

# The prevalence of E-cigarette uses among medical students at Umm Al-Qura University; a cross-sectional study 2020

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## ABSTRACT

**Background:** Electronic cigarette (e-cigarette) is becoming increasingly popular worldwide, and commercially a commonplace in the media. Health concerns and the avoidance of smoking are the most frequently reported factors for conventional smokers to turn to e-cigarettes. However, there is insufficient information about the use of e-cigarettes in Makkah city; therefore, this study aims to determine the prevalence of electronic cigarette uses among medical students at Umm al-Qura University (UQU). **Methods:** A cross-sectional study was conducted in February 2020 among medical students at UQU, Makkah, Saudi Arabia. Data were collected using a prevalidated printed version of a self-questionnaire to determine the prevalence and the main factors that influence medical students to smoke e-cigarettes and to evaluate their awareness, knowledge, and attitude. **Results:** Out of 1249 medical students, 910 participated in the survey, about 31.8 % of them confirmed using e-cigarette regularly. 14.7% think e-cigarettes are medically approved method for smoking cessation, while 59.5% believe it can cause addiction similar to tobacco cigarettes. Among the regular users, 24.3% used it to quit tobacco smoking, 18.9% think it is less harmful, 20.3 % use it because it is less costly, and 18.9% because of stress. Also, 28.4% found it tasty. 30.8% believed that it is less harmful, about 74% stated that they received information about e-cigarettes and only 16% of them received it from medical school. **Conclusion:** The prevalence of e-cigarette uses among medical student in UQU found to be relatively high, and their overall knowledge is insufficient, which conflict our hypothesis.

**Keywords:** Electronic cigarettes, e-cigarette, medical students, smoking cessation, smoking

## Introduction

More than 1.3 billion individuals worldwide smoke tobacco.<sup>[1]</sup> Depending on a nationally representative study conducted in Saudi Arabia, the prevalence of smoking in 2018 was 21.4%, 32.5% among males and 3.9% among females.<sup>[2]</sup> And in 2013, the most popular method of tobacco consumption was the cigarette in Saudi Arabia.<sup>[3]</sup>

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Received: 21-07-2020

Revised: 26-09-2020

Accepted: 24-11-2020

Published: 30-09-2021

### Access this article online

#### Quick Response Code:



Website:  
www.jfmpc.com

DOI:  
10.4103/jfmpc.jfmpc\_1496\_20

Electronic cigarette (e-cigarette) is an alternative to tobacco cigarettes smokers, it is a small electronic device powered by batteries. It is composed of a mouthpiece, atomizer, cartridge, and battery.<sup>[4]</sup> The atomizer heats the liquid to produce vapor, and in most cases, the latter contains nicotine, aerosolized substances, propylene glycol, vegetable glycerin, and several flavors.<sup>[5]</sup>

It is becoming increasingly popular worldwide, especially among the youth and young adults, and it is becoming commercially a commonplace in the media. Reports published in the New England Journal of Medicine (NEJM) illustrated an increment in adolescents' use of e-cigarettes from 2017 to 2018 by 10%,

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**How to cite this article:** Alshanberi AM, Baljoon T, Bokhari A, Alarif S, Madani A, Hafiz H, *et al.* The prevalence of E-cigarette uses among medical students at Umm Al-Qura University; a cross-sectional study 2020. J Family Med Prim Care 2021;10:3429-35.

compared to 1.3 million teenagers and an ongoing rise from 2018 to 2019.<sup>[6,7]</sup> However, despite its extended notoriety, there are no current specific regulations that record the composition and effects of e-cigarettes on the population in Saudi Arabia.

Consequently, the global e-cigarette market is rising. In 2015, e-cigarettes worldwide was estimated to be 10 billion USD.<sup>[8]</sup> Although there are fewer toxins than conventional tobacco smoke, toxins may vary widely depending on the brand.<sup>[8]</sup> The selling of all e-cigarettes or vaping items has been officially prohibited in Saudi Arabia since September 2015.<sup>[9]</sup> And for those over the age of 18 years, the personal use of e-cigarettes is reserved.<sup>[9]</sup>

In 2015, a meta-analysis found that relative to placebo, e-cigarettes helped tobacco cigarette smokers quit smoking.<sup>[10]</sup> One the contrary, a study was conducted in 2020 found that frequent e-cigarette users on daily bases did not show a cessation advantage over comparable no-e-cigarette users, and use of e-cigarettes in that attempt compared to the FDA approved cessation aids or no products, showed similar abstinence rates in the next 2 years.<sup>[11]</sup> However, its effectiveness in cessation aid is still being debated and unclear based on scientific evidence.<sup>[12]</sup>

By considering the harmful effects of e-cigarettes, there is evidence that suggests that e-cigarettes harm in mental health.<sup>[13]</sup> In 2019, the study was conducted to assess the potential harmful effects of e-cigarettes on the developing brain end with the conclusion that both nicotine and non-nicotine components of e-cigarettes could potentially play a role in social maladjustments, including poor learning and academic performance, aggressiveness, poor sleep quality, attention deficits, depression, and suicidal ideation.<sup>[13]</sup>

In contrast, in March 2019, there has been an ongoing epidemic of acute lung injury secondary to the individual use of e-cigarettes, reported cases were more than 2600 and the term e-cigarette or vaping-product associated lung injury (EVALI) was established.<sup>[14]</sup> However, the results of an article published by NEJM in April 2020 showed that among hospitalized patients with EVALI, chronic heart, and lung diseases are considered common.<sup>[15]</sup>

In a meta-analysis study of tobacco smoking prevalence among Saudi's college students that published in 2019 reported that the estimated pool of smoking prevalence was 17% and showed that males (prevalence rate of 26%) are more likely to smoke e-cigarettes compared to females (prevalence rate of 5%).<sup>[16]</sup>

In USA, a study conducted in Minnesota in 2018 showed that 14.7% of medical students had ever used e-cigarettes.<sup>[17]</sup> After that, there were many studies conducted in Saudi Arabia. In 2019, in a study conducted in Qassim among medical students, they found out that about 1 in 10 students (10.6%) had tried the e-cigarette.<sup>[18]</sup> And in 2020, a study in Riyadh at Alfaisal University showed that the prevalence of vaping among medical students was 12.2%.<sup>[19]</sup> In contrast, in a study conducted in Jeddah, the

prevalence of e-cigarette use was 27.7% among health science students in 2018.<sup>[20]</sup>

However, there is insufficient information concerning the use of e-cigarettes in Makkah city. Therefore, this study aims to determine the prevalence of e-cigarettes use among medical students at Umm al-Qura University (UQU). We hypothesized the prevalence of e-cigarette use would be low among medical students, and they would be well educated about it.

## Methods

A cross-sectional study was conducted in February 2020, including all medical students at Umm Al-Qura University (UQU), Makkah, Saudi Arabia. Male and female students from the second to the sixth year were included. A medical student with majors other than medicine, non-medical students, students of the foundation year, and post-graduates was excluded.

Data were collected using a printed version of a predesigned and validated self-administered questionnaire, which consisted of questions inquiring about demographic and academic data, knowledge, attitude, and medical students' practices regarding e-cigarettes. Knowledge was tested on a scale range from 0 to 8, and attitudes were assessed on a scale from 0 to 12. A pilot study on 50 students was conducted before the main study to detect any inquiries in the questionnaire, and its included cases were excluded from the main study.

The research was approved in March 2020 by the ethical committee at Umm Al-Qura University ID (HAPO-02-K-012-2020-03-367). Only individuals who voluntarily agreed to participate in this study after being fully informed about it through verbal discussion with the study team were included. They were announced that the personal identification data would be highly confidential.

The collected data were statistically analyzed using statistical package for social studies (SPSS) version 23, IBM, Chicago, IL, USA. Categorical variables were presented as numbers and percentages. Categorical variables were compared using the Chi-square test. The numerical variables were presented as means  $\pm$  standard deviations. Comparing mean scores between two groups and more than two groups was carried out using student t-test and analysis of variance test. The level of significance was adopted at  $P < 0.05$ .

## Results

Out of 1249 medical students at UQU, 910 participated in the survey and filled the questionnaire. 55.8% of the participants were males and 45.2% were females [Table 1].

Out of 233 (28.2%) participants who had ever tried an e-cigarette, 110 (47.3%) were currently smoking and 74 (31.8%) of them

smoke regularly. Moreover, 50% among the regular smokers have been smoking for 1 to 3 years, and 25.7% of them smoke within 30 min of waking up [Tables 1, 2a and b].

Regarding to the precipitating factors in e-cigarette smoking among the current smokers in this study, 24.3% of them used e-cigarettes to quit tobacco smoking, 20.3% found it's less costly than tobacco cigarettes, 18.9% think it's less harmful, and 18.9% they smoke it because of stress. While 28.4% used it because it is tasty [Table 2b].

More than 78% of the participants believe that there is not enough awareness about e-cigarette in the society, and 26% stated that they never received information about e-cigarettes. Interestingly, only 16% of e-cigarettes information was received from medical school, whereas more than 70% was received from social media and others. Moreover, Figure 1 shows that only 22.5% had good knowledge and Figure 2 shows that 49% had a good attitude.

Regarding to the distributed scores of knowledge of the students by the demographic variables, students less than 20 years have better knowledge with a mean of 4.275 and a significant difference of  $P < 0.001$ . Males had better knowledge with a mean of 4.411, and a significant difference of  $P < 0.001$ . In addition, in the academic year, third-year students had better knowledge with a mean of 4.480 and a significant difference of  $P < 0.001$ . Interestingly, those who had a GPA of 2-2.5 had better knowledge with a mean of 4.222 with no significant difference with  $P = 0.285$  [Table 3].

Furthermore, according to the distributed scores of attitudes of the students by the demographic variables, students between 20 and 23 years old had a better attitude with a mean of 7.237 with no significant difference of  $P = 0.503$ . Males had a better attitude with a mean of 7.469, with a significant  $P < 0.001$ . Moreover, in the academic year, students of the second year had a better attitude with a mean of 7.272 with no significant

difference of  $P = 0.952$ . Those who had a GPA of 2-2.5 had a better attitude of mean 7.689 with no significant difference with  $P = 0.150$  [Table 4].

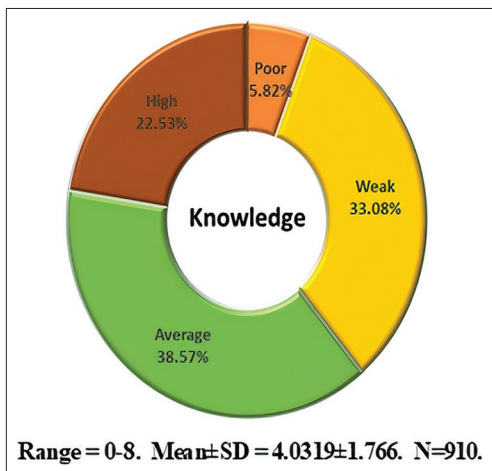
Out of 910 participants, 134 (14.7%) think e-cigarettes is medically approved for smoking cessation, and 278 (30.5%) were not sure if it's approved or not. Although 30.8% think that e-cigarette is less harmful than tobacco cigarette, and 24.7% were not sure about this. However, 59.5% of the participants believe it can cause addiction similar to tobacco cigarettes [Table 2a].

### Discussion

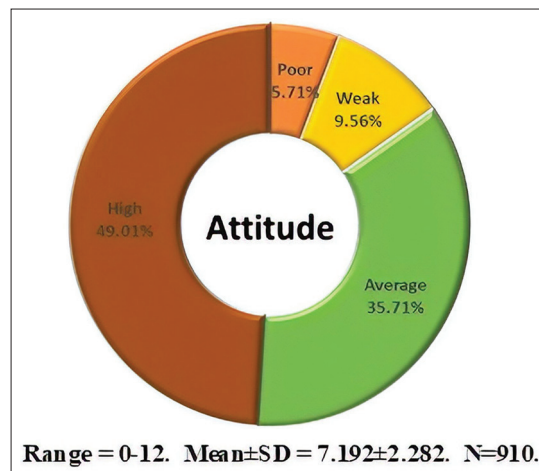
This study demonstrated the prevalence, knowledge, experience, and attitude of e-cigarette use among medical students at Umm AlQura University, Makkah, Saudi Arabia.

**Table 1: The distribution of demographic variables of studied population by gender**

	n	%	Chi-square	
			X <sup>2</sup>	P
Age				
<20	40	4.4	734.598	<0.001
20-23	507	55.7		
23-25	339	37.3		
25 or more	24	2.6		
Academic year				
Second year	162	17.8	4.110	0.391
Third year	179	19.7		
Fourth year	199	21.9		
Fifth year	189	20.8		
Sixth year	181	19.9		
GPA of the last year				
4-3.5	376	41.3	523.769	<0.001
3.5-3	256	28.1		
3-2.5	228	25.1		
2.5-2	45	4.9		
<2	5	0.5		



**Figure 1:** Distribution of scores of categorize of knowledge of the students



**Figure 2:** Distribution of scores of categorize of attitude of the students

**Table 2a: Distribution of knowledge about electronic cigarettes**

Question	Yes (%)	No (%)	Not sure (%)
Do you think E-cigarette is a medically approved method to stop smoking tobacco cigarette? (smoking cessation)	134 (14.7)	498 (54.7)	278 (30.5)
Do you think it is less harmful than tobacco cigarette?	280 (30.8)	405 (44.5)	225 (24.7)
Do you believe it is less costly than regular tobacco cigarette?	305 (38.5)	251 (27.6)	309 (34.0)
Do you think E-cigarette can cause addiction (dependence) like tobacco cigarette?	541 (59.5)	122 (13.4)	247 (27.1)
Do you think there is enough awareness about E-cigarette smoking in the society?	87 (9.6)	715 (78.6)	108 (11.9)
Have you ever received any information about E-cigarette?	237 (26.0)	673 (74.0)	

**Table 2b: Distribution of knowledge about electronic cigarettes**

Question	n	%
Have you ever heard about E-cigarette?		
Yes	826	90.8
No	84	9.2
If yes: Have you ever tried it before?		
Yes	233	28.2
No	593	71.8
Are you currently smoking E-cigarette?		
Yes	74	31.8
No	123	52.8
Sometimes	36	15.5
If yes: Since when you smoke E-cigarette?		
<1	21	28.4
1-3.	37	50.0
3 or more	16	21.6
How frequent do you smoke E-cigarette? (per day)		
1 time	8	10.8
2 time	11	14.9
3 time	11	14.9
4 time	25	33.8
More than 4 times	19	25.7
Approximately How many puffs you smoke each time?		
<5	14	18.9
5-10.	12	16.2
10 or more	48	64.9
How many minutes or hours between Waking up and smoking E-cigarette?		
<30 min	19	25.7
30 to 60 minutes	23	31.1
More than 2 hours	12	16.2
More than 4 hours	7	9.5
More than 6 hours	13	17.6
Why do you smoke E-cigarette?		
To quit smoking	18	24.3
Because it is less in cost	15	20.3
Less harmful than smoking tobacco cigarette	14	18.9
Because of stress	14	18.9
It is tasty	21	28.4
No specific reasons	17	23.0

There were 28.2% of our participants confirmed that they had tried e-cigarettes. Compared to a study carried out in Qassim university in Saudi Arabia, 10.6% confirmed having tried it.<sup>[16]</sup> A similar percentage (10.3%) was reported from health science colleges in Jeddah.<sup>[17]</sup> Thus, Umm AlQura university found to have a higher percentage of students who have tried e-cigarettes.

It seems that it might be due to insufficient awareness regarding e-cigarettes, its associated harms, and complications.

Our study showed that 31% of respondents are currently smoking e-cigarettes, compared to a study conducted in 2018 among medical students at the University of Minnesota in USA, which showed that less than 1% are now smoking.<sup>[13]</sup> There is a notable difference between the two studies with unclear reasons. Still, maybe it is slightly attributed to the rapid increase of e-cigarette use in recent years, the 2-year difference, and/or the geographic distance between the two surveys.

In terms of those precipitating factors of e-cigarettes use, the present study demonstrated that only 24.3% of participants considered that e-cigarettes are helpful in smoking cessation. A similar percentage (23.3%) was reported in Qassim University's students.<sup>[16]</sup> In contrast, Jeddah's study found that 42.7% of e-cigarette users have used it as a smoking cessation aid, and interestingly, half of them stated that they have succeeded.<sup>[17]</sup>

Regarding whether the students believe it is medically approved as a tool for smoking cessation or not, this study reported 14.7% believed it is. The comparable studies conducted in Minnesota and Qassim reported similar percentages of 4.1%.<sup>[13,16]</sup> This supports our perception of the low level of awareness among our students, as stated before.

Concerning e-cigarettes' information that was educated in medical schools, this study demonstrated 16%, which is approximately similar to the University of Minnesota 15%. Of the students reported that they have been educated about e-cigarettes in medical school.<sup>[13]</sup> Also, at Qassim University, the vast majority of students reported that they do not have adequate information about e-cigarette, which may concern us that medical schools worldwide have insufficiency in educating medical students about e-cigarettes and other tobacco alternative product.<sup>[16]</sup> Thus, future physicians will not be prepared appropriately to offer an effective cessation counseling session for the patients.

In summary, half of the studied population confirmed using e-cigarettes, with equal distribution among males and females. The most influencing precipitating factors of using e-cig were the good taste, to quit smoking, and the low cost. More than half of the participants believed that e-cigarettes cause addiction, similar to tobacco cigarettes. A significantly low percentage

**Table 3: Distribution of scores of knowledge of the students by demographic variables**

Demographic data	n	Knowledge			F or T	ANOVA or t-test	
		Mean	±	SD		test	P
Age	<20	40	4.275	±	f	5.635	<0.001
	20-23	507	4.191	±			
	23-25	339	3.835	±			
	25 or more	24	3.042	±			
Gender	Female	411	3.572	±	t	-7.335	<0.001
	Male	499	4.411	±			
Academic year	Second year	162	4.259	±	f	6.554	<0.001
	Third year	179	4.480	±			
	Fourth year	199	3.970	±			
	Fifth year	189	3.635	±			
	Sixth year	181	3.867	±			
GPA of the last year	4-3.5	376	4.146	±	f	1.256	0.285
	3.5-3	256	3.867	±			
	3-2.5	228	4.004	±			
	2.5-2	45	4.222	±			
	<2	5	3.400	±			

**Table 4: Distribution of scores of attitudes of the students by demographic variables**

Demographic data	n	Attitude			F or T	ANOVA or T-test	
		Mean	±	SD		test	P
Age	<20	40	6.675	±	f	0.783	0.503
	20-23	507	7.237	±			
	23-25	339	7.198	±			
	25 or more	24	7.042	±			
Gender	Female	411	6.856	±	t	-4.062	<0.001
	Male	499	7.469	±			
Academic year	Second year	162	7.272	±	f	0.173	0.952
	Third year	179	7.095	±			
	Fourth year	199	7.211	±			
	Fifth year	189	7.148	±			
	Sixth year	181	7.243	±			
GPA of the last year	4-3.5	376	6.979	±	f	1.692	0.150
	3.5-3	256	7.305	±			
	3-2.5	228	7.316	±			
	2.5-2	45	7.689	±			
	<2	5	7.400	±			

stated that they received information about e-cigarettes in medical school.

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 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. Nevertheless, the present study found the prevalence of e-cigarette use among medical students. Up to our knowledge, it is the first study to explore the prevalence and knowledge of medical students about e-cigarettes in depth in Makkah, Saudi Arabia. Besides, the relatively high response

rate (75.8%) in a large medical school is a notable strength in this study.

Further curriculum development and more information about electronic cigarettes in medical schools' curriculum, and preparedness of the students to discuss e-cigarette cessation effectively with their patients in the future are recommended.

As in 2018, a study conducted among primary health care providers (PHCP's) in the Western Region in SA, they reported an unsatisfactory in the level of knowledge of PHCP's an inadequate practice on smoking cessation counseling (SCC), and despite the positive attitude of them toward this role, it has influenced the quality of SCC with the patients.<sup>[21]</sup> And since the PHCP's are the frontline of medical contact with most patients, they get contact with a large number of the

smokers in all age groups. And they must always be updated with attitude, knowledge, prevalence, and identifications of the variable types of smokers in the society they are dealing with. With the evidence, they will be more convincing with such a group of ages and types of smokers targeted in this study in SCC practice, and they will be able to build a strong and updated smoking cessation on-job training program.

Furthermore, 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.

In conclusion, the prevalence of e-cigarette uses among medical students in Umm AlQura University was relatively high, and their overall knowledge is insufficient, which conflicts our hypothesis.

### Acknowledgments

A special thanks to Prof. Mohammad Erfanallah Siddiqi from community medicine department in college of medicine at Umm AlQura University in Makkah, Saudi Arabia, for his assistance with the statistics used in this study.

Finally, grateful thanks should also be addressed to the data collectors: Shahad Altayyar, Bayan Hafiz, Mohamed Aldabbagh, Raghad Shosho, Abdullah Alshambari, Omar Al-Hothali, Khaled Alghamdi, Rouzan Kalantan, Ahmad Ngash, Somayya Khan, Renad Alhazmi, Rawan Aldhahwani, and Wed Khayyat, from college of medicine at Umm AlQura University in Makkah, Saudi Arabia.

### Financial support and sponsorship

Nil.

### Conflicts of interest

There are no conflicts of interest.

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