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ORIGINAL ARTICLE

Knowledge assessment of e-smoking risk factors among Al-Ahsa population in Saudi Arabia

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ABSTRACT

Objective: This study aimed to evaluate the general knowledge of electronic smoking, and its associated risk factors among the inhabitants of Al-Ahsa, Saudi Arabia.

Methods: A cross-sectional study in Saudi Arabia's Al-Ahsa region was conducted that used an online self-administered questionnaire to gather demographic data and knowledge about e-smoking side effects through social media.

Results: The current study found that a significant, one-fourth of participants used e-cigarettes. Usage was predominant among male, young, and undergraduate adults. The study population attributed it toward flavor variability and social acceptability. The majority of the users believed that these devices are less harmful than the traditional methods, although they were aware of the potential side effects of their constituents. About half of the users were aware of the services and initiatives available to help people stop smoking and vaping.

Conclusion: According to this study, rumors regarding e-cigarettes' capacity to help smokers quit are making young adolescents in Al-Ahsa attracted toward these devices. However, their safety has not received governmental clearance. Toxic and addictive compounds found in e-cigarettes can lead to coughing and dyspnea, with lung cancer being the most common risk. Campaigns to inform people about the dangers of e-cigarettes must be encouraged and additional research is the need of the hour to fully grasp the risks associated with it.

Keywords: E-cigarettes, smoking, risk factors, knowledge, Saudi Arabia.

Introduction

E-cigarettes, also called electronic nicotine delivery systems and occasionally electronic non-nicotine delivery systems, are available in a variety of representations, according to the World Health Organization (WHO) [1]. By heating a liquid, these systems produce aerosols that are inhaled by the users [2]. These so-called e-liquids might include nicotine with or without tobacco, but they frequently include additives, flavors, and substances that are potentially harmful to human health [1].

Further research is required to comprehend the possible pitfalls versus benefits ratio of these devices. To this day, not a single e-cigarette has been licensed as a cessation aid, nor authorized to modify a risk associated with conventional smoking. It is noteworthy, that adverse effects have been disclosed by consumers. A vast majority (98%) of patients reported respiratory problems [3], out of which, two-thirds of patients had a dry and one-third of them had a productive cough. Surprisingly, dyspnea has been the most frequently reported symptom with 86% of the patients reporting it and 77% also had concomitant hypoxemia [2].

The tobacco plant contains nicotine, a substance that is very addictive [3]. Cigarettes, cigars, smokeless tobacco

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including dip, snuff, chewing tobacco, hookah tobacco, and the majority of e-cigarettes contain nicotine. In 2021, the National Youth Tobacco Survey was conducted among students concerning their usage of different types of tobacco products. According to the data issued by the Food and Drug Administration and the Centers for Disease Control and Prevention (CDC) [3], e-cigarettes were the most popular tobacco product at that time, evidenced by 2.06 million (7.6%) middle and high school students' users. It was followed in descending order, by cigarettes (1.5%), cigars (1.4%), smokeless tobacco (0.9%), hookahs (0.8%), and nicotine pouches (0.8%) [3].

A similar study conducted in 2015 in North Carolina concluded that the majority of the students (77.3%) were aware of e-cigarettes but were not educated about the health risks and safety of these products. Only 5.4% of the participants claimed that the schools provided e-cigarette use information [4]. In a questionnaire-based study conducted in Europe on 14,352 students, 43.7% of the participants claimed to have used an e-cigarette [5]. In 2022, the China CDC performed the National Youth Tobacco Survey among secondary school students, which deducted a prevalence of e-smoking as 16.7%, with 23.2% of males smoking in comparison to 9.5% of females [6].

In Saudi Arabia, according to a survey released in 2022, 26.3% of people have used electronic cigarettes at least once, and 24.7% have a relative who is an active user [7]. E-cigarettes have increased the youth's consumption of nicotine products, but there is growing evidence showing health risks. E-liquid's primary components, propylene glycol, and vegetable glycerin, form toxic aldehydes when heated, and the long-term effects of inhalation and flavoring chemicals are still unknown [8]. Hence, this study aimed to evaluate the general knowledge of electronic smoking, and its associated risk factors among the inhabitants of Al-Ahsa, Saudi Arabia.

Subjects and Methods

A cross-sectional study was conducted by administering an online self-administered questionnaire through social media obtained through a community-based study that represented the population of the Al-Ahsa region, Saudi Arabia [7].

Participants were selected randomly by distributing an online Arabic, and an English self-designed questionnaire. It covered the demographic data of the participants and their knowledge about e-smoking side effects.

The data were collected, reviewed, and then fed to Statistical Package for Social Sciences version 21 (SPSS: An IBM Company). All statistical methods used were two-tailed with an alpha level of 0.05 considering significance if the *p*-value was less than or equal to 0.05. Descriptive analysis was performed by prescribing frequency distribution and percentages for study variables, including participants' data, and patterns and reasons for e-cigarette use. The participants' knowledge and perceptions of e-smoking-related risk factors were tabulated. Cross tabulation to show factors associated with e-cigarette use among study participants was conducted with Pearson chi-square test for significance and exact probability test if there were small frequency distributions. Inclusion factors: Resident of Al-Hasa, accepted to be a part of the study. Exclusion factors: Not a resident of Al-Hasa.

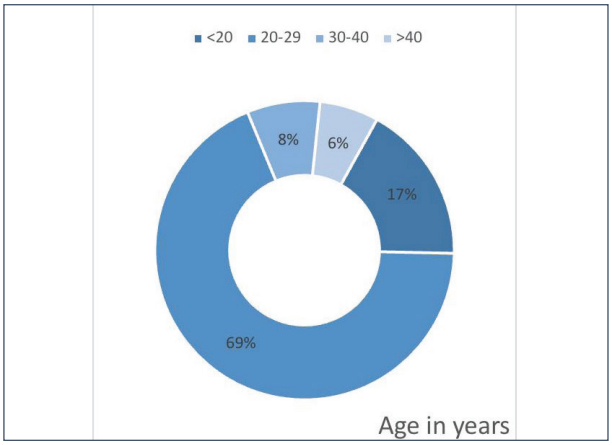

Figure 1. *Age of the participants in the years.*

Table 1. *Personal data of study participants, Al-Ahsa, Saudi Arabia.*

Personal data	Frequency (n)	Percentage (%)
Age in years		
<20	81	17.3
20-29	321	68.4
30-40	37	7.9
>40	30	6.4
Gender		
Male	326	69.5
Female	143	30.5
Educational level		
Secondary/below	63	13.4
Undergraduate	358	76.3
Post-graduate	48	10.2

Results

A total of 469 participants from Al-Ahsa were included. Most of the participants were young with a mean age of 24.9 ± 12.6 years old (Figure 1).

Furthermore, 69.5% of the participants were males. The predominant group of users was undergraduates (76.3%), followed by (13.4%) users belonging to the secondary level of education and below. Only 10.2% of the participants were post-graduates (Table 1).

Table 2. *E-cigarette use pattern among study participants, Al-Ahsa, Saudi Arabia.*

E-cigarette use	Frequency (*n*)	Percentage (%)
Are you using E-cigarettes		
Yes	123	26.2
No	346	73.8
If "yes" what is your reason for starting e-cigarette		
Enjoy a variety of flavors that only e-cigarette offers	40	32.5
Quit or reduce smoking and reduce smoking exposure of family members	26	21.1
Just to try something new	20	16.3
I had already quit smoking, but I wanted to avoid relapse (restart smoking)	15	12.2
Less cost	15	12.2
Avoid smoking ban in public places	7	5.7

Table 3. *Knowledge and perception of e-smoking risk factors among the Al-Ahsa population in Saudi Arabia.*

	Frequency (*n*)	Percentage (%)
Do you think e-cigarette is		
More harmful to tobacco cigarettes	176	37.5
Equally harmful to tobacco cigarettes	136	29.0
Less harmful to tobacco cigarettes	146	31.1
Completely safe and healthy	11	2.3
Which of the following effects of nicotine are you aware of?		
Risk of lung cancer	325	69.3
Allergic airway inflammation	295	62.9
Dry cough	247	52.7
Headache	213	45.4
Nausea	166	35.4
Dizziness	158	33.7
Vomiting	97	20.7
None of the above	39	8.3
Do you know about the available programs and resources to quit smoking and vaping?		
Yes	223	47.5
No	246	52.5

Exactly 123 (26.2%) of the study participants used e-cigarettes. The most reported reason, attributed toward this, was the availability of a variety of flavors that only e-cigarettes offer (32.5%). Around 21.2% of the users started it as an aid to quit, reduce smoking, or limit their family's exposure to smoke. While 16.3% initiated it in an attempt to try something new (16.3%), to avoid relapse to smoking (12.2%), for its less cost (12.2%) and to avoid smoking ban in public places (5.7%) (Table 2).

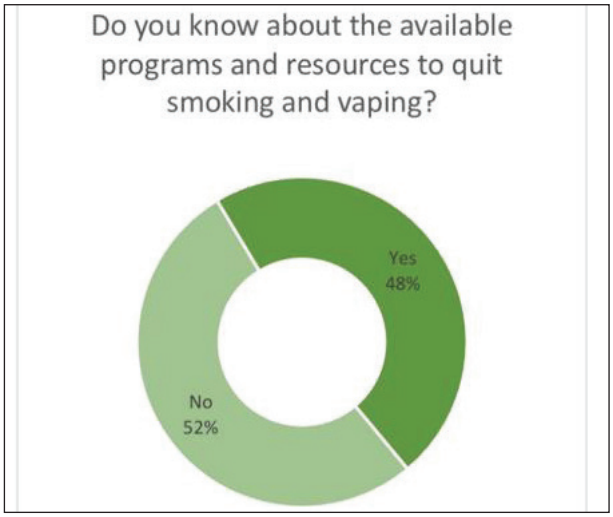

Figure 2. *Do you know about the available programs and resources to quit smoking and vaping.*

A total of 176 (37.5%) of the study participants thought that e-cigarettes are more harmful than tobacco cigarettes, 136 (29%) thought that it is equally harmful to tobacco cigarettes, and 146 (31.1%) thought it is less harmful to tobacco cigarettes. Concerning the effects of nicotine, the most known included risk of lung cancer (69.3%), followed by allergic airway inflammation (62.9%), dry cough (52.7%), headache (45.4%), and nausea (35.4%). A total of 39 (8.3%) reported none of the above (Table 3).

A total of 223 (47.5%) knew about the available programs and resources to quit smoking and vaping (Figure 2).

Around 29.9% of participants in the 20-29 years category used e-cigarettes compared to 6.7% of users aged more than 40 years with recorded statistical significance (p-value = 0.014). E-cigarettes were used by 33.7% of males versus 9.1% of females (p-value = 0.001). Also, 90.9% of those who thought e-cigarettes were completely safe and healthy used them in comparison to 11.9% of others who thought it is more harmful than tobacco cigarettes (p-value = 0.001). Likewise, 30.9% of those who knew about the available programs and resources to quit smoking and vaping used e-cigarettes versus 22% of others (p-value = 0.027) (Table 4).

Discussion

Nicotine is a highly addictive chemical compound that is found in tobacco plants. According to the WHO, there are diverse types of e-cigarettes currently in use. These liquids might or might not include nicotine, even though, they do contain addictive flavors and chemicals that can

Table 4. *Factors associated with e-cigarette use among study participants, Al-Ahsa, Saudi Arabia.*

Factors	Yes		No		*p*-value
	No	%	No	%	
Age in years					
<20	15	18.5	66	81.5	0.014*$
20-29	96	29.9	225	70.1	
30-40	10	27.0	27	73.0	
>40	2	6.7	28	93.3	
Gender					
Male	110	33.7	216	66.3	0.001*
Female	13	9.1	130	90.9	
Educational level					
Secondary/below	15	23.8	48	76.2	0.561
Undergraduate	98	27.4	260	72.6	
Post-graduate	10	20.8	38	79.2	
Do you think e-cigarette is					
More harmful to tobacco cigarettes	21	11.9	155	88.1	0.001*$
Equally harmful to tobacco cigarettes	27	19.9	109	80.1	
Less harmful to tobacco cigarettes	65	44.5	81	55.5	
Completely safe and healthy	10	90.9	1	9.1	
Do you know about the available programs and resources to quit smoking and vaping?					
Yes	69	30.9	154	69.1	
No	54	22.0	192	78.0	

P: Pearson X^2 test $: Exact probability test * $p < 0.05$ (significant).

be toxic for those who smoke, e.g., periodontal ligament fibroblasts damage [9]. The most common side effects that have been reported by the patients include coughing (80%), dyspnea (86%), and hypoxemia [3].

According to similar studies, some people thought that e-cigarettes were safe for passive smokers [10]. When in fact they also affect passive smokers. One such example is the prevalence of Atopic dermatitis which is significantly associated with active as well as passive smoking in Korean adolescents [11]. E-cigarettes are getting popular among youth and middle-aged people worldwide. A study in European countries showed that the percentage of users of e-cigarettes among adolescents has increased from 5.5% (in 2010-2012) to 29.9% (in 2013-2014) [12]. A study published in 2022 showed that 26.3% of the participants have smoked an e-cigarette at least once and 24.7% of them had a family member who had tried e-smoking in Saudi Arabia.

This study was conducted to assess the awareness of the Al-Ahsa population about the impact of e-smoking on human health. Based on this study, the findings indicated that the awareness of the Al-Ahsa population about e-smoking was quite impressive.

Most of the traditional cigarette smokers in Saudi Arabia were between 18 and 24 years of age [13], however with regards to e-smokers, they were found to be from an older age group, i.e., second and third decade of life. In any category of age group e-smoking was conducted by a minority of the population. As seen in patterns, concerning gender distribution of traditional smoking there is a similar trend with males having a significant majority.

Variability of flavors was the most reported reason for starting it followed by an attempt at reducing or quitting tobacco cigarettes, which is a profound factor, as published in another study [14]. Education plays a foremost role in sustaining such activities as the least reported users were from the postgraduate category. Likewise, users who deemed these devices to be safer also showed an upward trend toward their use. The current study demonstrated that only 39% of the users who thought that they were harmful used them when compared to 60% who thought they were less damaging than traditional tobacco cigarettes. This behavior might be because of the greater acceptance of public e-cigarette use when compared to cigarettes as the attitudes and norms of a society are known to predict intentions for future users of such items that are above the effect of smoking [15].

About half of the participants did not have an idea about these programs in place to help individuals quit or reduce smoking. The Ministry of Health in Saudi Arabia has initiated an antismoking clinic that aims to

facilitate access to therapeutic services and integrates these clinics with other healthcare providers to ensure a high-quality standard of service for all beneficiaries. They aim to provide the best preventive and therapeutic plans through a qualified staff to help the largest possible number of those willing to quit smoking. There were some limitations of this study, which included difficulty in the distribution of the questionnaire and ensuring that all the collected data were not compromised by any one of the data collectors.

Conclusion

The purpose of this study was to evaluate the general awareness and knowledge of E-smoking and the risk factors that are associated with it among the people living in Al-Ahsa, Saudi Arabia. A wide range of participants in the study participated, and the results indicated that the region's level of awareness about e-smoking and the risk factors that go along with it was not ideal. This demonstrates the value of continuing education initiatives and public awareness campaigns to increase understanding of e-smoking and lessen its negative effects. Raising awareness can help those impacted by e-smoking and its risk factors have better results. Future investigations ought to focus on resolving the shortcomings of this study and offering a more thorough comprehension of the awareness of e-smoking in Saudi Arabia.

List of Abbreviations

CDC	Centers for disease control
E-cigarettes	Electronic cigarettes
ENDS	Electronic nicotine delivery system
E-smokers	Electronic smokers
WHO	World Health Organization

Conflict of interest

The authors declare no conflicts of interest in the publication of this study.

Funding

None.

Consent to participate

Informed consent was obtained from all participants.

Ethical approval

The study obtained ethical clearance from the deanship of scientific research of King Faisal University with Ref. no. KFU-REC-2022-DEC-ETHICS432. Dated: 20-12-2022.

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