ORIGINAL ARTICLE

Prevalence of Electronic Cigarette use in Al Kharj city

Abdullah Mubarak Aldawsari[1], Faihan Turki Faihan Alotaibi[1], Meshari Khalid Alhumaydani[1], Ahmad Nawaf Alrasheedi[1], Omar Mudhhi Alanazi[1], Ali Awadh Ali Alahmari[1], Musab Khalid Alotaibi[1], Ali Hassan A. Ali[2,3]

[1]Department of Basic Medical Science, College of Medicine, Prince Sattam Bin Abdulaziz University, Al-Kharj, KSA, [2]Department of Anatomy, College of Medicine, Prince Sattam Bin Abdulaziz University, Al-Kharj, KSA, [3]Department of Anatomy, Faculty of Medicine, Al-Azhar University, Cairo, Egypt

Abstract

Aim: There is an alternative to smoking traditional tobacco cigarettes: electronic cigarettes, or e-cigarettes. The purpose of this study is to determine how common electronic cigarette use is among people in Al Kharj City. **Materials and Methods:** Between May and July of 2023, 570 people of both genders participated in a cross-sectional survey that was carried out in Al-Kharj, Saudi Arabia through a self-administered questionnaire. With 45.30% of the sample being male, the gender distribution showed a very balanced representation. In terms of educational attainment, 74.70% of participants held a university degree. **Results and Discussion:** The findings showed that 80.30% of the sample had never smoked regular cigarettes. The study participants' e-cigarette consumption patterns showed that 78.20% had never used an e-cigarette. Significant differences were also seen in educational attainment, with greater education levels being associated with decreased e-cigarette use. In terms of quitting, the majority (81.40%) had never smoked regular cigarettes. E-cigarette users are more likely to be young adults and people who have used tobacco products in the past. **Conclusion:** These results should be considered by Saudi Arabian health-care professionals in their efforts to educate the public about the risks of e-cigarette usage.

Key words: Al-Kharj, electronic cigarettes, prevalence, smoking

INTRODUCTION

Electronic cigarettes, often known as e-cigarettes, are items that are powered by batteries and can deliver nicotine as well as other compounds, according to the Food and Drug Administration, which issued this definition in 2014. The use of electronic cigarettes, or "vaping," differs from traditional smoking practices in that it does not include the burning of tobacco. The e-cigarettes were created to keep the desired benefits of smoking a cigarette while reducing the hazardous effects of tobacco smoke.[1]

The e-cigarette is composed of four main parts to produce the aerosol, a lithium battery to generate power for the atomizer, which heats the e-liquid that is stored in the cartridge (pod), resulting in an aerosol that is inhaled using the mouthpiece. E-cigarettes have become more popular among teenagers and young adults as a result of greater public awareness of the risks associated with traditional cigarettes, laws enacted by health authorities banning smoking in public areas, ongoing manufacturer marketing initiatives, and a general belief that e-cigarettes are a healthier alternative to traditional cigarettes.[2] Some consumers use it for smoking cessation. In addition, one of the main reasons mentioned by many e-cigarette users was the false belief that using these devices can help you stop smoking.[3] Moreover, it has been wrongly assumed that it is a safer alternative to smoking tobacco. So far, recent studies have indicated that the risks associated with using e-cigarettes can be similar to those associated with tobacco use. Moreover, many studies prove that using e-cigarettes increases the risk of developing respiratory damage and CVS abnormalities such as elevated

Address for correspondence:
Ali Hassan A. Ali, Department of Anatomy, College of Medicine, Prince Sattam bin Abdulaziz University, Al-Kharj, KSA. Phone: 00966115886171.
E-mail: alihassan3750@yahoo.com/a.ali@psau.edu.sa

Received: 02-02-2024
Revised: 06-03-2024
Accepted: 11-03-2024

blood pressure and heart rate. It may also cause headaches, nausea, and vomiting. During the last few years, there has been a significant increase in the prevalence of e-cigarette smokers worldwide.[4] Unfortunately, the media encourages the rise of e-smoking by portraying it as less dangerous than other forms of smoking.[5]

Recent reports state that e-cigarettes' chemical ingredients contain several carcinogens that increase the risk of cancer.[6]

According to estimates, 48.5 million Europeans have used an e-cigarette at least once, and 7.5 million of them do so right now. In many contexts, the prevalence of e-cigarette use has been studied. One study looked at the frequency of e-cigarette use among young individuals in Canada. A survey on e-cigarette usage from 1188 participants showed that there is a reasonably high knowledge of e-cigarette use among young adult Canadians, with a 16.1% prevalence of e-cigarette use.[7]

Goniewicz *et al*. conducted a Polish study in which they examined teen and young adult e-cigarette use. About one-fifth of Poles who responded to a study with 20240 respondents were found to be e-cigarette smokers, according to the results. The research suggested that young persons' knowledge of the risks associated with e-smoking be increased.[8]

Previous research about e-cigarettes in KSA through questionnaires stated that 26% of the participants had tried e-cigarettes at least once in their lives, and the frequency of smoking in electric smokers is higher than in cigarette smokers.[9] The incidence of e-cigarette use among residents of Al-Kharj city is currently unknown. It is important to know the prevalence of e-cigarette smokers because there are many misunderstood conceptions about this type of smoking. Therefore, knowing and showing the prevalence and how this habit spread among the population in Al-Kharj will help to improve awareness about e-cigarette smoking.

MATERIALS AND METHODS

The PSA University Ethical Committee accepted the Research Guideline for the Use and Care, which we adhered to in our study. The Standing Committee of Bioethics (SCBR) and Deanship of Scientific Research at Prince Sattam Bin Abdulaziz University approved the research with approval No: (SCBR-047-2023).

A cross-sectional quantitative study employing a self-administered constructed questionnaire with close-ended questions using online Google Forms to determine the prevalence and awareness of e-cigarette use among the population of Al-Kharj and describe the factors associated with their use in the city. Only valid surveys will be included. The setting of this research in Al-Kharj was distributed to Al-Kharj residents between May and July 2023.

The research's participation was optional and anonymous. Inclusion criteria include all Al-Kharj residents aged 18 years and more, males and females, with all nationalities, whether they are single or married and were included by excluding questions in the survey. Only completed questionnaires were included, and participants had the option of rejecting participation at any time for any reason. Participants who do not own a smartphone or tablet, are unable to read or do not provide complete responses, or refuse to provide consent were excluded.

This formula was used to calculate the sample size, with significance adjusted at $P > 0.05$.

$NZ^2P\ (1-P)/(D^2+NZ^2P\ (1-P)]$, $N=(1.96)^2/4(0.05)^2=384.16$

Data were collected through the responses to the questionnaire. The questionnaire was sent through a different social media application in the English and Arabic languages.

The Excel application (version 16.0.8730.2046) was used for data collection, organization, and analysis.

The statistical analysis was performed using SPSS (IBM version 26). The categorical variables were presented as frequencies and percentages. The Chi-square test was used to show the association between the use of electronic cigarette smoking and the sociodemographic data to present frequencies, percentages, and P values. Logistic regression was constructed to predict the use of electronic cigarettes smoking based on the statistically significant sociodemographic data for the primary outcome. Results of the regression were presented as odds ratios (OR) and their respective 95% confidence intervals (CI). $P < 0.05$ is an indication of statistical significance.

RESULTS

Sociodemographic data

The study assessed the prevalence of electronic cigarette use in Al Kharj City among 570 participants after excluding the individuals who refused to participate in the study and the individuals aged below 18 years old. The gender distribution revealed a relatively balanced representation, with (45.30%) males. Regarding educational levels, the majority of participants had a university degree (74.70%). Marital status indicated that (59.60%) of respondents were single. The majority of participants were Saudi nationals (98.10%). In terms of residency, (66.00%) lived in Al Kharj and its suburbs. Employment status varied, with (47.10%) being students. Monthly income distribution revealed that (41.70%) earned less than 1000 [Table 1].

Traditional cigarettes smoking

The study examined participants' history and attitudes toward traditional cigarette smoking. Results indicated

that a significant portion of the sample had never used traditional cigarettes (80.30%) [Figure 1]. Among those who used traditional cigarettes, the duration of use varied, with (42.70%) reporting use for over 5 years [Figure 2]. Regarding the influence of family members, (46.00%) of participants reported no family members smoking traditional cigarettes [Figure 3]. Concerning cessation, the majority had never used traditional cigarettes (81.40%) [Figure 4].

Awareness about electronic cigarettes smoking

The investigation into electronic cigarette (e-cigarette) usage patterns among the participants in [Table 2] revealed that (78.20%) had never used e-cigarettes. Among e-cigarette users, varying durations of use were reported, with (26.50%) using them for 1 year. Concerning family influence, (54.00%) reported no family members using e-cigarettes. Regarding cessation, (79.90%) of participants had never used e-cigarettes. Participants provided diverse reasons for e-cigarette use, with (31.90%) aiming to quit traditional smoking. When evaluating harm perceptions, (40.80%) viewed e-cigarettes as more harmful than traditional cigarettes. In addition, (94.70%) of participants reported never using other tobacco products.

Table 1: Frequencies and percentages of sociodemographic data (*n*=570)

Parameter	Category	*n*	%
Gender	Male	258	45.30
	Female	312	54.70
Educational level	Uneducated	2	0.40
	Middle school	0	0.00
	High school	108	18.90
	Diploma	16	2.80
	University	426	74.70
	Master or phD	15	2.60
	Other	3	0.50
Marital status	Single	340	59.60
	Married	207	36.30
	Separated/divorced/ widowed	23	4.00
Nationality	Non-Saudi	11	1.90
	Saudi	558	98.10
Place of residency	Al Kharj and its subrubs	376	66.00
	Riyadh	129	22.60
	Other	65	11.40
Employment status	Unemployed	29	5.10
	Student	268	47.10
	Public sector employee	142	25.00
	Private sector employee	54	9.50
	Other	76	13.40
Monthly income	<1000	237	41.70
	1000–4999	114	20.00
	2000–5999	20	3.50
	5000–9999	52	9.10
	10000–14999	78	13.70
	15000–19999	30	5.30
	20000 or more	38	6.70

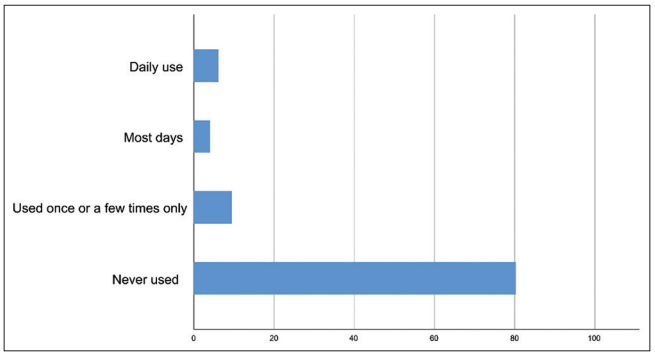

Figure 1: Bar chart showing the use of traditional cigarettes smoking

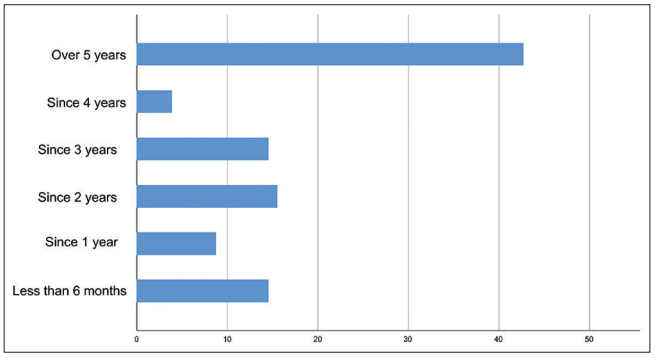

Figure 2: Bar chart showing the time of using traditional cigarettes smoking

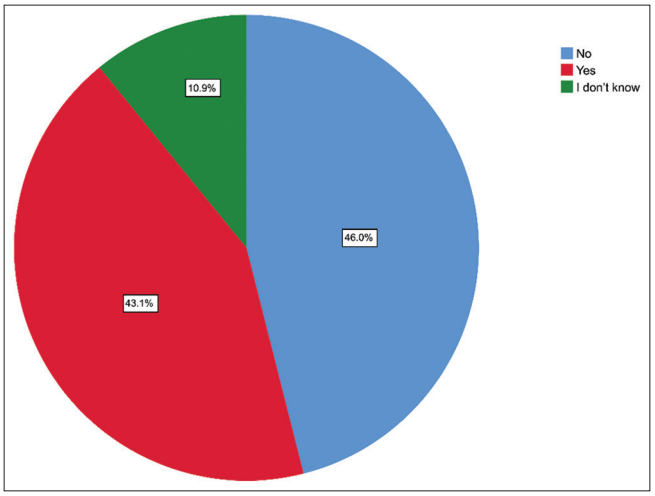

Figure 3: Pie chart showing the percentages of family members who smoke traditional cigarettes

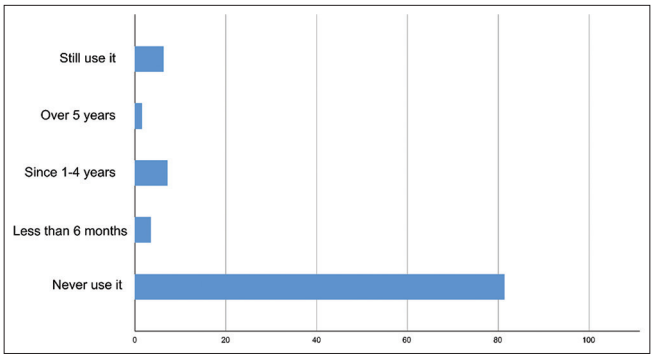

Figure 4: Bar chart showing the time of quitting traditional cigarettes smoking

Association between sociodemographic data and the use of electronic cigarettes smoking

The analysis of electronic cigarette (e-cigarette) usage patterns revealed significant associations with various demographic factors. Gender exhibited a marked difference in e-cigarette use, with (94.90%) of females reporting never using them compared to (41.90%) of males ($P < 0.001$). Educational level also demonstrated significant differences, as higher levels of education correlated with lower e-cigarette use ($P = 0.005$). Marital status exhibited an association, with (73.80%) of singles reporting never using e-cigarettes ($P = 0.006$). Place of residency showed significant differences, as (76.60%) of

Table 2: Awareness about electronic cigarette smoking (*n*=570)

Parameter	Category	*n*	%
Have you ever used Electric cigarettes smoking?	Never used	446	78.20
	Used few times/most days/daily use	124	21.80
If you have been using it, how long has it been? (Electric cigarettes smoking)	<6 months	26	23.00
	Since 1 year	30	26.50
	Since 2 years	20	17.70
	Since 3 years	14	12.40
	Since 4 years	10	8.80
	Over 5 years	13	11.50
Do you have a family member who smokes electric cigarettes?*	No	307	54.00
	Yes	169	29.70
	I don't know	93	16.30
If you have been quit Electric cigarette smoking, since when?**	Never use it	454	79.90
	<6 months	26	4.60
	Since 1–4 years	32	5.60
	Over 5 years	3	0.50
	Still use it	53	9.30
In your opinion, what is the reason for using Electric cigarettes smoking?	To quit traditional smoking	181	31.90
	Palatable flavor	160	28.20
	Less harmful than traditional smoking	99	17.50
	It can be used in places where the use of traditional cigarettes is prohibited	166	29.30
	Social causes	162	28.60
	Give a better effect than traditional smoking	40	7.10
	Lower cost than traditional smoking	129	22.80
In your opinion, how harmful are electric cigarettes compared to traditional cigarettes?*	I don't know	129	22.70
	No harm from electronic cigarettes at all	3	0.50
	Electronic cigarettes are less harmful than traditional cigarettes	64	11.20
	Electronic cigarettes are more harmful than traditional cigarettes	232	40.80
	The harm from electronic cigarettes is equal to the harm from traditional cigarettes	141	24.80
Do you use any other tobacco products like betel chewing?	Never used	539	94.70
	Used once or a few times only	16	2.80
	Most days	5	0.90
	Daily use	9	1.60

participants from Al Kharj and its suburbs reported never using e-cigarettes (P = 0.005). Employment status significantly influenced e-cigarette use, with (81.00%) of students and (84.20%) of other employment statuses reporting never using them (P < 0.001). Monthly income exhibited a significant association, with (85.70%) of participants earning less than 1000 reporting never using e-cigarettes (P = 0.002) [Table 3].

Predictors of the use of electronic cigarettes smoking based on the statistically significant sociodemographic data

The logistic regression analysis revealed significant associations between electronic cigarette (e-cigarette) use and various demographic factors. Females exhibited a significantly lower OR of e-cigarette use compared to males (OR = 0.090, 95% CI: 0.047–0.174, P < 0.001). Marital status also played a role, with married individuals having a lower odds of e-cigarette use compared to singles (OR = 0.433, 95% CI: 0.199–0.939, P = 0.034). Employment status revealed significant associations, with students having lower odds of e-cigarette use compared to unemployed individuals (OR = 0.365, 95% CI: 0.136–0.978, P = 0.045) [Table 4].

DISCUSSION

E-cigarette is mistakenly considered to be a safer alternative to smoking tobacco. However, according to recent investigations, there may be risks associated with e-cigarettes that are comparable to those associated with tobacco use.[10] The current study aims to investigate how common e-cigarette use is in Al-Kharj city. Our results indicated that (80.30%) had never used traditional cigarettes.

Table 3: Association between sociodemographic data and the use of electronic cigarette smoking

Parameter	Category	Never used		Used few times, most days or daily		*P*-value
		n	%	*n*	%	
Gender	Male	150	58.10	108	41.90	< 0.001
	Female	296	94.90	16	5.10	
Educational level	Uneducated	2	100.00	0	0.00	0.005
	High school	75	69.40	33	30.60	
	Diploma	10	62.50	6	37.50	
	University	349	81.90	77	18.10	
	Master or PhD	8	53.30	7	46.70	
	Other	2	66.70	1	33.30	
Marital status	Single	251	73.80	89	26.20	0.006
	Married	174	84.10	33	15.90	
	Separated/divorced/widowed	21	91.30	2	8.70	
Nationality	Non-Saudi	6	54.50	5	45.50	0.052
	Saudi	440	78.90	118	21.10	
Place of residency	Al Kharj and its subrubs	288	76.60	88	23.40	0.005
	Riyadh	97	75.20	32	24.80	
	Other	61	93.80	4	6.20	
Employment status	Unemployed	18	62.10	11	37.90	< 0.001
	Student	217	81.00	51	19.00	
	Public sector employee	117	82.40	25	17.60	
	Private sector employee	30	55.60	24	44.40	
	Other	64	84.20	12	15.80	
Monthly income	<1000	203	85.70	34	14.30	0.002
	1000–4999	81	71.10	33	28.90	
	2000–5999	13	65.00	7	35.00	
	5000–9999	33	63.50	19	36.50	
	10000–14999	64	82.10	14	17.90	
	15000–19999	24	80.00	6	20.00	
	20000 or more	28	73.70	10	26.30	

Table 4: Predictors of the use of electronic cigarette smoking based on the statistically significant sociodemographic data

Parameter	Category	OR	95% CI		*P*-value
			LB	UB	
Gender	Male	Ref.	Ref.	Ref.	Ref.
	Female	0.090	0.047	0.174	< 0.001
Marital status	Single	Ref.	Ref.	Ref.	Ref.
	Married	0.433	0.199	0.939	0.034
	Separated/divorced/widowed	0.434	0.076	2.477	0.347
Nationality	Non-Saudi	Ref.	Ref.	Ref.	Ref.
	Saudi	0.953	0.222	4.081	0.948
Place of residency	Al Kharj and its subrubs	Ref.	Ref.	Ref.	Ref.
	Riyadh	0.611	0.347	1.075	0.088
	Other	0.454	0.140	1.472	0.188
Employment status	Unemployed	Ref.	Ref.	Ref.	Ref.
	Student	0.365	0.136	0.978	0.045
	Public sector employee	0.307	0.091	1.036	0.057
	Private sector employee	0.701	0.216	2.272	0.554
	Other	0.826	0.237	2.873	0.764
Monthly income	<1000	Ref.	Ref.	Ref.	Ref.
	1000–4999	1.646	0.866	3.129	0.128
	2000–5999	0.762	0.254	2.290	0.628
	5000–9999	2.449	0.865	6.940	0.092
	10000–14999	2.072	0.665	6.457	0.209
	15000–19999	2.519	0.710	8.934	0.153
	20000 or more	1.593	0.483	5.253	0.445

The prevalence of e-cigarette use has been studied in several environments. An earlier study looked into how common e-cigarette use is among young individuals in Canada. A survey on e-cigarette use was completed by 1188 participants, and the results showed that young adults in Canada are reasonably aware of using e-cigarettes, with a prevalence of 16.1%.[7] Compared to the Canadian population, e-cigarette use was more common (19.70%) in the current study. In Saudi Arabia, e-smoking has also been connected to male gender, greater levels of education, tobacco use, and more frequent smoking. Teenagers and young adults' use of e-cigarettes was assessed in another Polish study. Approximately one-fifth of Poles smoke e-cigarettes, according to an analysis of a survey with 20240 respondents. The study suggested that young adults be made more aware of the risks associated with e-smoking.[8]

The percentage of 15-year-old European Union citizens who have used an e-cigarette at least once has doubled in the last five years, from 7.2% in 2012 to 15% in 2017.[11-13] In 2017, the group of participants aged 15–24 years had the greatest percentage of e-cigarette users (25%).[13] According to a 2015 research conducted among high school students in three Russian Federation cities, 2.2% of students between the ages of 15 and 18 reported using e-cigarettes within the previous 30 days.[14]

Variations in results might originate from the age ranges, research methods, and study population that were looked at. The mainstream media promotes e-cigarettes as a safer option to smoking traditional tobacco products. There were notable differences in how e-cigarettes were seen in each country. Students from the five research centers may have different attitudes and perceptions about e-cigarettes due to cultural differences and the structure of anti-smoking policies in each nation, particularly the various laws that are in effect in the European Union and Belarus and Russia's tobacco control acts.[15,16]

CONCLUSIONS

Those in their early adult years and those who have experienced tobacco usage are more likely to use e-cigarettes. To determine the full scope of the negative impacts of e-smoking in the Kingdom, more randomized research are desperately needed. Health-care practitioners in Saudi Arabia ought to take these findings into account to raise public awareness of the dangers associated with e-cigarette use.

ACKNOWLEDGMENTS

This publication was supported by the Deanship of Scientific Research at Prince Sattam bin Abdulaziz University, Al-Kharj, Saudi Arabia. In addition, we thank those who participated and contributed to the study.

INFORMED CONSENT

Not applicable.

AVAILABILITY OF DATA AND MATERIALS

The data are available upon request from the authors.

ETHICS APPROVAL

All series of steps that were implemented in this study that included animal models were in compliance with Ethics Committee of Prince Sattam bin Abdulaziz University Institutional Review Board (SCBR-047-2023).

REFERENCES

1. Moradi-Lakeh M, El Bcheraoui C, Daoud F, Tuffaha M, Kravitz H, Al Saeedi M, *et al*. Prevalence of asthma in Saudi adults: Findings from a national household survey, 2013. BMC Pulm Med 2015;15:77.
2. 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.
3. Khan WA, Abdulghani A, Almohrij S, Abukaram TM, Alturki F, Alaithan M, *et al*. A cross-sectional study of the prevalence of electronic cigarette use, knowledge and attitudes among Saudi youth. Med Sci 2023;27:e57ms2680.
4. 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.
5. Alsanosy RM. Smokeless tobacco (Shammah) in Saudi Arabia: A review of its pattern of use, prevalence, and potential role in oral cancer. Asian Pac J Cancer Prev 2014;15:6477-83.
6. Al Ghobain M, Alhamad EH, Alorainy HS, Al Kassimi F, Lababidi H, Al-Hajjaj MS. The prevalence of chronic obstructive pulmonary disease in Riyadh, Saudi Arabia: A BOLD study. Int J Tuberc Lung Dis 2015;19:1252-7.
7. Czoli CD, Hammond D, White CM. Electronic cigarettes in Canada: Prevalence of use and perceptions among youth and young adults. Can J Public Health 2014;105:e97-102.
8. Goniewicz ML, Zielinska-Danch W. Electronic cigarette use among teenagers and young adults in Poland. Pediatrics 2012;130:e879-85.
9. Althobaiti NK, Mahfouz ME. Prevalence of electronic cigarette use in Saudi Arabia. Cureus 2022;14:e25731.
10. Nahhas M, Bhopal R, Anandan C, Elton R, Sheikh A. Prevalence of allergic disorders among primary school-aged children in Madinah, Saudi Arabia: Two-stage cross-sectional survey. PLoS One 2012;7:e36848.
11. Filippidis FT, Laverty AA, Gerovasili V, Vardavas CI. Two-year trends and predictors of e-cigarette use in 27 European Union member states. Tob Control 2017;26:98-104.
12. Vardavas CI, Filippidis FT, Agaku IT. Determinants and prevalence of e-cigarette use throughout the European Union: A secondary analysis of 26 566 youth and adults from 27 Countries. Tob Control 2015;24:442-8.
13. Laverty AA, Filippidis FT, Vardavas CI. Patterns, trends and determinants of e-cigarette use in 28 European Union Member States 2014-2017. Prev Med 2018;116:13-8.
14. Kong G, Idrisov B, Galimov A, Masagutov R, Sussman S. Electronic cigarette use among adolescents in the Russian federation. Subst Use Misuse 2017;52:332-9.
15. Laverty AA, Filippidis FT, Fernandez E, Vardavas CI. E-cigarette use and support for banning e-cigarette use in public places in the European Union. Prev Med 2017;105:10-4.
16. Kennedy RD, Awopegba A, De León E, Cohen JE. Global approaches to regulating electronic cigarettes. Tob Control 2017;26:440-5.

Source of Support: Nil. **Conflicts of Interest:** The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.