords: Electronic cigarettes, Tobacco smoking, Smoking cessation, Youth, Lebanon

Introduction

Tobacco smoking is one of the major public health issues worldwide. Globally, more than 8 million people die every year due to tobacco smoking [1]. It is linked to 90% of lung cancer deaths and to 80% of Chronic Obstructive Pulmonary Disease (COPD) deaths [2,3]. To decrease the use of tobacco, public health policies are being implemented and many forms of nicotine delivery systems that are tobacco-free are arising. One of the main forms of nicotine delivery systems is electronic cigarettes (E-cigarettes) [1].

E-cigarettes, also known as electronic nicotine delivery systems, are lithium-battery powered devices, containing e-liquid that is transformed into inhaled vapor when heated [4]. E-cigarette devices are mostly manufactured in China where they were introduced in 2003 [4]. In the United States, it wasn't until the year 2007 when these devices started to gain popularity [4]. The e-liquid contains nicotine, glycerin, diethylene glycol (DEG), and other neurotoxins that were shown to be fatal to children if injected or absorbed even in tiny amounts [5]. Moreover, it contains formaldehyde, acetaldehyde, acrolein, lead, nickel, chromium, and aluminum, among other chemical elements which are considered toxic to the respiratory and nervous systems by the FDA [4,6].

On the other hand, the intention behind the creation of e-cigarettes was to create a product that contained nicotine without the other harmful substances found in tobacco. With e-cigarettes being combustion-free there is a popular belief that e-cigarettes are safer than conventional smoking [7]. According to the Royal College of Physicians (RCP) report of London "The hazard to health arising from long-term use of e-cigarettes is unlikely to exceed 5% of the harm from smoking tobacco" [8]. It is worth mentioning that a variety of potentially toxic compounds such as nitrosamines, phenols, nitrates, polycyclic aromatic hydrocarbons, aromatic amines, and carbon monoxide are specific to tobacco cigarettes and not found in e-cigarettes [9].

As per the latest CDC recommendations, potential serious risks from e-cigarettes are reported among the youth, and their use is not recommended. E-cigarettes associated lung injury is the major risk reported in the US [10]. Nicotine sickness is also a harmful effect of e-cigarettes and is characterized by being exposed to an excessive amount of nicotine which can lead to abdominal pain, nausea, vomiting, or tremors [11]. Moreover, asthmatic adolescents are prone to have increased cough and asthma exacerbations due to e-cigarettes [12]. An alarming observation was found in several longitudinal studies reporting an increased risk of conventional cigarette smoking among nonsmoking youth using e-cigarettes [13-16].

Currently, little is known about the long-term effects of these devices on health. They can cause mouth and throat irritation, cough, nausea, and headache, commonly dissipating over time [17]. Moreover, there is some lack of knowledge in the literature as to the exact contents and long-term effects of e-cigarettes, since they vary from one brand to another [18].

Furthermore, the use of e-cigarettes is gaining popularity among adolescents and the younger population due to the increased advertisement. The marketing strategies are attracting the younger crowd with fruit and candy-flavored nicotine liquids. This was demonstrated by a study done in 2017 that reported youth were more likely to select e-cigarettes from several product choices when exposed to e-cigarettes ads [19].

Some countries such as Brazil, Singapore, Canada, Seychelles, and Uruguay have already banned the sale of e-cigarettes. Other countries including the US, EU, and the UK are developing policies that show different ranges of regulatory approaches, somewhat similar to those already implemented on conventional cigarettes [4]. These approaches include subjecting the marketing of e-cigarettes to the same levels of restrictions as tobacco cigarettes, prohibiting their indoor use, and introducing

different flavors [4].

In Lebanon, the prevalence of conventional cigarette smoking is one of the highest where around 30% of the adults aged above 15 are smokers [20]. Given that Lebanon is a high-intensity smoking country, important concerns regarding the future of e-cigarettes in the Lebanese population must be raised especially since these devices have flooded the world market. Thus, our study is the first in Lebanon to assess the awareness, perception, and behavior of e-cigarettes use among the Lebanese population.

Methods:

Design:

We conducted a cross-sectional study in 2016 in the city of Beirut, Lebanon. The Institution Review Board of the American University of Beirut approved the study protocol. We surveyed Lebanese adults, both males and females, between ages 18 and 64, living or working in the city of Beirut who can read and write, irrespective of their smoking behavior. Individuals were excluded if they were not Lebanese or illiterate. Self-administered questionnaires were used as a data collecting method.

Individuals were categorized as daily smokers, non-daily smokers, ex-smokers, and never-smokers and were defined as below:

- Daily smoker: someone who has smoked greater than 100 cigarettes in their lifetime and currently smokes at least monthly
- Non-daily smoker is someone who currently smokes at least monthly, but not daily
- Ex-smoker: someone who has smoked greater than 100 cigarettes in their lifetime, does not currently smoke, but used to smoke daily
- Never smoker: someone who has not smoked greater than 100 cigarettes in their lifetime and does not currently smoke

Sampling Strategy:

The city of Beirut was chosen because it is the most reflective of the Lebanese population. Almost a quarter of the country's population coming from different areas, socioeconomic, and religious backgrounds reside in this city.

We used the approved map of Beirut, dividing Beirut into 24 sectors. Out of these, 10 sectors were chosen through randomization on an Excel sheet to reflect the diversity of the population living and working in Beirut.

We approached people on the street by introducing ourselves and presenting them with the consent form to sign. Every 5th pedestrian was systematically chosen to ensure randomization of the sample. After agreeing to participate in the study and signing the consent, the participant was handed an anonymous paper-pencil self-administered questionnaire, in either English or Arabic, depending on the preference of the participant. The main aim of the questionnaire was to assess the awareness, perception, and behaviors of e-cigarette smoking among the Lebanese population in Beirut. It is six pages long and takes approximately ten minutes to be completed. The questionnaire items were mainly gathered from a previously published article in the US with some modifications [18]. The questionnaire was pilot tested to ensure that all the questions were clear.
It was divided into five sections:

i. Socio-demographic Information
ii. Cigarette Smoking Behavior
iii. Water-pipe Smoking Behavior
iv. E-cigarettes: Experience
v. E-cigarettes: Perception

Statistical Analysis:

We used SPSS for data entry and analysis. We carried out descriptive statistics by using the number and percent for categorical variables, whereas continuous ones were presented as mean and standard deviation. We considered a chi-squared test since we

were interested in differences in frequency counts of our data, to assess whether there was a significant difference in the factors that could affect trying e-cigarettes and perceiving it as a way to stop smoking.

Results:

A total of 400 individuals were invited to participate in the study. 364 individuals signed consent and completed the survey resulting in a 91% response rate. Starting with gender, 53% of participants were males. Moreover, 41% of participants were smokers; 47% and 33% of males and females were never smokers respectively. The monthly income of participants ranged from less than 500$ to more than 5000$ with 46% having a range between 1000$ to 5000$. Concerning the education level of the participants, 70% had a university degree. Table 1 lists the demographics of the participants. Out of the participants, 84% were aware of the e-cigarettes, and 16% had previously tried them as demonstrated in Figure 1. The participants heard about it mainly through friends or family (49%) and 18% of them through advertisements.

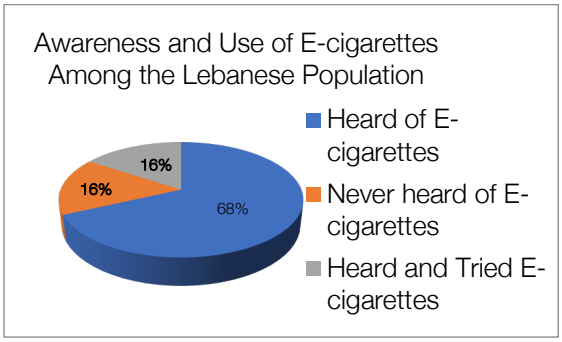

Figure 1: Percentage distribution of participants who heard and tried E-cigarettes

The majority of the participants who had tried e-cigarettes were in the lower age group as 61% of those participants were between “18 and 25 years”, 28% were between “26 and 39 years”, and 11% were “above the age of 40 years”. Daily smokers were more likely to try e-cigarettes (31% vs 19%). Out of the participants who tried e-cigarettes, 36% are never smokers, 31% are daily smokers and 20% are non-daily smokers of tobacco cigarettes. In addition, 15% of the sample study have tried e-cigarettes before trying tobacco smoking.

Table 1: Demographics of participants. Abbreviations: USD: United States Dollar.

	Percent % (n=364)
Age (years)	
<25	34%
25-40	36%
≥40	30%
Gender	
Male	53%
Female	47%
Education	
Elementary School	6%
Middle School	11%
Secondary School	14%
University	69%
Marital status	
Single	53%
Married	47%
Monthly Income	
Not working	20%
<1000 USD	34%
>1000 USD	46%
Comorbidities	
Yes	13%
No	87%
Alcohol use	
Yes	52%
No	48%
Cigarette Smoking status	
Daily Smoker	21%
Non-daily smoker	12%
Ex-smoker	9%
Never smoker	59%

Moreover, married participants were less likely to try e-cigarettes (68% vs 49%) (Table 2).

Table 2: E-cigarettes trial comparison according to variables. Abbreviations: EC: E-cigarette, DS: Daily smoker, NDS: Non-daily smoker, ES: Ex-smoker, NS: Never smoker.

	Tried EC % (N=57)	Didn't try EC % (N=307)	P-value
Age			
<25	61%	29%	0.001
25-40	28%	37%	
≥40	11%	34%	
Marital Status			
Single	68%	49%	0.01
Married	32%	51%	
Cigarette Smoking			
DS	31%	19%	0.002
NDS	20%	10%	
ES	13%	8%	
NS	36%	63%	
Waterpipe Smoking			
DS	19%	10%	0.016
NDS	15%	13%	
ES	12%	4%	
NS	54%	73%	
Okay to be used indoor			
Yes	18%	36%	0.006
No	49%	29%	
I don't know	33%	35%	

Concerning waterpipe smoking, 25% of participants are current or social waterpipe smokers and 34% of them have tried e-cigarettes at least once. Also, 49% of participants who have tried e-cigarettes believe that it is okay to use them indoors compared to 29% of participants who never used e-cigarettes (Table 2).

As a way to cut down on tobacco smoking, e-cigarettes helped 56% of regular e-cigarette smokers in cutting down tobacco smoking. Moreover, 45% reported that the main reason to use e-cigarettes was to stop smoking. Of those who tried it only, 11% reported disappointment with the first experience.

Regarding the perception of e-cigarettes, 30% of participants think that e-cigarettes are a good way to cut down on smoking and only 17% perceive them as better than nicotine replacement therapies. Moving to harm perception, Figure 2 shows that 60% thought e-cigarettes are less harmful than tobacco cigarettes while 12% thought they are more harmful. As an alternative, 33% consider them a better alternative for high school students than tobacco cigarettes. Concerning regulation, 39% of participants believe that it should be regulated by the government. No difference between users and never users was noted in the perception that e-cigarettes should be regulated like tobacco cigarettes (Table 3).

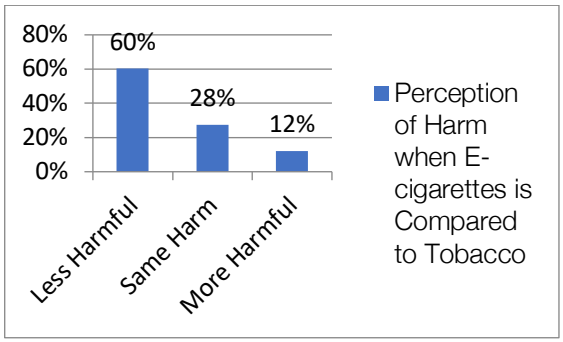

Figure 2: Harm Perception of E-cigarettes compared to Tobacco Cigarettes

Moreover, as shown in Figure 3, 21% of the participants thought that e-cigarettes have no nicotine, 37% assumed they have harmful substances, and 66% believed it is not safe to use during pregnancy.

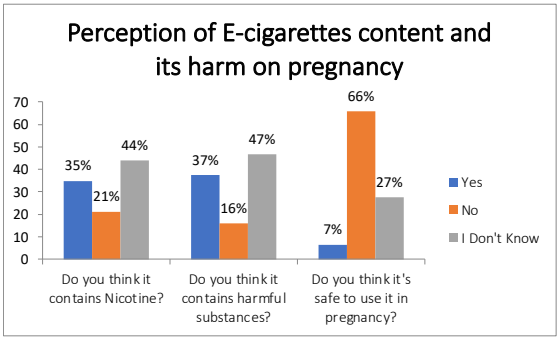

Figure 3: Percentage distribution of participants' E-cigarettes harm perception

Table 3: Participants Perception about E-cigarettes. Abbreviations: EC= Electronic Cigarettes, NRT= Nicotine Replacement Therapy

	Percentage of Participants (%)
EC help to cut down cigarette smoking	
Yes	30%
No	34%
I don't know	36%
EC better than NRT	
Yes	17%
No	35%
I don't know	48%
EC harm compared to cigarettes	
Less Harmful	61%
Same	27%
More Harmful	12%
EC better alternative than tobacco smoking	
Yes	33%
No	42%
I don't know	25%
EC should be regulated by government	
Yes	39%
No	28%
I don't know	33%

Discussion:

Our study is the first to examine the awareness, use, and perception of e-cigarettes in Lebanon. A large percentage of participants are aware of e-cigarettes (84%), indicating these devices are well known in the Lebanese population. The majority (49%) have heard of them through family and friends which can be attributed to the increase in its use in Lebanon. Awareness of e-cigarettes globally in multiple studies ranged from 37.4% to 91.1% [21-24]. E-cigarettes use has not been previously documented in Lebanon, thus our study has revealed that 16% of our participants have tried e-cigarettes. Same as for different parts of the world, there is an increasing trend in its use worldwide. The use of e-cigarettes among US adults increased from 2.1% in 2010 reaching 12.6% in 2014.25,26 Likewise in New Zealand the reported ever use of e-cigarettes increased from 7% in 2011 to 13% in 2014 [27].

Our study showed that the majority (61%) of participants who tried e-cigarettes were aged between 18 and 25 years of age. This might support the notion that the younger generation is an appealing target for the e-cigarettes industry. Similar findings have been found in multiple studies where younger age was a significant factor related to the usage of e-cigarettes [21-23,27]. Reasons could be due to the intensive advertisement portraying these devices as fashionable, less harmful, and more cost-effective than conventional cigarettes [28]. Another reason may be the fact that younger populations tend to follow new trends and are more up-to-date with the discoveries through easy access to the internet as well as to other forms of social media. Even e-cigarette advertisements targeting the youth may have a role in increasing the likelihood of trying it compared to youth not exposed to e-cigarette advertisements. This should draw the attention of public health researchers since e-cigarettes could be creating a new generation of nicotine addicts.

Our study showed that 61% of participants perceived e-cigarettes as less harmful than cigarette smoking which is higher than what was perceived in other studies. This may explain the high prevalence of use of e-cigarettes in Lebanon. Szklo et al in Brazil found that 44.4% of participants who are aware of e-cigarettes think that it is less harmful than tobacco smoking [24]. Another study by Franks et al in the US had a similar result with 43.9% believing it is less harmful than tobacco smoking [29].

As previously mentioned, according to the RCP report and the Public Health England report, e-cigarettes are significantly less harmful than tobacco cigarettes [8,30]. Furthermore, 21.2% of participants thought that e-cigarettes have no nicotine and 46.6% do not know if it contains harmful substances. The recent CDC recommendations about E-cigarettes associated with lung injury and other harms reported make such perception worrisome as it is masking the true harm of e-cigarettes [10,11].

An alarming fact in our study was the high percentage (36%) of non-smokers who have tried e-cigarettes. This might support the threat that these new devices may hold in becoming a potential gateway into smoking, rather than out of it. This is supported by, a recent study in The Lancet which showed that one in ten high-school students in the UK who tried e-cigarettes have never tried the conventional cigarettes [31]. Also, a study done in the US in 2015 demonstrated that e-cigarette use was independently associated with the progression of tobacco smoking among non-smokers [32]. However, this is different than the data found in other studies where Gallus et al found that 2.6% of nonsmokers compared to 20.6% of current smokers have tried e-cigarettes [23]. Moreover, in New Zealand, 50% of smokers as compared to 3.4% of nonsmokers reported trying E-cigarettes [27].

Regulatory control is pivotal in tobacco products. In Lebanon, a low percentage (39%) of participants believed that e-cigarettes should be regulated by the government like tobacco smoking as compared to the US where 83.5% believed it should be regulated [33]. This may be explained by the poor enforcement of regulatory control for tobacco smoking in Lebanon and the need for a more restricted law on tobacco manufacturing, marketing, and sale. In 2016, the US Food and Drugs Administration released a regulatory control for e-cigarette manufacturing, sales, and marketing [34]. It is only by implementing policies related to e-cigarette use and marketing that we can control and avoid their still unknown ultimate effects on public health [34].

Concerning perception of e-cigarettes, 41% of participants believed that it is not a better alternative to stop smoking and only 17% thought it is better than nicotine replacement therapy. However, e-cigarettes helped 56% of users in cutting down on smoking regular cigarettes. There is controversy in the literature on the benefits of e-cigarettes as a way to quit smoking. Although Adkison et al showed in their study that most e-cigarette users reported using it as an aid to quit smoking, it has failed to demonstrate a significant difference in quitting smoking rates between users and nonusers after one year [35]. Also, a meta-analysis performed in 2016 concluded that “as currently being used, e-cigarettes are associated with significantly less quitting among smokers” and should not be recommended as an effective smoking cessation aid [36]. On the other hand, a second meta-analysis was done in the same year and concluded that e-cigarettes may assist in quitting smoking when compared to placebo or nicotine patches [17]. However, the confidence was rated as low according to the GRADE standards [17]. The most recent randomized study by Hajek et al, concluded that e-cigarettes were more effective for smoking cessation than nicotine-replacement therapy when both products were accompanied by behavioral support [37]. The findings of the above study could reinforce the use of e-cigarettes in smoking cessation, though its

safety in the long term should be accounted for.

Limitations:

Inherent limitations may exist that may restrict the generalizability of our result to the general population. First, conducted in the capital of Lebanon, Beirut, the result may not apply to other places in the country where there might be a lower socio-economic status and educational level. Second, it is worth mentioning that the data were collected in 2016 which may not reflect the current results accurately. Having a pandemic, a recent blast, and a huge economic crisis in Lebanon may alter the results by increasing the stress and the need to smoke on one hand and having more poor people that can't afford e-cigarettes on the other hand. Third, although we were trying to capture a wide variety of people, we have missed the housewives and anyone who cannot go out of their homes. Finally, the survey used in this study is formulated by the authors and not validated worldwide, so it may not cover all aspects of the perception and harm of e-cigarettes and may not be applied to other countries.

Conclusion:

Our study found that most of the Lebanese population is aware of e-cigarettes and some perceive them as less harmful than tobacco smoking. A minority in our study had tried it but the overall main reason for the trial was to cut down on smoking tobacco. Younger age and non-smokers were at significantly higher risk of trying the e-cigarettes due to probably increased advertisement and social popularity, particularly among the younger generation. E-cigarettes may then be viewed as a gateway to smoking rather than out of it if further caution is not implemented. Moreover, further investigation is needed to assess the long-term health effects of e-cigarettes and their efficacy as a smoking cessation tool, along with better regulation to control its use and have the maximal benefit as an aid to stop smoking.

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