



## PREVALENCE OF ADVERSE EFFECTS OF E-CIGARETTES USE AMONG HEALTH CARE PROVIDERS IN THE PRIMARY HEALTH CARE IN MAKKAH AT SAUDI ARABIA 2022

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### Abstract

#### BACKGROUND:

Electronic cigarette (e-cigarette) use in Saudi Arabia has rapidly increased since the 2022 National Health and Medical Research Council (NHMRC) Chief Executive Officer (CEO) statement on e-cigarettes. The type of products available and the demographic characteristics of people using these products have changed. New evidence has been published and there is growing concern among public health professionals about the increased use, particularly among young people who do not currently smoke combustible cigarettes. E-cigarette sales in the United States (US) are projected to reach 16.5 billion by 2024 according to market analysis. Six deaths and 450 lung illnesses have been linked to e-cigarette use. This study aimed to This comprehensive research paper investigates the impacts of electronic cigarettes on public health, focusing on health care providers. It examines both the short-term and long-term health effects of electronic cigarette use, exploring potential health risks and benefits, as well as the influence of electronic cigarette marketing on public health.

**Aim of the study.** Prevalence of Adverse Effects of E-cigarettes Use Among health care providers in the Primary Health Care in Makkah at Saudi Arabia 2022.

**METHODS:** Cross-sectional descriptive study was carried out, including a random representative sample of health care providers in the Primary Health Care in Makkah. A self-administered validated questionnaire was adopted and modified. The Sample size of medical practitioners. Our total participants were (500)

**RESULTS:** showed that the majority of the participant were (52.0%) smoker regarding smoking period the majority while <5 were (35.0%), Current use of e-cigarettes were(72.0%) and (30.0%) of the participant knew that the electronic cigarettes contain nicotine whereas 56.15% did not know if e-cigarettes contain nicotine or not. Most of the students (75.0%) thought that the electronic cigarette is harmful to health.

**CONCLUSION:** The prevalence of e-cigarettes smoking among health care providers in the Primary Health Care in Makkah. was found relatively high and most common reasons to smoke e-cigarettes were similar taste to conventional cigarettes, adequate nicotine, E-cigarettes are implicated in adverse effects on health care providers cells, yet very few have been tested. More longitudinal studies using a wider variety of e-cigarettes are necessary before we can determine their total adverse effects. Future research must also investigate chronic e-cigarette use and if it leads to periodontal disease and/or head, neck, or oral cancer.

**KEYWORDS:** E-cigarette, prevalence, health care providers, PHC, Makkah, Saudi Arabia.

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## INTRODUCTION

An e-cigarette is a device that uses a heating element to produce an aerosol from a liquid that users inhale.(1) E-cigarettes were developed to simulate smoking, to reduce disease associated with tobacco use, and as a smoking cessation aid. However, e-cigarettes are not FDA approved nor proven to be a cessation aid.(2) E-cigarettes have been available in the Saudi Arabia since 2007 and sales among youth are alarming.(3) As of 2020, 19.6% of high school and 4.7% of school students in the Saudi Arabia use e-cigarettes. (4) According to the National Institute for Health and Centers for Disease Control, daily use of e-cigarettes may affect brain development in young adults, and heavy metals found in e-cigarettes are carcinogenic<sup>4</sup> and known to damage health.(5) E-cigarette flavoring and nicotine have been linked to lung and cell defects.(6)

The utilization of electronic cigarettes (e-cigarette) has been developing and became a significant public concern.(7) The e-cigarette is a handheld, battery-powered device designed as a smoking cessation tool for adults to deliver aerosol by vaporizing flavored liquid nicotine, glycerol or propylene glycol.(8) E-cigarettes claim to be less harmful than cigarette smoking and use a valid alternative or aid to quit cigarette smoking by nicotine delivery, without the toxic effect of tobacco use.(9) Since their introduction to the market in the early 2000s, e-cigarette use has increased rapidly among adolescents worldwide.(10) Little is known about e-cigarette usage among adolescents in Saudi Arabia. Further studies need to be conducted to define the rate of use and long-term effect of e-cigarette and to apply proper prevention measures.

Electronic cigarettes were synthesized to mimic the approximate sensory feeling of smoking usual cigarettes (11). The utilization of electronic cigarettes (e-cigarette) has been developing and become a significant public concern. E-cigarettes are battery-operated devices that heat a liquid substance (or electronic -liquid) into an aerosol, or vapor, which is then inhaled by the user. Not all e-cigarettes/e-liquids contain nicotine; however, when present, nicotine in e-liquids is derived from tobacco. Four principal components comprise an e-cigarette: the battery; the atomizer; the cartridge or tank; and the mouthpiece (12). The battery powers the device and the atomizer channels that heats e-liquid in the cartridge or tank, which then creates a vapor that users inhale through the mouthpiece (13). Some e-cigarettes require users to take a drag to activate the atomizer; others have manual atomizer activation.

The study aims to investigate the prevalence and determinants associated with e-cigarette use among the health care providers in Makkah, Saudi Arabia. In addition, the collection of data on usage patterns through surveys may provide information about the property of users and the impact of those products and help to introduce appropriate interventions and policies in the future

## 1.2 Literature Review

In 2015, a meta-analysis found that relative to placebo, e-cigarettes helped tobacco cigarette smokers quit smoking.(14) On the contrary, a study was conducted in 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.(11) However, its effectiveness in cessation aid is still being debated and unclear based on scientific evidence.(16)

Scholz et al found the efficacy of smoking cessation is inevitably beneficial, and the cost-effectiveness of medical interventions for nicotine dependence have been well-established.(17) Although physicians of different specialties may frequently ask their patients about their smoking statuses during examination, PCPs are expectedly more likely to contribute to providing advice and counseling regarding smoking cessation. Therefore, assessment of PCPs' knowledge and attitudes is a critical part of the smoking cessation interventions, which could reduce the burden of the resultant disorders in areas with high prevalence of smoking, such as Saudi Arabia.(18)

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%).(19)

Actually, these findings indicate a significant shortage of the educational content on tobacco smoking in medical education. Undergraduate curricula in Saudi Arabia lack the required information regarding the risks of smoking and the need to motivating patients to abstinence. This was highlighted by Jradi and Al-Shehri, who showed that knowledge levels were generally low among students from three local medical schools, and the authors underscored the need to prioritize the topics related to smoking risks and treatment in medical

education curricula. Similar patterns of low knowledge were reported among dental students regarding smoking as one of the most common risk factors of oral cancer.(20-21) In our settings, improving the undergraduate dental curricula is necessary since dentists have shown the lowest levels of knowledge regarding counseling compared to other specialties.

## **MATERIALS AND METHODS**

### **Study design:**

A cross-sectional descriptive study was done among health care providers at the primary health care in Makkah City at Saudi Arabia,2022.

### **Study Area**

The study has been carried out in the city of Makkah Al-Mokarramah Makkah is the holiest spot on Earth. It is the birthplace of the Prophet Mohammad and the principal place of the pilgrims to perform Umrah and Hajj. It is located in the western area in Kingdom of Saudi Arabia and called the Holy Capital. Contains a population around 2.578 million. This study was conducted in Makkah primary health-care centers at Saudi Arabia, and it reflects a diversified demographic profile with a considerable portion of the population comes from rural descent, while others come from an urban one. This difference translates into biological, socioeconomic and lifestyle differences in the Makkah population.

### **Study Population**

The study has been conducted among health care providers regarding the Electronic Cigarettes in primary health-care in Makkah the sample was selected to include primary health-care medical practitioners who aged from <25years - > 55 years and their total number was 500

### **The sample size**

The sample size has been calculated by applying Raosoft sample size calculator based on (The margin of error: 5%, Confidence level: 95%, and the response distribution was considered to be 20%) accordingly to sample size from medical practitioners by the required sample size; (500). (male and female) and adding 10 more to decrease margin of error. After adding 5% oversampling, the minimum calculated sample has been 500. Computer generated simple random sampling technique was used to select the study participants. Data collection was done by the researcher during a period from the October to December, 2022.

### **Sampling technique:**

Systematic random sampling technique is adopted. After that, by using random number generator, then simple random sampling technique was applied to select the health care providers. Also, convenience sampling technique will be utilized to select the participants in the study. By using systematic sampling random as dividing the total health care providers by the required sample size; (500).

### **Data collection tools of the study:**

The self-administered questionnaire was adopted and modified from WHO Youth Tobacco Survey 2011 Questionnaire.5 the questionnaire consists of two main parts, socio-demographic and personal characteristics including age, gender, nationality, grade and associated determinants. The questionnaire was then translated from English to Arabic. Then it was independently retranslated into English to ensure the linguistic quality. The final questionnaire was validated by three consultants. The study was approved by the local research committee, and permitted by the Joint Program of Family Medicine in Makkah. Permission to conduct the study in the PHC was also obtained from the Ministry of health. Written consent was obtained from each participant. All collected data from the health care providers are kept confidential, accessed only for scientific research. The study is self-funded by the

### **Data entry and analysis:**

The Statistical Package for Social Sciences (SPSS) software version 24.0 has been used for data entry and analysis. Descriptive statistics (e.g., number, percentage) and analytic statistics using Chi-Square tests ( $\chi^2$ ) to test for the association and the difference between two categorical variables were applied. A p-value  $\leq 0.05$  will be considered statistically significant.

### **Pilot study**

A pilot study has been conducted in primary health care patient's the same sector due to the similarity to the target group using the same questionnaire to test the methodology of the study, the questionnaire has been clear and no defect has been detected in the methodology

### **Ethical considerations**

Permission from the Makkah joint program Family Medicine program has been obtained. Permission from the Directorate of health, verbal consents from all participants in the questionnaire were obtained. All information was kept confidential, and results have been submitted to the department as feedback.

### Data entry and analysis:

Data was entered using SPSS version 25 (IBM Corp., Armony, NY). Frequency and percentage were used to describe data. Chi-square and Fischer exact tests were used for testing the association

between e-cigarette usage from their potential associated factors from the other side, with a significance of P-value <0.05 and CI 95%.

**Budget:** Self-funded

## RESULTS

**Table 1.** Distribution of the Socio-demographic characteristics about Electronic Cigarettes in the participants. (n=500)

Categories	N	%
<b>Age</b>		
<25	175	35
25-45	110	22
45-55	155	31
>55	60	12
<b>Gender</b>		
Male	310	62
Female	190	38
<b>Nationality</b>		
Saudi	365	73
Non- Saudi	135	27
<b>income</b>		
<5000	60	12
5000-10000	175	35
10000-15000	130	26
>15000	135	27
<b>Job title</b>		
Doctors	115	23
Nurse	230	46
Others	155	31
<b>Marital status</b>		
Married	345	69
Not married	155	31

The study included 500 of the participants Table 1 show the socio-demographic characteristics. majority of the age in <25 were 35.0%, more than half of the students (62.0%) were males and 73.0%

were Saudis. The highest percentage of job title nurse were (46.0%) but the doctors were (31.0%) and Others were (31%), the majority of the participant married were (69.0%).

**Table 2.** Distribution of the Participant's Opinion about electronic cigarette.

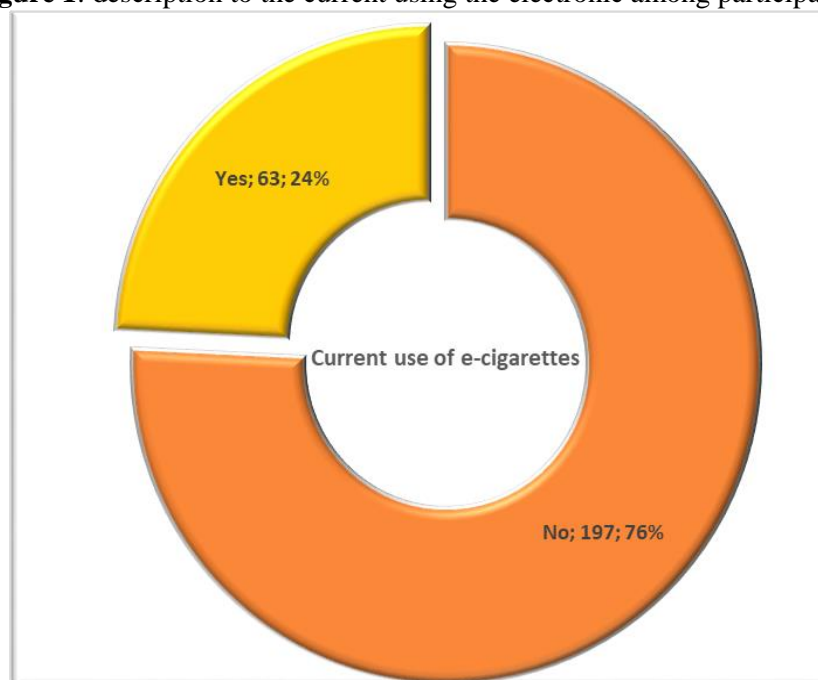
	N	%
<b>Smoking</b>		
Smoker	260	52
Non smoker	240	48
<b>Smoking period (n=260)</b>		
<5	91	35
5-10.	57	22
10-15.	49	19
>15.	63	24
<b>Current use of e-cigarettes (n=260)</b>		
No	197	72
Yes	63	28
<b>Does the electronic cigarette contain nicotine?</b>		
Yes	78	30.00

No	36	13.85
Don't know	146	56.15
<b>Do you think that the electronic cigarette is harmful to health?</b>		
Yes	195	75.00
No	31	11.92
Don't know	34	13.08

The study showed that the majority of the participant were (52.0%) smoker regarding smoking period the majority while <5 were (35.0%), **Current use of e-cigarettes** were(72.0%) and (30.0%) of the participant knew that the electronic cigarettes

contain nicotine whereas 56.15% did not know if e-cigarettes contain nicotine or not. Most of the students (75.0%) thought that the electronic cigarette is harmful to health

**Figure 1:** description to the current using the electronic among participation.



**Table (3):** Distribution of main reasons for electronic cigarette use among ever trying **health care providers**

	N	%
<b>Main reasons for electronic cigarette</b>		
I feel that e-cigarette is safer than tobacco cigarette	151	58.08
I feel that smoking an e-cigarette is the same as smoking tobacco cigarette	26	10.00
I feel that e-cigarette can help me to quit smoking	172	66.15
I like the taste and smell of the e-cigarette	125	48.08
I want to experiment with the cigarette	198	76.15
Offered by friends	83	31.92
Offered by family members	57	21.92
I follow idol trend (fashion)	42	16.15
E-cigarette is more economical than tobacco cigarette	112	43.08

Reasons for electronic cigarette use

Table (3) summarizes the main reasons for e-cigarette use among health care providers the most reported reasons were the desire to have an experience with e- cigarette (76.15%), feeling that e-

cigarette can help them to quit smoking (66.15%), trying to taste and smell the e-cigarette (48.08%) and feeling that e-cigarette is safer than tobacco cigarette (58,08%).

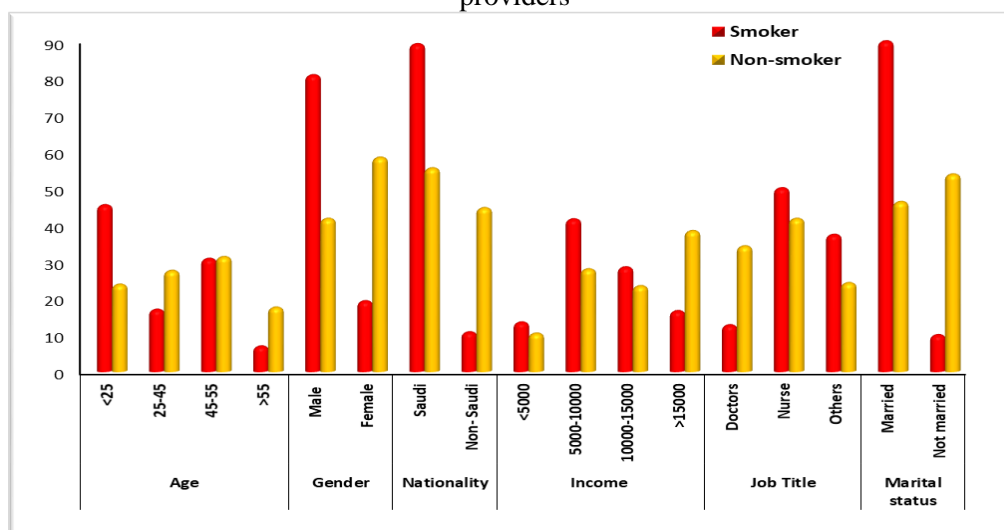
**Table 4:** Distribution of socio-demographic factors associated with ever-trying e-cigarettes among health care providers.

Items		Smoking				Total		Chi-square	
		Smoker (n=260)		Non-smoker (n=240)					
		N	%	N	%	N	%	X <sup>2</sup>	P-value
Age	<25	118	45.38	57	23.75	175	35	34.680	<0.001*
	25-45	44	16.92	66	27.50	110	22		
	45-55	80	30.77	75	31.25	155	31		
	>55	18	6.92	42	17.50	60	12		
Gender	Male	210	80.77	100	41.67	310	62	80.993	<0.001*
	Female	50	19.23	140	58.33	190	38		
Nationality	Saudi	232	89.23	133	55.42	365	73	72.398	<0.001*
	Non- Saudi	28	10.77	107	44.58	135	27		
Income	<5000	35	13.46	25	10.42	60	12	30.799	<0.001*
	5000-10000	108	41.54	67	27.92	175	35		
	10000-15000	74	28.46	56	23.33	130	26		
	>15000	43	16.54	92	38.33	135	27		
Job Title	Doctors	33	12.69	82	34.17	115	23	33.858	<0.001*
	Nurse	130	50.00	100	41.67	230	46		
	Others	97	37.31	58	24.17	155	31		
Marital status	Married	234	90.00	111	46.25	345	69	111.676	<0.001*
	Not married	26	10.00	129	53.75	155	31		

Table 4 show statistical significant relation While Chi-square X<sup>2</sup> 34.680 and P=0.001 about (45.38%) of health care providers smoker compared to only (23.75%) of the health care providers non-smoker in age <25, regarding the gender Statistical significant relation While Chi-square X<sup>2</sup> 80.993 and P=0.001 about (80.77%) of health care providers smoker compared to only (41.67%) of the health care providers non-smoker in male, regarding the Nationality Statistical significant relation While Chi-square X<sup>2</sup> 72.398 and P=0.001 about (89.23%) of health care providers smoker compared to only (55.42%) of the health care providers non-smoker in Saudi, regarding the Income Statistical

significant relation While Chi-square X<sup>2</sup> 30.799 and P=0.001 about (41.54%) of health care providers smoker compared to only (27.92%) of the health care providers non-smoker in 5000-10000, regarding the Job Title Statistical significant relation While Chi-square X<sup>2</sup> 33.858 and P=0.001 about (50.00%) of health care providers smoker compared to only (41.67%) of the health care providers non-smoker in nurse, regarding the Marital status Statistical significant relation While Chi-square X<sup>2</sup> 111.676 and P=0.001 about (90.0%) of health care providers smoker compared to only (46.25%) of the health care providers non-smoker in married

**Figure 2:** Distribution of socio-demographic factors associated with ever-trying e-cigarettes among health care providers



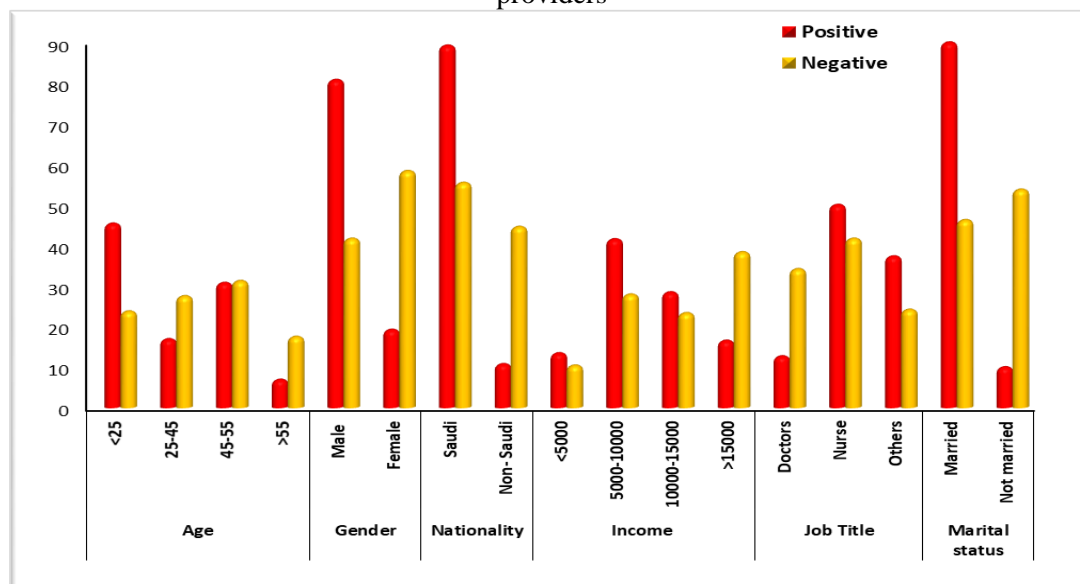
**Table 5:** Socio-demographic factors associated with current use of e-cigarettes among health care providers.

Categories		Current use of e-cigarettes				Total		Chi-square	
		Positive (n=63)		Negative (n=197)					
		N	%	N	%	N	%	X <sup>2</sup>	P-value
Age	<25	7	11.11	111	56.35	118	45.385	66.986	<0.001*
	25-45	15	23.81	29	14.72	44	16.923		
	45-55	25	39.68	55	27.92	80	30.769		
	>55	16	25.40	2	1.02	18	6.9231		
Gender	Male	28	44.44	182	92.39	210	80.769	70.634	<0.001*
	Female	35	55.56	15	7.61	50	19.231		
Nationality	Saudi	51	80.95	181	91.88	232	89.231	5.930	0.015*
	Non- Saudi	12	19.05	16	8.12	28	10.769		
Income	<5000	3	4.76	32	16.24	35	13.462	64.492	<0.001*
	5000-10000	9	14.29	99	50.25	108	41.538		
	10000-15000	22	34.92	52	26.40	74	28.462		
	>15000	29	46.03	14	7.11	43	16.538		
Job title	Doctors	33	52.38	0	0.00	33	12.692	118.971	<0.001*
	Nurse	20	31.75	110	55.84	130	50		
	Others	10	15.87	87	44.16	97	37.308		
Marital status	Married	56	88.89	178	90.36	234	90	0.114	0.736
	Not married	7	11.11	19	9.64	26	10		

Table (5) shows that statistical significant relation While Chi-square X<sup>2</sup> 66.986 and P=value 0.001 about (39.68%) of health care providers current positive use of e-cigarettes compared to only (27.92%) of the health care providers current negative use of e-cigarettes in age 45-55, also Job

title that statistical significant relation While Chi-square X<sup>2</sup> 118.971 and P=value 0.001 about (52.38%) of health care providers current positive use of e-cigarettes compared to only (33.0%) of the health care providers current negative use of e-cigarettes' in age 45-55

**Figure 2** Socio-demographic factors associated with current use of e-cigarettes among among health care providers



## DISCUSSION

Worldwide, little is known regarding safety and impacts of e-cigarettes on health.(22, 23) In Saudi Arabia, as a result of lacking of studies to identify the magnitude of the problem of e-cigarettes use among adolescents, this study was carried out to tackle this problem as well as to identify factors

associated with this behavior among health care providers in Makkah. In the present study, the health care providers use electronic cigarettes of them have used e-cigarettes. Different figured have been reported in various parts of the world. In Wales,(24) 18.5% of doctor studies have tried e-cigarettes and 2.7% were regular users whereas in the USA, the



current e-cigarette use among doctor increased from 4.5% in 2013 to 13.4% in 2014,(25) and in 2015, it became 16%.(26) However, in another American study (2013-2014), the prevalence rate was 1.21% (27). In Poland, about 22% of the health care providers aged between 25 and 50 years were ever tried e-cigarette smoking and 27% used them in the past 30 days.(28) Among students in grades 10-12 in Canada, the prevalence of ever trying e-cigarettes was 27.1% and current smoking in the past 30 days was 8.9%.(29)

According to the Canadian Student Tobacco, Alcohol and Drugs Survey (2015), rate of e-cigarettes ever use and use in the past 30 days among students aged between 15 and 19 years were 26% and 6.2%, respectively.(30) In the UK,(31) rate of current use of e-cigarettes among students 11-18 years was 2% whereas that in Scotland among those aged 15 years was 3%.(25) In Hong Kong,(32) a low rate has been reported (1.1%) among adolescents. In Sweden,(29) the rate of ever trying e-cigarettes was more than 25% among students aged 15-16 years. Comparison between the findings of the present study and others should be taken with caution due to variations in the time of study conduction, age group, and study designs.

The relatively high prevalence observed in the present study indicates that e-cigarettes are easily accessible to adolescents and health care providers although there are restrictions on the sale of tobacco products in KSA. However, they may be available for sale online as there is little control over their marketing in comparison to tobacco products.

E-cigarettes could be a new way into nicotine addiction for never smoker young population, if regular use occurs extensively.(19) A systematic review showed that 7% of non-smokers had used e-cigarettes and the current use among them was 1.5%.(28) In Argentina, although e-cigarettes use is prohibited, the trial of using increased from 1.8% to 7.6% over a 17 month period.(15) Therefore, health education for young students is very important to prevent initiation of e-cigarettes trials.

The present study demonstrated gender and job difference between health care providers in regarding ever trying or current use of e-cigarettes. The same has been observed in a study carried out in Sweden.(24) However, in Studies carried out in the United States,(9) Canada,(19) Hong Kong,(32) New Zealand(28) and Argentina,(25) male were more likely to try and use e-cigarettes compared to females.

Health care providers who had higher pocket money/day had higher rates of both ever trying and

using e-cigarettes than their peers. Also, in Canada (19) and Argentina,(25) students living in higher socio-economic areas were more likely to use e-cigarettes.

In disagreement with others, (26) the present study reported that students with more educated mothers were more likely to use e-cigarettes.

## CONCLUSION

The prevalence of e-cigarettes smoking among health care providers, was found relatively high and comparable to that reported in previous studies from Saudi Arabia and studies from USA and European countries. Most common reasons to smoke e-cigarettes were similar taste to conventional cigarettes, adequate nicotine, helping in control of smoking behavior, perceived less harmful effects than conventional cigarettes, and low cost. Young age was significantly associated with current use of e-cigarettes, while gender and level of training were non significantly associated with the current use. The desire to have an experience with e-cigarette, the perception that e-cigarettes can help them to quit smoking, and that it provides a safer sensory experience than tobacco cigarette are the main reasons for e-cigarette use

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