ORIGINAL ARTICLE

Prevalence and Knowledge of Electronic Cigarettes among School Teachers in Jeddah, Saudi Arabia

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Abstract

Background: Electronic (E) cigarette use has skyrocketed globally since its introduction in 2004, especially among youth and young adults. While potentially less harmful than traditional cigarettes, e-cigarettes (ECs) pose serious health risks, including cardiovascular system and respiratory system injuries. Surveys in Saudi Arabia reveal high rates of ECs use, which has become a growing concern for schools. This study aims to assess the prevalence knowledge of ECs among school teachers in Jeddah, Saudi Arabia. **Materials and Methods:** An anonymous self-administered online questionnaire was used to collect data, and the link was sent through WhatsApp Application to the randomized sample of both gender teachers working at public and private schools in Jeddah City. Teachers' responses were analyzed using the Statistical Package for the Social Sciences (SPSS) version 22 (SPSS, IBM Corp., Armonk, New York, USA). **Results:** A total of 400 participants were involved in this study. Most of the participants were females than males (73.8% versus 26.3%), in age group ≥40 (66.0%) than 30–39 years (22.3%) and <30 years (11.8%), and teaching secondary school (43.5%). Participants said social media (52.5%) and then their relatives and friends (41.3%) were their primary sources of ECs knowledge. More than two-thirds of them (n = 348, 87.0%) confirmed that they had not used ECs or vaped before, while (n = 27, 6.8%) reported using it only once or twice, 4.3% used it sometimes, and 2.0% used it constantly. The vast majority of the participants (92.8%) identified correctly that exposing children to vaping or ECs is not safe. **Conclusion:** This study shows that knowledge of electronic cigarettes among school teachers is poor and insufficient. Educational programs about the impact of electronic cigarettes are necessary to increase awareness.

Key words: E-cigarettes,Vape, Smoke

INTRODUCTION

Since they first appeared in 2004, electronic cigarettes (also known as "E-cigarettes") have expanded in availability, and their usage has grown dramatically over the world, particularly among teenagers and young people.[1,2] E-cigarettes (ECs) are battery-operated items created to deliver nicotine, flavor, and other compounds, according to the Food and Drug Administration description. Vaping is the term for using these ECs.[3] The nicotine market has changed due to the sharp rise in the popularity of new smoking accessories. BBC News reports that from around 7 million users in 2011–41 million users in 2018, their total user base increased.[4]

ECs expose users to high quantities of various pollutants that raise the risk of respiratory and cardiovascular diseases. Even though they contain fewer carcinogens than regular cigarettes, ECs are thought to be less dangerous than traditional cigarettes. Still, there is not enough evidence to say whether they work as a smoking cessation aid.[5,6]

The long-term implications of smoking ECs on health have not yet been studied because it is a relatively new habit.

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However, various studies noted its short-term adverse effects. An epidemic of "e-cigarette or vaping, product use-associated lung injury" has been affecting the USA.[7] Significant evidence shows that ECs are associated with unpleasant respiratory symptoms and diseases.[8,9] According to the Centers for Disease Control (CDC) and Prevention, using ECs has also increased the risk of lung harm (CDC).[10] Unfortunately, the primary addictive substance with the most diverse effects is nicotine.[11]

In Saudi Arabia, a study conducted in 2018 showed that out of 1404 individuals, 68.9% were using ECs, with 58.7% of users admitting to using them every day.[12] According to a previous study, the perception of ECs as less dangerous substitutes for traditional cigarettes may be related to their use.[13] Parental attitudes and lack of information about ECs use were reported. Parents' awareness and views towards ECs usage were statistically substantially correlated with parental smoking, particularly among mothers. Parents concurred that educating parents about ECs usage was necessary.[14] A third study showed that (36%) of principals reported suspending or expelling students for ECs possession or usage at least monthly. In comparison, nearly half (46%) of all school staff members reported seeing a student using an ECs on campus at least monthly.[15]

MATERIALS AND METHODS

Study design and settings

A cross-sectional study was done in Jeddah, Saudi Arabia, from June 2022 to October 2023 to assess the teacher's knowledge and prevalence of electronic cigarettes.

Ethical considerations and study participants

Four hundred teachers from Jeddah were included in the current study. Participants who reside in Jeddah, Saudi Arabia, and are older than 18 were eligible to participate. Exclusion criteria were non-Jeddah residents, participants <18 years of age, and those who refused to participate in the study. The study was approved by the King Abdulaziz University Ethics Committee (Ref# SRIU-2022-M-G6-TCC016).

Data collections method

A validated and reliable assessment questionnaire that was taken from a previously published studies[16,17] was used. Participants were approached through social media platforms with a link to the study questionnaire, which was provided in Arabic and English and included a consent form for the use of participant data in research.

According to the requirements of the university ethics committee for cross-sectional studies, each participant provided informed consent. Three sections make up the questionnaire. The first section was to gather sociodemographic information. The second section included questions about knowledge and awareness of ECs. The third section provided questions assess the prevalence of ECs.

Statistical analysis

The data expressed as mean±standard deviation, minimum and maximum for parametric data, and as frequency (%) for categorized data. Values analyzed utilizing the Statistical Package for the Social Sciences (SPSS) version 22 (SPSS, IBM Corp., Armonk, New York, USA). The characteristics that predicted ECs knowledge were determined using logistic regression (dummy variables defined as a total score equal to or higher than the mean score of the study participants, which was 7.0). Statistical significance is defined as $P < 0.05$.

RESULTS

In this study, 405 participants were chosen to participant in this study, of then 400 agree to participate, and 5 disagree with response rate 98.8%. A total of 400 participants involved in this study. Most of participants were females (73.8%), in age group ≥40, teaching secondary school (43.5%). Most of them reported that they hold Bachelor (80.5%), work in public/government school (93.3%), and had ≥20 years' work experience (42.0%). Most of participants were married (81.8%) and had children (82.0%).

Refer Table 1 for more information on the study participants' demographic characteristics.

Knowledge of and attitude towards electronic-cigarettes

Participants said social media (52.5%), then their relatives and friends (41.3%), were their main source of ECs knowledge. About half (45.5%) of them reported that they think that buying and selling e-cigarettes is allowed and legal in Saudi Arabia. Around 34.8% of them reported that the minimum age for using ECs is 18 years. Most participants (95.3%) reported that vaping should be prohibited indoors or in places where smoking is prohibited, such as workplaces, restaurants, cafes, and cinemas. Most of them (75.0%) believe that vaping is less dangerous than nicotine gum or patches. Of the participants, 13.3% reported that they think that vaping or ECs and their use are authorized by the "Saudi Food and Drug Authority." More than half of them (57.3%) reported correctly that vaping or ECs do not emit only water vapor. ECs, according to 9.0% of them, are safer than traditional cigarettes and tobacco products, and the main source for this information was the internet (30.3%). Almost 69.5% reported that vaping or ECs contain dangerous chemicals such as nicotine, carbonylates, minerals, volatile organic compounds, as well as small particles. The majority

Table 1: Demographic characteristics of participants (*n*=400)

Characteristics	Frequency (%)
Gender	
Male	106 (26.3)
Female	295 (73.8)
Age group	
<30 years	47 (11.8)
30–39 years	89 (22.3)
≥40 years	264 (66.0)
Teaching grade	
Primary school	128 (32.0)
Middle school	98 (24.5)
Secondary school	174 (43.5)
Education	
Bachelor	322 (80.5)
Diploma	40 (10.0)
Postgraduate higher education	38 (9.5)
School	
Public/government	373 (93.3)
Private	27 (6.8)
Work experience	
<5 years	48 (12.0)
5–9 years	43 (10.8)
10–19 years	141 (35.3)
≥20 years	168 (42.0)
Marital status	
Married	327 (81.8)
Single	47 (11.8)
Divorced	20 (5.0)
Widowed	6 (1.5)
Have children	
Yes	328 (82.0)
No	72 (18.0)

of them (84.0%) identified correctly that preservatives and flavors used in vaping or ECs are harmful. The vast majority of the participants (92.8%) identified correctly that exposing children to vaping or ECs is not safe. Only 4.3% of them identified correctly that nicotine solution at the concentration of some filled cartridges or cartons does not cause death if swallowed or ingested by a child. Around 85.3% identified correctly that indoor vaping cause harm to non-smokers near (passive smoking) if they are exposed to chemicals and aerosols from vaping. The vast majority (89.3%) confirmed that vaping or ECs is not safer for a pregnant woman and her fetus. The total knowledge score ranges from 1 to 10 with mean 6. Most of the participants (61.2%) had poor knowledge and attitude (<7), while only 38.8% had Dummy knowledge (≥7). For further details on the participants' response to knowledge and attitude questions [Table 2].

Predictors of knowledge of electronic-cigarettes

Individuals with postgraduate higher education were found to have 2.556 higher knowledge and attitude of ECs than Bachelor using binary logistic regression analysis (95% confidence interval: 1.026–6.365, $P = 0.044$), Table 3.

Experience with electronic-cigarettes

Table 4 below described participants' experience with ECs. Around 51.7% reported that they have a family member or friend who vape. Around one third of them (87.0%) confirmed that they have used ECs or vaped before, while 6.8% reported to use it only once or twice, 4.3% used it sometimes, and 2.0% use it constantly. Around 30.8% of them reported that they use ECs or vape more than once a day, while 25.0% use it more than once a day, and 5.8% use it once a day. The most two commonly reported causes of using ECs or vaping were ease to use and modern size and shape with 55.8% and 11.5%, respectively. Fourth-generation ECs were the most commonly used type of ECs (42.3%). Tobacco and cigarettes shops or hookah stores and Stores that sell e-cigarettes and its products were the most two commonly reported places of buying vaping products with 46.2% and 23.1%, respectively. About 36.5% of them reported that they believe and rely on the nicotine concentration that is written on the label of the pack. Almost 51.9% reported that they have both indoor and outdoor. Figure 1 describes the most commonly reported symptoms after vaping. Exhaustion and others (25.0% and 25.0%) were the most two commonly reported symptoms after vaping then angry/annoyance (11.5%), I don't stop vaping (11.5%), anxiety (9.6%), difficulty to sleep (5.8%), intense craving for nicotine (5.8%), impatience (3.8%), depression (9.0%). Only 17.3% stated that they have been to the emergency department or hospitalized with a condition related to vaping or ECs. The reported withdrawal symptoms from quitting vaping or ECs for some times were change in appetite (15.4%), headache (11.5%), dizziness (9.6%), nausea/vomiting (7.7%), discomfort in mouth and throat (7.7%), cough (5.8%), discomfort in the eye (1.9%) and others (7.%); while 32.7% never had any symptoms [Figure 2]. Around 38.5% of the study participants were a former smoker of traditional cigarettes, I do not smoke them now; while 38.5% never smoked conventional cigarettes before and only smoked e-cigarettes, 23.1% Dual user, I use both traditional smoking and vaping. In 25.0% of participants vaping prompt them to try and use traditional tobacco (traditional cigarettes) where they have not smoked traditional cigarettes before. Around 15.4% of the study participants reported that vaping or ECs helped them to quit traditional tobacco products, while 26.9% reported that they smoke less traditional tobacco than before [Table 3].

Table 2: Participants' response to knowledge and attitude questionnaire (*n*=400)

Variables	Frequency (%)
KQ1. Source of information about vaping/e-cigarettes	
Social media	210 (52.5)
Relatives and friends	165 (41.3)
TV	21 (5.3)
Magazines	3 (0.8)
Newspapers	1 (0.3)
KQ2. "Do you believe that selling and buying electronic cigarettes is legitimate in Saudi Arabia?"	
Yes	182 (45.5)
No	74 (18.5)
Not sure	144 (36.0)
KQ3. "Is there a minimum age for using e-cigarettes?"	
At least 18 years old*	139 (34.8)
At least 21 years old	55 (13.8)
There's no age limit	31 (7.8)
Smoking e- cigarettes is prohibited for all age group	112 (28.0)
Not sure	63 (15.8)
KQ4. Do you think that vaping should be prohibited indoors or in places where smoking is prohibited, such as workplaces, restaurants, cafes, and cinemas?	
Yes	381 (95.3)
No	8 (2.0)
Not sure	11 (2.8)
KQ5. Do you think vaping is safer than nicotine patches or nicotine gum?	
No*	300 (75.0)
Yes	12 (3.0)
Not sure	88 (22.0)
KQ6. Do you think that vaping/e-cigarettes and their use are authorized by the Food and Drug Authority (SFDA)?	
Yes*	53 (13.3)
No	199 (49.8)
Not sure	148 (37.0)
KQ7. Vaping/E-cigarettes emit only water vapor	
Wrong*	229 (57.3)
Right	13 (3.3)
Not sure	158 (39.5)
KQ8. "Do you believe that e-cigarettes are less harmful than traditional cigarettes and other tobacco products?"	
Yes*	36 (9.0)
No	304 (76.0)
Not sure	60 (15.0)
KQ9. If you answered with (yes) or (no) in the previous question, from which source did you get this information?	
The internet	103 (30.3)
Just assumed	93 (27.4)
Social media	87 (25.6)
Family and friends	35 (10.3)
Magazines	1 (0.3)
Other	21 (6.2)
KQ10. "Vaping or e-cigarettes contain dangerous chemicals such as nicotine, carbonylates, minerals, Volatile organic compounds, as well as small particles:"	
Right*	278 (69.5)
Wrong	4 (1.0)
Not sure	118 (29.5)
KQ11. "Do you think that preservatives and flavors used in vaping/e-cigarettes are harmless?"	
Wrong*	336 (84.0)
Right	24 (6.0)
Not sure	40 (10.0)
KQ12. "Do you think exposing children to vaping/ e-cigarettes is safe?"	
No*	371 (92.8)
Yes	11 (2.8)
Not sure	18 (4.5)
KQ13. "Do you think that the nicotine solution at the concentration of some filled cartridges/ cartons causes' death if swallowed or ingested by a child?"	
No*	17 (4.3)
Yes	232 (58.0)
Not sure	151 (37.8)
KQ14. Does indoor vaping cause harm to non-smokers near (passive smoking) if they are exposed to chemicals and aerosols from vaping?	
Yes*	341 (85.3)
No	7 (1.8)
Not sure	52 (13.0)
KQ15. Vaping/e-cigarettes safer for a pregnant woman and her fetus?	
No*	357 (89.3)
Yes	17 (4.3)
Not sure	26 (6.5)
Total knowledge and attitude score (0–7)	6.00±1.45 (1.00–10.00)
Poor (<7)	245 (61.2)
Dummy (≥7)	155 (38.8)

(Contd...)

Table 3: Binary logistic regression analysis for demographic characteristic predictors of Dummy knowledge and attitude among participants

Predictors	B (95% confidence interval)	Significance
Gender		
"Females (reference group)"	1	
Males	1.560 (0.994–2.450)	*P*=0.053
Age group		
"<30 years (Reference group)"	1	
30–39 years	0.695 (0.338–1.428)	*P*=0.322
≥40 years	0.780 (0.417–1.458)	*P*=0.436
Teaching grade		
"Primary school (Reference group)"	1	
Middle school	1.139 (0.663–1.957)	*P*=0.637
Secondary school	1.133 (0.707–1.813)	*P*=0.604
Education		
"Bachelor (Reference group)"	1	
Diploma	0.951 (0.482–1.876)	*P*=0.885
Postgraduate higher education	2.556 (1.026–6.365)	*P*=0.044
School		
"Public/ Government (Reference group)"	1	
Private	1.511 (0.690–3.306)	*P*=0.302
Work experience		
"<5 years (Reference group)"	1	
5–9 years	0.818 (0.348–1.919)	*P*=0.644
10–19 years	0.739 (0.375–1.455)	*P*=0.381
≥20 years	1.231 (0.640–2.366)	*P*=0.533
Marital status		
"Married (Reference group)"	1	
Single	0.868 (0.467–1.613)	*P*=0.655
Divorced	0.579 (0.189–1.769)	*P*=0.337
Widowed	0.270 (0.029–2.495)	*P*=0.248
Have children		
"Yes (Reference group)"	1	
No	1.067 (0.630–1.805)	P=0.810

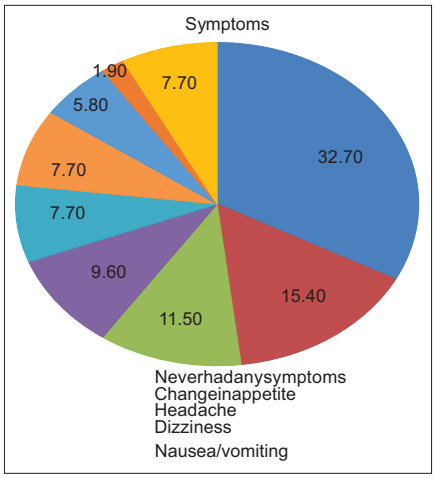

Figure 1: Symptoms experienced after vaping (*n* = 52)

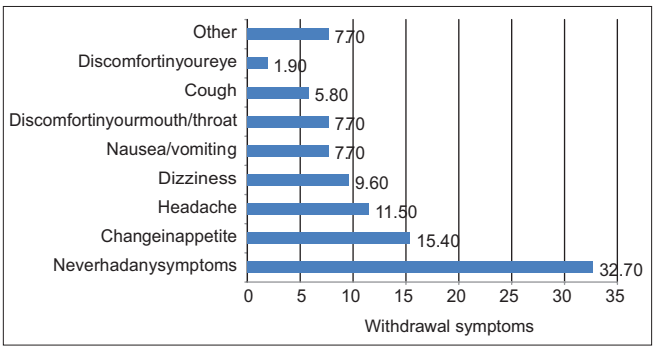

Figure 2: E-cigarette or vaping withdrawal symptoms (*n* = 52)

DISCUSSION

Students are exposed to new information, social conventions, and organizational rules at schools, where they also form critical interpersonal ties, including friendships.[18] The prevention of ECs in school settings is affected by the finding that friends are the primary source from whom teenagers obtain ECs.[19] While tobacco use and other unhealthy habits have long been addressed in schools, ECs provide a fresh and expanding concern. Teachers have a special potential to observe and impact student behavior because they are important figures in the social and ecological contexts of young people.[18] Teachers are second only to parents as the adults who interact with school-age children the most. The purpose of this study was to investigate Saudi Arabian teachers' present perceptions and levels of knowledge on the risks associated with ECs usage. In this study, a total of 400 teachers were included. Most of the participants were females (73.8%) and in the age group ≥40 (66.0%). The teaching grades of participants were primary school (32.0%), middle school (24.5%), and secondary school (43.5%). Most of the included teachers reported that they hold Bachelor (80.5%) and work in public/government school (93.3%). The work experience of participants was mostly ≥20 years (42.0%), then 10–19 years (35.3%), <5 years (12.0%), and 5–9 years (10.8%).

The following are the study's main conclusions: (1) approximately 23.0% of participants said they had previously vaped or used an ECs. (2) About 9.0% of research participants said they believed ECs are safer than traditional

Table 4: Participants' experience with electronic-cigarettes

Variables	Frequency (%)
PQ1. Does anyone in your family or friends vape?	
Yes	207 (51.7)
No	154 (38.5)
Not sure	39 (9.8)
PQ2. Have you used an e-cigarette/vaped before?	
No	348 (87.0)
Yes, only once or twice	27 (6.8)
Yes, sometimes	17 (4.3)
Yes, constantly	8 (2.0)
PQ3. How often do you smoke e-cigarettes/vape? (*n*=52)	
Once or twice a month	16 (30.8)
More than once a day	13 (25.0)
Once a day	3 (5.8)
Other	20 (38.5)
PQ4. What attracted you to vaping/e-cigarettes? (*n*=52)	
Ease to use	29 (55.8)
Because it's modern, size, and shape	6 (11.5)
Amount of vapor	3 (5.8)
Attractive colors	3 (5.8)
Good marketing	1 (1.9)
Tricks to do with vapor	1 (1.9)
Other	9 (17.3)
PQ5. What generation of electronic cigarettes do you use (photos below for help)? (*n*=52)	
Fourth generation	22 (42.3)
First generation	10 (19.2)
Second generation	8 (15.4)
Third generation	7 (13.5)
Others	5 (9.6)
PQ6. Where do you buy your vaping products? (*n*=52)	
Tobacco and cigarettes shops/hookah stores	24 (46.2)
Stores that sell e-cigarettes and its products	12 (23.1)
Friends	6 (11.5)
The Internet	2 (3.8)
The supermarket	2 (3.8)
Grocery shops	1 (1.9)
Others	5 (9.6)
PQ7. Can you believe and rely on the nicotine concentration that is written on the label of the pack? (*n*=52)	
Yes, I believe and trust the label	19 (36.5)
No, I don't believe and trust the label	17 (32.7)
I smoke nicotine-free cigs	3 (5.8)

(Contd...)

Table 4: *(Continued)*

Variables	Frequency (%)
PQ8. Where do you vape? (*n*=52)	
Indoors and outdoors	27 (51.9)
Outdoors	13 (3.3)
In closed rooms	7 (13.5)
Other	5 (9.6)
PQ9. Have you had withdrawal symptoms from quitting vaping/e-cigarettes for some time? (Indicate any symptoms you have had, whether one or more) (*n*=52)	
Exhaustion	13 (25.0)
Other	13 (25.0)
Angry/annoyance	6 (11.5)
I don't stop vaping	6 (11.5)
Anxiety	5 (9.6)
Difficulty to sleep	3 (5.8)
Intense craving for nicotine	3 (5.8)
Impatience	2 (3.8)
Depression	1 (1.9)
PQ10. Have you been to the emergency department or hospitalized with a condition related to vaping/e-cigarettes? (*n*=52)	
No	43 (82.7)
Yes	9 (17.3)
PQ11. Have you experienced any of these symptoms after vaping? (Check all that apply to you) (*n*=52)	
Never had any symptoms	17 (32.7)
Change in appetite	8 (15.4)
Headache	6 (11.5)
Dizziness	5 (9.6)
Nausea/vomiting	4 (7.7)
Discomfort in your mouth/throat	4 (7.7)
Cough	3 (5.8)
Discomfort in your eye	1 (1.9)
Other	4 (7.7)
PQ12. Do you smoke traditional tobacco (traditional cigarettes)? (*n*=52)	
I've never smoked conventional cigarettes before and only smoked e- cigarettes	20 (38.5)
A former smoker of traditional cigarettes, I do not smoke them now	20 (38.5)
Dual user, I use both traditional smoking and vaping	12 (23.1)
PQ13. Did vaping prompt you to try and use traditional tobacco (traditional cigarettes) where you have not smoked traditional cigarettes before? (*n*=52)	
No	39 (75.0)
Yes	13 (25.0)

Table 4: *(Continued)*

Variables	Frequency (%)
PQ14. If you used vaping/e-cigarettes to quit traditional tobacco products, did it work for you? (*n*=52)	
Doesn't apply to me (I Don't smoke conventional tobacco)	30 (57.7)
Yes, I smoke less traditional tobacco than before	14 (26.9)
Yes, I do not use traditional tobacco products now, and I gave up	8 (15.4)

smokes and tobacco products. (3) Of them, 69.5% claimed that using an ECs or vaping involves the use of hazardous substances such minerals, volatile organic compounds, carbonylates, nicotine, and tiny particles. (4) A great deal of them (92.8%) accurately noted that it is not safe to expose kids to vaping or ECs. (5) About 85.3% of them correctly concluded that passive smoking, or the exposure of non-smokers to the chemicals and aerosols from vaping, is harmful when it occurs indoor. (6) The overwhelming majority (89.3%) agreed that using an ECs or vaping during pregnancy is not safer for the fetus. (7) of the study's participants, only 38.8% had a dummy level of knowledge and attitude regarding ECs. (8) Those with postgraduate higher education were more likely to have more knowledge and attitude about ECs.

About one-fourth of them (23.0%) in our survey acknowledged having previously vaped or used ECs. Around 30.8% of our teachers reported that they use ECs or vape once or twice a month, while 25.0% use it more than once a day, and 5.8% use it once a day. In this study, of the 52 e-smokers, 23.1% used both traditional smoking and vaping, 38.5% were former traditional cigarette smokers, and only 38.5% smoked only ECs. Similarly, AlBaik *et al*.[20] reported that 33.5% of research participants used electronic cigarettes in Saudi Arabia. "E-cigarettes," or electronic cigarettes, are tiny, portable nicotine delivery devices that are becoming more and more well-liked as a possible alternative to smoking regular tobacco.[16] According to research conducted in Italy, 30.3% of nursing students used vaping devices in addition to ECs.[21] According to a different survey conducted in Italy by Gorini *et al*.,[22] the percentage of people using vaping devices in 2018 was 17.5%. In a UK survey, 75% of participants said that ECs are addicted, and 63% of participants said they are unhealthy. In addition, eleven individuals out of the total stated that they presently use ECs every day.[23] It may perhaps be more difficult for people to give up smoking due to the social stigma associated with ECs use. It has been noted that users of ECs frequently look for praise for their attempts to lessen damage, and if they do not receive it, they may resume smoking cigarettes.[24] To learn more about these attitudes and the underlying factors that influence participants' unfavorable opinions, more qualitative study may be required.

Many consumers believe that electronic cigarettes are less dangerous and addictive than regular cigarettes. Comparing ECs usage to nicotine replacement treatment has shown that it is associated with a greater incidence of smoking cessation and less severe withdrawal symptoms.[25] Only 9.0% of participants in our research said they thought ECs were safer than regular cigarettes and tobacco products, and the majority of these people got this knowledge from their own assumptions. Only 221 smokers (20.5%) in Alfaraj *et al*.[16] Survey feel that vaping is a safer or healthier option than traditional cigarettes, compared to 37% of smokers in the Jeddah study.[26] Similar findings were made in Egypt,[27] where 41% of survey participants thought ECs helped people quit smoking, and around 31.9% thought they were less dangerous than regular cigarettes. Approximately 30% of Jordanian university students who were surveyed believed that smoking ECs posed less of a risk than smoking regular cigarettes.[28] In a Malaysian study, over half of the participants (56.3%) stated that their primary motivation for using ECs was that they were less harmful than conventional cigarettes.[29] This is troubling given the argument that labels might not accurately represent the amount of nicotine in ECs.[29] According to comparable research conducted in Mexico, 19% of middle school pupils think that smoking electronic cigarettes is less dangerous than smoking traditional cigarettes.[30] In addition to this research, a different survey indicated that 67% of British citizens generally think ECs are safer than traditional cigarettes.[31] Electronic cigarettes are promoted as being a safer substitute for conventional cigarettes, a helpful tool for quitting, and a device that may be used in places where smoking is not allowed. Promoting cutting-edge flavors and vaping in public are two additional crucial marketing techniques to reach a larger audience. The general public and those with vested interests, such as manufacturers and marketers, appear to be the main parties discussing and promoting these devices.[32]

In this study, participants said social media (52.5%), then their relatives and friends (41.3%), were their main source of ECs knowledge. Doumi *et al*.[33] reported that the majority of participants (60.4%) and social media (56.3%) reported first learning about ECs, which is consistent with the results of another previous research.[34-36] Aghar *et al*.[34] reported that the majority of research participants (46.3%) learned about ECs from friends and family, with social media and marketing coming in second and third, respectively (17.2%). Peer pressure and the influence of friends may be to blame for this, since they are more prevalent among the younger population, who make up the majority of the study's age group. This is especially true when it comes to popular trends. Our results were consistent with research on EC users in Atlanta, Georgia, where the majority of participants said they learned about ECs via friends and family, whereas a smaller percentage said they learned about them from TV news reports and commercials.[37] ECs are frequently marketed as a healthier alternative to traditional cigarettes, and exposure to ECs promotions and advertisements may be linked to ECs

use, according to a previous systematic review of 24 studies that found that ECs marketing costs and online social media engagement have increased over time.[38] This comprehensive investigation also had shown a link between ECs marketing and decreased beliefs about the risk of using ECs and desire to use them, underscoring the need for advertising restrictions that promote public health objectives.[38] Alfaraj *et al*.[16] reported that of the ECs users, 50.8% knew about vaping from their friends and relatives.

More than 69.5% of participants in our survey stated that nicotine, carbonylates, minerals, volatile organic compounds, and tiny particles are among the harmful substances found in vaping or ECs. This further supported the results of a prior Saudi Arabian research,[16] in which 46% of participants believed that electronic cigarettes included hazardous materials. ECs typically include glycerol and propylene glycol, strong flavors, and potentially varying amounts of nicotine. Aerosols, refill solutions, and ECs cartridges have been shown to include a variety of chemicals.[39] Each liquid evaluated for vaping solutions had between 60 and 70 different substances, both known and unknown, for a total of around 113 different chemicals.[40,41] According to National Academies,[39] ECs aerosols, cartridges, and ambient emissions include a variety of chemical compounds and ultrafine particles that are dangerous, carcinogenic, and can lead to heart and pulmonary problems. Nicotine, a well-known addictive chemical, is an ingredient in ECs that can lead to chronic obstructive lung disease.[42] Nicotine in ECs reduces tension and aggression, relaxes muscles, and enhances mood and focus. These provide a happy and pleasant attitude that might lead to young people being addicted to EC smoking. Moreover, the e-liquid found in ECs contains a variety of additional potentially dangerous materials that are toxic to cells and may result in lung toxins or inflammatory blockage of the tiniest airways in the lung, a condition known as popcorn lung disease.[43] In children and teenagers, nicotine use can have detrimental effects on the development of the brain and neurological system, which can have long-term effects.[44,45]

Nearly 92.8% of participants correctly concluded that it is not safe to expose youngsters to vaping or ECs. Furthermore, 89.3% of respondents said that using ECs or vaping during pregnancy is not safer for the fetus. ECs usage during pregnancy may affect placental function and result in morphological abnormalities in the developing embryo.[46] This might lead to physiopathology abnormalities in the developing lung, which could thereafter affect respiratory health. Furthermore, there is evidence that ECs usage can lead to short- and long-term respiratory issues in kids, and the risk of nicotine addiction in young people is a major worry. Due to the low parental perception of the hazards connected with children being exposed to ECs, pediatric populations are more vulnerable to the harmful effects of passive vaping.[46] According to our survey, 85.3% of participants correctly recognized that indoor vaping exposes non-smokers to chemicals and aerosols that might damage them while they are around (passive smoking).

Schools have a significant impact on young people's decision to start new risky habits, such as using ECs.[47] The study participants showed a moderate level of knowledge about ECs with a mean score of 6.0 (1.45), which represents 54.5% out of the maximum score with 61.2% had low levels of knowledge and altitude. Low knowledge of ECs was revealed by prior survey research conducted in Europe.[48] In Jordan, Abdel-Qader and Al Meslamani[49] found inadequate knowledge regarding the kinds and contents of ECs among their participants. A number of studies show that teacher preparation is a crucial – yet sometimes overlooked – factor in carrying out school health initiatives faithfully.[50-52] Several key training objectives have been identified by researchers through these studies on teacher training. These include: Supplying teachers with background information on the severity of the problem, emphasizing the role they play, and incorporating their input; providing a rationale, theories, or models that inform the intervention; and clearly communicating the roles and responsible parties involved in the intervention. It is imperative that teachers get instruction on how to talk to children about not using ECs. It is recommended that teachers get training progressively, along with resources or ongoing technical assistance and feedback on their implementation of the.[50-52]

In our study, teachers with postgraduate higher education were more knowledgeable about ECs. Doumi *et al*.[33] reported that the only factor that was found to be an independent predictor of poor knowledge was age, with older participants being more likely to know little or nothing about ECs. This finding confirmed an anticipated trend, as younger people were generally assumed to have been exposed to more information and examples of smoking and vaping from peers and social media.[35,36]

In our study, the most two commonly reported causes of using ECs or vaping were ease to use and modern size and shape with 55.8% and 11.5%, respectively. ECs are more attractive than traditional cigarettes for a number of reasons, including cost, taste diversity, accessibility, and use and effect of social media. The primary factors influencing young people's usage of ECs containing nicotine were social media marketing and ECs' accessibility and availability.[53] This is especially concerning because, according to local research,[54] the use of ECs is far more common among young individuals, in line with evidence that has been reported globally.[55]

In our study, about 15.4% of participants stopped smoking with ECs, and 26.9% smoked less conventional tobacco overall. This validated the results of an earlier Saudi Arabian study[26] that revealed that 43.0% of ECs users considered them to be helpful in stopping smoking. A Polish study[56] revealed that around 60.0% of vaping device users used them

to stop smoking. Aghar *et al*.[34] reported that 80.6% thought that ECs help in quitting smoking. Doumi *et al*.[33] reported that over 25% of participants thought that ECs may assist smokers in reducing their daily cigarette intake or quitting. Similar findings and trends, ranging in percentage from 20.2% to 69.1%, were also reported from several regional nations.[43,57,58] According to research done on health science students in Jeddah, 42.7% of ECs users thought of it as a tool for quitting smoking, 9.2% said that using ECs was their only motivation for starting to use them, and 5.8% said they thought of it after trying one or more other smoking cessation methods unsuccessfully.[26] According to data from a Polish survey, 58.7% of students there attempted to give up smoking by using electronic cigarettes.[57] 4.1% and 23.1% of students at various American institutions have tried electronic cigarettes for the same reason.[59,60] Previous research has demonstrated that using ECs and vaping to quit smoking is ineffective; hence, these methods should not be employed to quit smoking.[61-63] It is better to use other research-backed methods, such as nicotine gums, nasal or oral sprays, and patches, to assist smokers in quitting.[64] Furthermore, restrictions on the promotion of ECs are necessary to meet public health goals.[38]

Limitation

Our capacity to investigate the causal relationship between our research variables was limited by the cross-sectional methodology. It is possible that part of our intended group was overlooked due to the handy research sample we were able to assemble through our online survey. Non-response bias may have resulted from our failure to estimate the number of participants who were invited to take part in this investigation.

CONCLUSION

This study opens a window on the assessment of knowledge, perception, and practice of ECs use among teachers in Middle Eastern communities. This study demonstrated that, in comparison to national or international awareness levels, the local community, at the very least, needs stronger health education campaigns and laws to decrease ECs usage and decrease future use of tobacco products for smoking.

REFERENCES

1. Rom O, Pecorelli A, Valacchi G, Reznick AZ. Are E-cigarettes a safe and good alternative to cigarette smoking? Ann N York Acad Sci 2015;1340:65-74.
2. Brożek GM, Jankowski M, Lawson JA, Shpakou A, Poznański M, Zielonka TM, *et al*. The prevalence of cigarette and E-cigarette smoking among students in central and Eastern Europe-results of the YUPESS study. Int J Environ Res Public Health 2019;16:2297.
3. Tan AS, Bigman CA. E-cigarette awareness and perceived harmfulness: Prevalence and associations with smoking-cessation outcomes. Am J Prev Med 2014;47:141-9.
4. Jones L. Vaping: How popular are e-cigarettes? BBC News 2019. 2019;11.
5. Kalkhoran S, Chang Y, Rigotti NA. Electronic cigarette use and cigarette abstinence over 2 years among U.S. Smokers in the population assessment of tobacco and health study. Nicotine Tob Res 2020;22:728-33.
6. King AC, Smith LJ, McNamara PJ, Matthews AK, Fridberg DJ. Passive exposure to electronic cigarette (e-cigarette) use increases desire for combustible and e-cigarettes in young adult smokers. Tob Control 2015;24:501-4.
7. Pray IW, Atti SK, Tomasallo C, Meiman JG. E-cigarette, or vaping, product use-associated lung injury among clusters of patients reporting shared product use - wisconsin, 2019. MMWR Morb Mortal Wkly Rep 2020;69:236-40.
8. Meo SA, Ansary MA, Barayan FR, Almusallam AS, Almehaid AM, Alarifi NS, *et al*. Electronic cigarettes: Impact on lung function and fractional exhaled nitric oxide among healthy adults. Am J Mens Health 2019;13:1557988318806073.
9. Soule EK, Bode KM, Desrosiers AC, Guy M, Breland A, Fagan P. User-perceived negative respiratory symptoms associated with electronic cigarette use. Nicotine Tob Res 2020;22:S45-53.
10. Alsanea S, Alrabiah Z, Samreen S, Syed W, Bin Khunayn RM, Al-Arifi NM, *et al*. Prevalence, knowledge and attitude toward electronic cigarette use among male health colleges students in Saudi Arabia-A cross-sectional study. Front Public Health 2022;10:827089.
11. Sharanesha RB, Alkhaldi AM, Alshehri AG, Alanazi MA, Al-Shammri TM, Alanazi FM. Knowledge and perception of e-cigarettes among dental students in Riyadh region Saudi Arabia. J Pharm Bioallied Sci 2022;14:S340-3.
12. Karbouji MA, Abduldaem AM, Allogmani AM, Alharbi AS, Alnozha O, Al-Zalabani AH. Awareness and attitude toward smoking e-cigarettes (vape) among smokers in Saudi Arabia 2017. Egypt J Hosp Med 2018;70:1346-51.
13. Choi K, Forster J. Characteristics associated with awareness, perceptions, and use of electronic nicotine delivery systems among young US Midwestern adults. Am J Public Health 2013;103:556-61.
14. Sabbagh HJ, Khogeer LN, Hassan MH, Allaf HK. Parental knowledge and attitude regarding E-cigarette use in Saudi Arabia and the effect of parental smoking: A cross-sectional study. Risk Manag Healthc Policy 2020;13:1195-205.
15. Jongenelis MI, Robinson A. Educators' perceptions of e-cigarettes in Australian secondary schools. Tob Induc Dis 2023;21:41.

16. Alfaraj DN, Alessa YZ, Al Abdulatif FA, Alshorafa JM, Alshakhs MA, AlButayan HA. Knowledge and perception of risks and use of e-cigarettes (vaping) among adults in the eastern province of Saudi Arabia. Int J Med Res Health Sci 2019;8:17-31.
17. Alammari YM, Al Harbi KM, Bukhari AI, Hakami OA, Qutob RA, Habib SK, *et al*. Knowledge and perception of risks and use of e-cigarettes among adults in Saudi Arabia: a cross-sectional study. Med Sci (Basel). 2022;26:1-14.
18. Sallis JF, Owen N, Fisher E. Ecological models of health behavior. Health Behav Theor Res Pract 2015;5:43-64.
19. Kong G, Morean ME, Cavallo DA, Camenga DR, Krishnan-Sarin S. Sources of electronic cigarette acquisition among adolescents in Connecticut. Tob Regul Sci 2017;3:10-6.
20. AlBaik M, Abdrabulnabi AA, Aldahan SM, Alkhadhrawi N. Electronic cigarette in Saudi Arabia: An online survey. Valley Int J 2014;1:411-26.
21. Canzan F, Finocchio E, Moretti F, Vincenzi S, Tchepnou-Kouaya A, Marognolli O, *et al*. Knowledge and use of e-cigarettes among nursing students: Results from a cross-sectional survey in North-Eastern Italy. BMC Public Health 2019;19:976.
22. Gorini G, Gallus S, Carreras G, De Mei B, Masocco M, Faggiano F, *et al*. Prevalence of tobacco smoking and electronic cigarette use among adolescents in Italy: Global youth tobacco surveys (GYTS), 2010, 2014, 2018. Prev Med 2020;131:105903.
23. Bozier J, Foster J, Oliver B. A New Era of Smoking: Young Peoples Perceptions of Emerging Tobacco Products. Switzerland: European Respiratory Society; 2018.
24. Goldberg RL, Cataldo JK. Using an e-cigarette is like eating tofu when you really want meat. Am J Health Behav 2018;42:54-64.
25. Hajek P, Phillips-Waller A, Przulj D, Pesola F, Smith KM, Bisal N, *et al*. E-cigarettes compared with nicotine replacement therapy within the UK stop smoking services: The TEC RCT. Health Technol Assess 2019;23:1-82.
26. Qanash S, Alemam S, Mahdi E, Softah J, Touman AA, Alsulami A. Electronic cigarette among health science students in Saudi Arabia. Ann Thorac Med 2019;14:56-62.
27. Abo-Elkheir OI, Sobh E. Knowledge about electronic cigarettes and its perception: A community survey, Egypt. Respir Res 2016;17:58.
28. Al-Sawalha NA, Almomani BA, Mokhemer E, Al-Shatnawi SF, Bdeir R. E-cigarettes use among university students in Jordan: Perception and related knowledge. PLoS One 2021;16:e0262090.
29. Sreeramareddy CT, Shroff SM, Gunjal S. Nicotine dependence and associated factors among persons who use electronic e-cigarettes in Malaysia - an online survey. Subst Abuse Treat Prev Policy 2023;18:51.
30. Thrasher JF, Abad-Vivero EN, Barrientos-Gutíerrez I, Pérez-Hernández R, Reynales-Shigematsu LM, Mejía R, *et al*. Prevalence and correlates of e-cigarette perceptions and trial among early adolescents in Mexico. J Adolesc Health 2016;58:358-65.
31. Brown J, West R, Beard E, Michie S, Shahab L, McNeill A. Prevalence and characteristics of e-cigarette users in Great Britain: Findings from a general population survey of smokers. Addict Behav 2014;39:1120-5.
32. McCausland K, Maycock B, Leaver T, Jancey J. The messages presented in electronic cigarette-related social media promotions and discussion: Scoping review. J Med Internet Res 2019;21:e11953.
33. Doumi R, Khaytan S, Alobaidan AS, Alqahtany BM, Aldosari NM, Almutairi AA, *et al*. Knowledge, attitude, and practice of E-cigarettes of adolescents and adults in Saudi Arabia: A cross-sectional study. Healthcare (Basel) 2023;11:2998.
34. Aghar H, El-Khoury N, Reda M, Hamadeh W, Krayem H, Mansour M, *et al*. Knowledge and attitudes towards E-cigarette use in Lebanon and their associated factors. BMC Public Health 2020;20:278.
35. Jaafar H, Razi NA, Mohd TA, Noor NA, Ramli S, Rahman ZA, *et al*. Knowledge, attitude and practice on electronic cigarette and their associated factors among undergraduate students in a public university. IIUM Med J Malaysia 2021;20:43-51.
36. Rayes BT, Alalwan A, AbuDujain NM, Darraj A, Alammar MA, Jradi H. Prevalence, trends, and harm perception associated with E-cigarettes and vaping among adolescents in Saudi Arabia. Arch Clin Biomed Res 2023;7:147-56.
37. Ma BH, Yong HH, Borland R, McNeill A, Hitchman SC. Factors associated with future intentions to use personal vaporisers among those with some experience of vaping. Drug Alcohol Rev 2018;37:216-25.
38. Collins L, Glasser AM, Abudayyeh H, Pearson JL, Villanti AC. E-cigarette marketing and communication: How e-cigarette companies market e-cigarettes and the public engages with e-cigarette information. Nicotine Tob Res 2019;21:14-24.
39. Eaton DL, Kwan LY, Stratton K. Public Health Consequences of E-Cigarettes. Washington, DC: National Academies Press, US; 2018.
40. Herrington JS, Myers C. Electronic cigarette solutions and resultant aerosol profiles. J Chromatogr A 2015;1418:192-9.
41. Kucharska M, Wesołowski W, Czerczak S, Soćko R. [Testing of the composition of e-cigarette liquids - manufacturer-declared vs. True contents in a selected series of products]. Med Pr 2016;67:239-53.
42. Farrell KR, Weitzman M, Karey E, Lai TK, Gordon T, Xu S. Passive exposure to e-cigarette emissions is associated with worsened mental health. BMC Public Health 2022;22:1138.
43. Alzahrani Z, Zaidi SF, Alsolami H, Bashrahil B, Alghamdi N, Nooh M, *et al*. Electronic cigarettes consumption and associated factors among general population in Western Saudi Arabia. J Public Health Res 2021;11:2346.

44. World Health Organization. WHO Report on the Global Tobacco Epidemic 2021: Addressing New and Emerging Products. Geneva: World Health Organization; 2021.
45. Gülşen A, Uslu B. Health hazards and complications associated with electronic cigarettes: A review. Turk Thorac J 2020;21:201-8.
46. Mescolo F, Ferrante G, La Grutta S. Effects of E-cigarette exposure on prenatal life and childhood respiratory health: A review of current evidence. Front Pediatr 2021;9:711573.
47. Jamal F, Fletcher A, Harden A, Wells H, Thomas J, Bonell C. The school environment and student health: A systematic review and meta-ethnography of qualitative research. BMC Public Health 2013;13:1-11.
48. Ferrara P, Shantikumar S, Cabral Veríssimo V, Ruiz-Montero R, Masuet-Aumatell C, Ramon-Torrell JM. Knowledge about E-cigarettes and tobacco harm reduction among public health residents in Europe. Int J Environ Res Public Health 2019;16:2071.
49. Abdel-Qader DH, Al Meslamani AZ. Knowledge and beliefs of Jordanian community toward E-cigarettes: A national survey. J Community Health 2021;46:577-86.
50. Hallfors DD, Pankratz M, Hartman S. Does federal policy support the use of scientific evidence in school-based prevention programs? Prev Sci 2007;8:75-81.
51. Gingiss PM, Roberts-Gray C, Boerm M. Bridge-it: A system for predicting implementation fidelity for school-based tobacco prevention programs. Prev Sci 2006;7:197-207.
52. Lander N, Eather N, Morgan P, Salmon J, Barnett L. How do teachers need to be trained for physical education interventions to improve fundamental movement skills and/or physical activity? A systematic review. J Sci Med Sport 2017;20:e41.
53. Ollila H, Tarasenko Y, Ciobanu A, Lebedeva E, Raitasalo K. Exclusive and dual use of electronic cigarettes among European youth in 32 countries with different regulatory landscapes. Tob Control 2024;33:622-7.
54. Althobaiti NK, Mahfouz ME. Prevalence of electronic cigarette use in Saudi Arabia. Cureus 2022;14:e25731.
55. Pan L, Morton J, Mbulo L, Dean A, Ahluwalia IB. Electronic cigarette use among adults in 14 countries: A cross-sectional study. EClinicalMedicine 2022;47:101401.
56. Brożek G, Jankowski M, Zejda J, Jarosińska A, Idzik A, Bańka P. E-smoking among students of medicine frequency, pattern and motivations. Adv Respir Med 2017;85:8-14.
57. Al-Hamdani M, Brett Hopkins D. E-cigarettes in the Middle East: The known, unknown, and what needs to be known next. Prev Med Rep 2023;31:102089.
58. Boakye E, Osuji N, Erhabor J, Obisesan O, Osei AD, Mirbolouk M, *et al*. Assessment of patterns in e-cigarette use among adults in the US, 2017-2020. JAMA Netw Open 2022;5:e2223266.
59. Franks AM, Hawes WA, McCain KR, Payakachat N. Electronic cigarette use, knowledge, and perceptions among health professional students. Curr Pharm Teach Learn 2017;9:1003-9.
60. Zhou S, Van Devanter N, Fenstermaker M, Cawkwell P, Sherman S, Weitzman M. A study of the use, knowledge, and beliefs about cigarettes and alternative tobacco products among students at one U.S. Medical school. Acad Med 2015;90:1713-9.
61. Christensen T, Welsh E, Faseru B. Profile of e-cigarette use and its relationship with cigarette quit attempts and abstinence in Kansas adults. Prev Med 2014;69:90-4.
62. El Dib R, Suzumura EA, Akl EA, Gomaa H, Agarwal A, Chang Y, *et al*. Electronic nicotine delivery systems and/or electronic non-nicotine delivery systems for tobacco smoking cessation or reduction: A systematic review and meta-analysis. BMJ Open 2017;7:e012680.
63. Grana R, Benowitz N, Glantz SA. E-cigarettes: A scientific review. Circulation 2014;129:1972-86.
64. Liu X, Lugo A, Davoli E, Gorini G, Pacifici R, Fernández E, *et al*. Electronic cigarettes in Italy: A tool for harm reduction or a gateway to smoking tobacco? Tob Control 2020;29:148-52.

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