

ELECTRONIC CIGARETTE USAGE AMONG THE UNIVERSITY STUDENTS IN KINGDOM SAUDI ARABIA

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Abstract

Background: Nowadays, the use of electronic-cigarette shows a significant increase among adults and youth in many countries, although there is still a public health debate about its relative effects compared to the traditional cigarettes. The aims of this study were to assess the prevalence, Attitude, possible reasons of use, and factors associated with E-cigarettes use among the University students.

Materials & Methods: A cross-sectional study design was conducted and 930 university students were selected by multistage random sampling technique. A self-administered questionnaire included socio-demographic data, questions related to prevalence, attitude, and risk factor about electronic cigarette was used to collect data. Data were be collected and analyzed using SPSS Program version 22.

Results: 637students were respond, with response rate 68.5%. The prevalence of E-cigarettes smoking was found to be about 26.69% among study sample. The prevalence rate of E-cigarettes smoking by gender was found to be significant ($p = 0.00$), it's found more in male 132 (38.3%) than female 38 (13.0%). The most used flavor among who previously used E-cigarettes was fruits 125 (73.5%). I can smoke anywhere without anyone notice was the highest reason for E-cigarettes smoking 78 (45,9%).

Conclusion: Higher prevalence of e-cigarette usage among medical students in Saudi Arabia was reported among university students. Similar to tobacco smoking, e-cigarette usage is a major public health issue and concern among the younger population in Saudi Arabia. Further studies of large samples as well as health education program about danger of e-cigarette usage are highly recommended to the students and their families.

Keywords: E-cigarettes, Traditional, Attitude, University, Saudi Arabia

Introduction

Electronic cigarette (e-cigarette) is a device designed for delivering nicotine flavor (which can be picked by the user) and other chemicals including propylene glycol and/or glycerol. That used as a substitute for tobacco products, especially cigarettes. In the year 2003, a Chinese pharmacist, Hon Lik, designed this new device with the concept of delivering nicotine and a product that can be used as a device for tobacco cessation [1, 2].

The prevalence of conventional cigarette smoking among health science students in Saudi Arabia has been reported in previous studies. It has been shown that around 13% of the male and 2.4% of the female

medical students smoke a conventional cigarette. These percentages vary between the different geographic regions of the country. For instance, in the western region, it reaches 24.8% among males and 9.1% among females. For other health science specialties, the prevalence of smoking is estimated to be 7.9%, 13.4%, and 29% for dental, pharmacy, and medical science students, respectively [3-5]. Less known about the E-cigarettes prevalence and pattern of use among health science students in Saudi Arabia as it has been recently introduced to the country [6].

E-smoking is becoming a trend among youths they are gaining wide acceptance. They are called as electronic cigarette or e-cigarette. The major difference between conventional tobacco cigarettes and e-cigarettes is e-cigarette do not cause bad breath; they do not produce flame or carbon monoxide but this electronic device simulates tobacco smoking. They are battery operated having a cartridge which is refillable, here user inhales vapor instead of smoking. E-cigarette vapor contains fewer toxins, in lower amounts, than cigarette smoking [7].

E-cigarettes are wrongly thought to be safer than tobacco products, however, they are considered hazardous and unsafe for the respiratory system. Despite this fact, it is increasingly used and promoted globally, particularly among young adults, even in families with high social and financial levels. Unfortunately, the media influences the increasing use of e-smoking by claiming that they are less harmful in comparison to other smoking modes. They are attracted to it due to the rumors of being helpful to stop tobacco smoking. This could be because younger adults become influenced by new trends especially if they think that new trend would help them get rid of an unhealthy habit which is tobacco smoking. Also, the availability of a wide range of flavors makes them preferred by most of the users. Furthermore, smokers who cannot quit smoking believe that e-cigarettes are a better option with lower health hazards [8].

Over the last decade there has been a significant boost towards the use of electronic cigarettes (e-cigarettes), especially among youth. Different concentrations of propylene glycol (PG) or vegetable glycerin (VG), flavors and nicotine are mixed in plastic cartridges and commercially offered or privately produced by the vapers. During vaping, a mixture of air and vapors is inhaled to the lungs. Since the ingredients of the e-cigarettes are not burned but vaporized (heated), fewer chemicals are emitted. The levels of potentially toxic compounds (e.g. volatile organic compounds (VOCs), particulate matter (PM), metals, radicals, nitrosamines, etc.) emitted from vaping appear to be lower compared to that of tobacco smoking (from combustible cigarettes) [3].

They are marketed as a safer alternative for smokers to inhale nicotine and as an aid in smoking cessation, but nicotine has several side effects, including a highly addictive quality and a negative effect on brain development from the prenatal period into adolescence. Additionally, nicotine can be associated with an increased risk of cardiovascular, respiratory, and gastrointestinal disorders. Furthermore, nicotine decreases the immune response and negatively impacts oral and reproductive health. By various mechanisms, nicotine can lead to cancers by affecting cell proliferation, oxidative stress, apoptosis, and DNA maturation. Moreover, the direct contact of nicotine with oral and pharyngeal tissues can cause irritation, burning, increased salivation, nausea, abdominal pain, vomiting, and diarrhea [4].

Considering these reports several countries have restricted the use of e-cigarettes, including Canada and Australia. The Saudi Arabian government had raised a ban on the import of e-cigarettes in the year 2014, following the recommendations of the Saudi Food and Drug Authority. Later, this ban had been revoked in the year 2019, allowing travelers to carry one e-cigarette and a limited amount of flavorants. This also allows the business owners to import and sell the e-cigarette and its products. These policies have been raising many concerns about the current prevalence of usage of e-cigarettes among the younger population as they might consider them as safe and as an aid to quit tobacco [1].

The study done in 2013, found that 4.9% of students reported ever using an e-cigarette, with curiosity and social influences being key reasons for initiation. Use was more common among males and those who had ever smoked traditional cigarettes [5].

Other study done in 2019, showed a significant rise in e-cigarette use among young adults, especially university students. It found that about 15-30% of university students in the U.S. reported using e-cigarettes at least once in their lifetime [9].

The study examined the relationship between e-cigarette use and mental health and found that students who reported higher levels of stress, anxiety, and depression were more likely to use e-cigarettes, viewing them as a form of coping mechanism [10].

Other study highlighted that a large percentage of university students believed e-cigarettes were a healthier alternative to smoking. However, many were unaware of the presence of nicotine in e-cigarettes or its addictive potential [11].

On the other hand, studies that provided important insights to the knowledge and beliefs toward e-cigarettes among the adult community found that, there are limited information about perceptions and knowledge of the harmful effects of e-cigarettes within the younger adults, especially among university students. Thus far, all the studies investigating e-cigarettes focused on the older adult population. Assessing young individuals' perceptions of e-cigarettes can help to identify factors that may influence their decision to e-cigarettes use. In addition, it has the potential to implement effective regulations and educational programs that particularly address e-cigarettes use. This study examined the perceptions, and knowledge of e-cigarettes among university students [12].

Few knowledge are known about this problem among university students especially in Saudi Arabia. So, the aims of this study were to assess the prevalence, Attitude, possible reasons of use, and factors associated with E-cigarettes use among the University students.

Materials & Methods

Study setting

Governmental Universities in Saudi Arabia.

Study design

A cross-sectional study design was chosen to determine the predesigned objectives among university students.

Sampling methods and sampling size

Multistage random sampling technique was used. It consists of the following stages:

First stage: we choose Taif university from 30 governmental universities in Saudi Arabia by simple random sample.

Second stage: we choose 3 colleges from Taif university by simple random sample (college of medicine - college of art - college of applied medical science).

Third stage: we choose one grade from chosen colleges by simple random sample (4th grade).

The sample size was 930 students.

Data collection tool

Data was collected through the responses of participants to the pre-designed self-administered validated questionnaire.

The questionnaire was validated by conducting pilot study on small number of 30 students which not included in the analysis. The usefulness of the pilot study is to overcome and correct any difficulties in the questionnaire.

The aim of the study was explained to all participants in the study before distributing the questionnaire. The questionnaire was include information on the responder's sociodemographic data like age, sex,

..... in addition to questions to evaluate the prevalence and frequency of using of e-cigarette smoking, and questions related to the reasons and risk factors of E-Cigarette smoking.

Statistical Analysis

Data entry and statistical analysis were performed using Statistical Package for the Social Science (SPSS) program for windows version 22. Percentage was used to determine prevalence of E-cigarettes smoking among university students. Proportion and percentage were used for category variables. Chi square test examined the relationship between socio-demographic factors and E-cigarettes smoking. The p values < 0.05 was be considered for statistical significance.

Ethical considerations

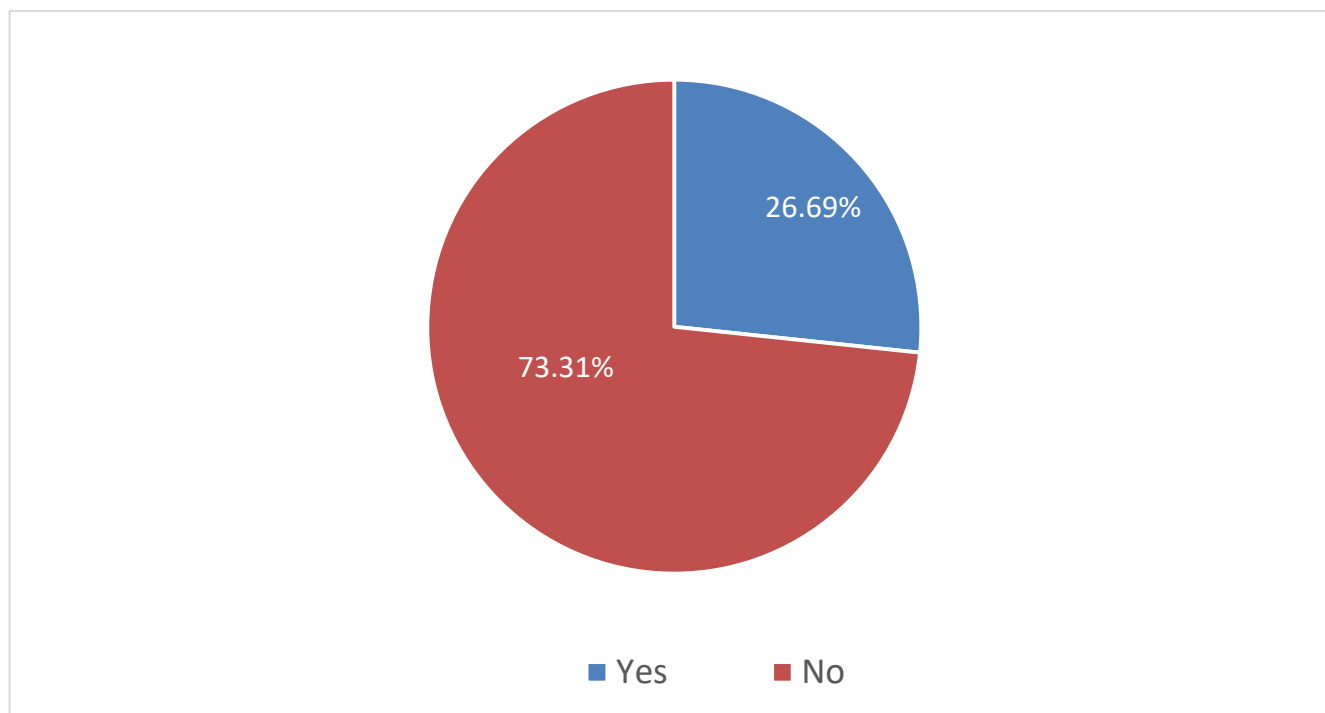
Institutional research ethics board approval was obtained from Taif University before conducting any study procedure, approval No. (44-377). Consent was taken from the Participant and their identity kept confidential.

Results

The total number of the students in the selected colleges art, applied medical sciences and medicine was 930 and 637 students respond showed a response rate of 68.5 %, including both male and female students. The age of study sample ranged between 21 – 24 years old. The mean age of study sample was 21.96 ± 0.76 years old.

The prevalence of electronic cigarettes smoking among study participants was found to be about 26.69% (Figure 1).

Figure 1. Prevalence of E-cigarettes smoking among study sample.



The prevalence rate of E-cigarettes smoking by gender was found to be significant ($p = 0.00$), it's found more in male 132 (38.3%) than female 38 (13.0%). Concerning age, the prevalence rate of E-cigarettes

smoking was found to be insignificant ($p = 0.063$), The age of twenty-one was found 35 (20.1%) and the age of twenty-two was found 93 (27.8%). Regarding marital status, the prevalence rate of E-cigarettes smoking was found to be insignificant ($p = 0.194$), single students 168 (27.1%) was found to be higher than married students 2 (12.5%). The prevalence rate of E-cigarettes smoking by monthly income was found to be insignificant ($p = 0.583$), student with income less than 5000SR 167 (27.0%). The prevalence of E-cigarettes smoking by collage was found to be insignificant ($p = 0.39$), art collage 75 (29.6%), Applied Medical Sciences collage 62 (24.9%), medicine collage 33 (24.4%) (Table 1).

Table 1. Socio-demographic factors associated with E-cigarettes smoking among study sample.

Parameters	Categories	Previous use				P- value
		Yes No.	%	No No.	%	
Gender	Male (345)	132	38.3%	213	61.7%	0.00
	Female (292)	38	13.0%	254	87.0%	
Age	21.00 (174)	35	20.1%	139	79.9%	0.063
	22.00 (334)	93	27.8%	241	72.2%	
	23.00 (107)	33	30.8%	74	69.2%	
	24.00 (22)	9	40.9%	13	59.1%	
Marital status	Married (16)	2	12.5%	14	87.5%	0.194
	Single (621)	168	27.1%	453	72.9%	
	Divorced (0)	0	0.0%	0	0.0%	
	Widow (0)	0	0.0%	0	0.0%	
Monthly income	less than 5000 *SR (619)	167	27.0%	452	73.0%	0.583
	5000-10000 SR (10)	2	20.0%	8	80.0%	
	more than 10000 SR (8)	1	12.5%	7	87.5%	
College	Art (253)	75	29.6%	178	70.4%	0.39
	Applied Medical Sciences (249)	62	24.9%	187	75.1%	
	Medicine (135)	33	24.4%	102	75.6%	

*SR = Saudi Riyals.

The most common used flavor among E-cigarettes smokers and found that fruits 125 (73.5%), was the first one while the second most common flavor used was tobacco 33 (19.4). In the last 30 days 38 (22.4%) had not smoke E-cigarettes, while 73 (42.9%) E-cigarettes smokers had smoke from 21-30 days. Daily rate use was moderate in 63 (37.1%) E-cigarettes smokers and was light among 44 (25.9%) E-cigarettes smokers (Table 2).

Table 2. Flavor and consumption of E-cigarettes smoking among study sample.

Parameters	Categories	No.	%
E-cigarettes flavor	Fruits	125	73.5%
	Mint	4	2.4%
	energy drinks	3	1.8%
	Tobacco	33	19.4%

	candy, gum	3	1.8%
	Other	2	1.2%
Last 30 days use	I didn't smoke	38	22.4%
	1-10	29	17.1%
	11-20	30	17.6%
	21-30	73	42.9%
Daily rate use	light (1 - 10 times)	44	25.9%
	moderate (11-30 times)	63	37.1%
	high (31-50 times)	34	20.0%
	very high (more than 50 times)	29	17.1%

The reasons and risk factors of electronic cigarettes smoking among study participants. I can smoke anywhere without anyone notice was found to be higher reason for E-cigarettes smoking 78 (45.9%). To stop other tobacco products and friend use E-cigarettes each come next with 66 (38.8%). Curiosity toward E-cigarettes was a reason among 50 (29.4%) students (Table 3).

Table 3. Reasons and risk factors of E-cigarettes smoking among study sample.

Parameters	N0.	%
Family member use E-cigarettes	15	8.8%
Friend use E-cigarettes	66	38.8%
To stop other tobacco products	66	38.8%
Cheaper than other tobacco products	37	21.8%
Less harmful than other products	39	22.9%
I can smoke anywhere without anyone notice	78	45.9%
Curiosity toward e-cigarettes	50	29.4%

The majority of students who previously used E-cigarettes 126 (74.1%) and who didn't previously used E-cigarettes 398 (85.2%) were strongly agreed that E-cigarettes smoking is harmful to health. On the other hand, students who used E-cigarettes 46 (27.1%) and who didn't used E-cigarettes 138 (29.6%) were all neutral about E-cigarettes being less harmful than traditional cigarettes smoking. Additionally, students who used E-cigarettes 57(33.5%) and who didn't used E-cigarettes 179 (38.3%) were all neutral about E-cigarettes smoking help to quit traditional smoking. Most of E-cigarettes smokers 81 (47.6%) and non-smoker 183 (39.2%) strongly agreed that E-cigarettes smoking can cause addiction. Students were asked about recommending E- cigarettes smoking to quit traditional smoking, students who used E-cigarettes 53(31.2%) and who didn't used E-cigarettes 187 (40%) were all strongly disagreed with

this question. Most of E-cigarettes smokers 99 (58.2%) and non-smoker 231(49.5%) strongly agreed that there is an increase in E-cigarettes smoking use among university students in Saudi Arabia. Students who used E-cigarettes 52 (30.6%) and who didn't used E-cigarettes 176 (37.7%) were all neutral about receiving adequate awareness about e-cigarette smoking and its effects (Table 4).

Table 4. Attitude towards E-cigarettes smoking among study sample.

Parameters	Categories	Previous use		No.	%	No.	%
		Yes	No				
E-cigarettes smoking is harmful to health	Strongly agree	126	74.1%	398	85.2%		
	Agree	34	20.0%	41	8.8%		
	Neutral	8	4.7%	28	6.0%		
	Disagree	0	0.0%	0	0.0%		
	Strongly disagree	2	1.2%	0	0.0%		
E-cigarettes smoking less harmful than traditional cigarettes smoking	Strongly agree	41	24.1%	61	13.1%		
	Agree	36	21.2%	62	13.3%		
	Neutral	46	27.1%	138	29.6%		
	Disagree	22	12.9%	111	23.8%		
	Strongly disagree	25	14.7%	95	20.3%		
E-cigarettes smoking help to quit traditional smoking	Strongly agree	29	17.1%	55	11.8%		
	agree	37	21.8%	59	12.6%		
	Neutral	57	33.5%	179	38.3%		
	Disagree	22	12.9%	81	17.3%		
	Strongly disagree	25	14.7%	93	19.9%		
E-cigarettes smoking cause addiction	Strongly agree	81	47.6%	183	39.2%		
	Agree	52	30.6%	167	35.8%		
	Neutral	27	15.9%	90	19.3%		
	Disagree	9	5.3%	19	4.1%		
	Strongly disagree	1	0.6%	8	1.7%		
I recommend e-cigarettes smoking to quit traditional smoking	Strongly agree	21	12.4%	30	6.4%		
	Agree	19	11.2%	33	7.1%		
	Neutral	28	16.5%	116	24.8%		
	Disagree	49	28.8%	101	21.6%		
	Strongly disagree	53	31.2%	187	40.0%		
increase E-cigarettes smoking use among university students in Saudi Arabia	Strongly agree	99	58.2%	231	49.5%		
	Agree	43	25.3%	144	30.8%		
	Neutral	26	15.3%	77	16.5%		
	Disagree	2	1.2%	11	2.4%		
	Strongly disagree	0	0.0%	4	0.9%		
I have received adequate awareness about e-cigarette smoking and its effects	Strongly agree	30	17.6%	85	18.2%		
	Agree	40	23.5%	87	18.6%		
	Neutral	52	30.6%	176	37.7%		

Discussion

Over the past few years, there has been a drastic increase in the usage of e-cigarettes globally. This is mainly because of the strong and aggressive marketing strategies adopted by the manufacturing companies. These companies target people of all age groups, including the younger age groups and also the female population. E-cigarette companies advertise their products as safety devices that help in meeting an individual's need for nicotine, thereby helping a replacement for conventional smoking. The availability of the products in different forms and flavors makes them more attractive and appealing for the buyers. The promotion of e-cigarettes as a healthier alternative to conventional cigarettes is mainly increasing their popularity among the younger population.

Our study was intended to critically review the prevalence of e-cigarette usage among Taif university students. The total study sample was 637 students, including both male and female students. The results of the studied students sample revealed that the prevalence of E-cigarettes smoking was found to be 26.69%. While in other studies surprisingly a greater proportion of students reported that 9.8% e-cigarettes compared to 18.4% smoking regular cigarettes [13].

The increased prevalence of e-cigarette usage among Taif university students in Saudi Arabia can be attributed to the facts that there are an increase and ease in the availability of e-cigarettes nowadays and also with the belief among the users that they are less harmful. This has to be dealt with high priority by the regulatory bodies. Despite several potential side effects of these products, there is a lack of sufficient knowledge among Taif university students and the general population about the potential consequences of using e-cigarettes [1].

E-cigarette was found to be more among single (27.1%) than married students (12.5%) in the present study. This was in agreement with other studies which showed that most of the smokers are unmarried students while a small percentage of smokers are married. This implicates the percentage is nearly constant over the years [14,15].

The current study revealed that, the prevalence of E-cigarettes smoking was found to be more among less monthly income students (27.0%). This was consistent with other studies which showed that students with less monthly income were more e-cigarette smoking (22.6%) than moderate and high monthly income students. This was obviously due to the cheapness of electronic cigarette that became reusable in contrast to the regular cigarette, which become more expensive and disposable [14,15].

Our study showed that, person can smoke anywhere without anyone notice was found to be higher reason for E-cigarettes smoking 78 (45,9%). This followed by to stop other tobacco products and friend use E-cigarettes (38.8%). This was in contrast to other study which reported that half of E-cigarette user students used it for entertainment (49%), peer effect (17%), anxiety and stress relieve (9.2%), to quite conventional cigarette 19 (9.2%), while other reasons for sadness and depression (7.8%). This difference may be explained by different location and different culture of studied sample [16].

Even though there is insufficient evidence for the health care professions to promote these products as safe and tobacco cessation aids, health professional students in our study still believed that e-cigarettes could help tobacco users in quitting the habit. This was in agreement with other studies conducted which found that a majority of the e-cigarette users considered them as a tool for tobacco cessation and e-cigarette users considered them in an attempt to quit conventional smoking. Considering these facts and to prevent the public health disaster, which could be similar to the widely prevalent conventional cigarette smoking, raises urgent concern for the regulatory policies concerning sales and marketing of the products [16,17].

In our study the majority of students who previously used E-cigarettes (74.1%) and students who didn't previously used E-cigarettes (85.2%) were strongly agreed that E-cigarettes smoking is harmful to health. Students who used E-cigarettes (27.1%) and who didn't used E-cigarettes (29.6%) were all

neutral about E-cigarettes being less harmful than traditional cigarettes smoking. Additionally, students who used E-cigarettes (33.5 %) and who didn't used E-cigarettes (38.3%) were all neutral about E-cigarettes smoking help to quit traditional smoking. Most of E-cigarettes smokers (47.6%) and non-smoker (39.2%) strongly agreed that E-cigarettes smoking can cause addiction. students who used E-cigarettes (31.2%) and who didn't used E-cigarettes (40%) were all strongly disagreed the question about recommending E- cigarettes smoking to quit traditional smoking. Most of E-cigarettes smokers (58.2%) and non-smoker (49.5%) were strongly agreed that there is an increase in E-cigarettes smoking use among university students in Saudi Arabia. Students who used E-cigarettes (30.6%) and who didn't used E-cigarettes (37.7%) were all neutral about receiving adequate awareness about e-cigarette smoking and its effects. In another study, approximately 60% of participants had the misconception that all e-cigarettes contain natural substances, and 32.1% of them knew that e-cigarettes are source of second-hand exposure to nicotine. Furthermore, 57.2% of participants knew that e-cigarettes contain carcinogenic ingredients. Most of them knew that e-cigarettes' aerosol increases the heart rate/ arterial stiffness (58.5%), blood pressure (57.7%) and induces obstruction of conducting airways (70%) [12]. The findings of our study showed a higher interest in e-cigarettes since the legalization of e-cigarette marketing in Saudi Arabia. The aggressive marketing strategies adopted by the manufacturing companies, especially through online media and social media, have highly influenced the consumers. Similar to conventional cigarettes, health warning messages need to be incorporated into the products. There is sufficient evidence from the reported studies, that incorporation of warning messages in the e-cigarette products can increase the harm perception among the buyers and this can eventually help in reducing the sale and publicity of e-cigarettes. Surprisingly, the majority of these products have warning messages, but they are usually inconsistent in the location and content of the health warning messages. Hence, the policymakers should consider implementing and regulating the compulsion of standardization of health warning messages on the e-cigarette products, which can help in reducing the purchasing of e-cigarettes [18].

Several limitations to the current study are acknowledged and should be addressed, including that data were collected using a self-administered questionnaire, which may have recall and desirability biases. Moreover, the study was restricted to a specific population, which reduces and limits the generalizability of the results to the general population of other universities in Saudi Arabia. Furthermore, we did not include questions that concerns about the traditional cigarettes or other alternative tobacco use to have a brief and focused study on e-cigarettes use.

Conclusion

The study reports on the higher prevalence of e-cigarette usage among medical students in Saudi Arabia. Similar to tobacco smoking, e-cigarette usage is a major public health issue and concern among the younger population in Saudi Arabia. E-cigarettes themselves being an addictive substance must be considered with great caution.

In the light of our study, we recommend further and more extensive studies, including different regions in Saudi Arabia to be conducted, and clinical studies that explore e-cigarettes use complications and effects. Also, we recommend conducting further studies that assess physicians' knowledge in depth, experience about e-cigarette, and whether they can confidently discuss all forms of nicotine products with their patients in all group age. Efforts must be made to educate and create awareness among the health care professionals and the general public at large, regarding the risks associated with e-cigarette usage. Regulatory bodies must focus and initiate strict laws and policies to minimize the sales of these products to the younger population. To minimize the popularity of e-cigarettes, the aggressive advertising of these products has to be reduced. Health promotion strategies need to be developed to

reduce the usage of e-cigarettes, especially among the younger population.

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Conflict of interest

The authors declare that there is no conflict of interest regarding the publication of this article.

Consent to participate

Informed consent was obtained from all the participants.

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