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A cross-sectional study of the prevalence of electronic cigarette use, knowledge and attitudes among Saudi youth

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ABSTRACT

Background: E-cigarettes are a lithium-ion battery device that delivers nicotine via inhaled vapor. There are misconceptions regarding the use of e-cigarettes, with many users unaware about the harmful effects of vaping. The knowledge and attitudes regarding the use of e-cigarettes needs to be studied to find ways and formulate policies to reduce its prevalence. We aim to study the prevalence of e-cigarettes among Saudi youth and document their knowledge and attitudes regarding the harmful effects of vaping. The study also correlated the attitudes and level of awareness with the educational level of the participants. *Methods:* It is a cross-sectional study conducted on 388 participants involving both the genders in September and October 2021 in Riyadh, KSA. Data was collected through systemically random sampling and analyzed using SPSS software. Graphs and tables were used to present data and suitable statistical tests of significance used for data analysis, p-value of < 0.05 or less was considered significant. *Results:* The use of E-Cigarettes was 60% with a high male prevalence rate. The use was less in post-graduate participants as compared to the lower educational level. Awareness level also correlated with the educational level with high level of awareness in the post graduate participants. *Conclusion:* Unfortunately, vaping is high among the youth and more so in males as compared to females. The level of education plays an important role in determining the use of e-cigarettes with high educational status demonstrating increased level of awareness of harmful effects amongst them.

Keywords: Electronic Cigarettes, Riyadh, Vapes, Saudi Youth.

1. INTRODUCTION

Electronic Nicotine Delivery Systems (ENDS) are novel battery-operated devices that vaporize a liquid mixture composed of nicotine, glycerin,

propylene glycol and additives (Qanash et al., 2019). Electronic cigarettes (E-cigarettes) are one of the most common forms of ENDS, which have become considerably popular worldwide, especially among young adults (Romijnders et al., 2018; Qutob et al., 2022). The e-cigarettes were developed to minimize the toxic effects of tobacco smoke while maintaining the desired actions of smoking a cigarette. The vapor produced by the device also provides a flavor and physical sensation mimicking tobacco smoke. The amount of nicotine delivered via these devices is variable; however, several studies have shown that they deliver less amount of nicotine as compared to conventional cigarettes (CC). Noticeably, trace amounts of numerous toxic substances like tobacco-specific nitrosamines, aldehydes, polycyclic aromatic hydrocarbons, etc. have been found in the vapors produced by these devices. Several survey responders said they started using e-cigarettes because of several misconceptions like being a less harmful, cheap and less addictive alternative to CC. Some started using these devices to look cool and modern and as an aid for smoking cessation. Studies have shown that e-cigarette use can cause many health risks and side effects like asthma, atherosclerosis, lung injury and increase in heart beats, blood pressure and an increased risk of cardiovascular abnormalities. Nausea, vomiting, irritation of the mouth and throat, eye dryness, headache, cough, chest pain and burn injuries were observed in users of these devices (Farsalinos and Polosa, 2014; Chen, 2013). Generally speaking, ECs have been utilized as alternatives to conventional cigarettes (CCs) or as tools to help smokers quit. Some studies claim that the EC helps people quit smoking cigarettes, while others critique it as a potentially harmful product on its own (Cho and Paik, 2016). CDC issued guidelines for medical professionals in late August on the lung damage brought on by e-cigarette or vaping device usage (Siegel et al., 2019). Through a multitude of mechanisms, including increased oxidative stress and promotion of a pro-inflammatory state, which results in both lipid oxidation and thrombogenesis, EC hasten atherosclerosis and cardiovascular disease? Additionally, EC raise catecholamine release and sympathetic nervous system activation, increasing the risk of ischemia and arrhythmias (Mac-Donald and Middlekauff, 2019). Worldwide, the prevalence of e-cigarettes use varies according to different countries. In the USA, almost 30% of young adults aged 20-28 years were using e-cigarettes. In another recent study from the USA, 19.6% and 4.7% of high school and middle school students reported current use of these devices. A prevalence of 23% in France, 14% in Qatar, around 22% in China, 33.4% in Russia, 55.6% Lithuania, 34.4% in Slovakia, 6.2% in Pakistan and wide-ranging prevalence levels from 10% to 27.2% in the Kingdom of Saudi Arabia (KSA) was observed in different studies (Kurdi et al., 2021). An allergic airway inflammation, decreased exhaled nitric oxide (FeNO) synthesis in the lungs, altered bronchial gene expression, risk of lung cancer, burn injuries, upper respiratory tract irritation, dry cough, dryness of the eyes and mucous membrane and release of cytokines and pro-inflammatory mediators are all possible side effects of EC (Meo and Al-Asiri, 2014). Few studies have been done in the Kingdom of Saudi Arabia regarding prevalence, knowledge and attitudes of E-cigarettes use among Saudi youth. Peer pressure, curiosity and family members who smoke were important factors promoting e-cigarette use among Saudi youth. Advertisements and social media platforms were an important source of knowledge regarding e-cigarettes for the Saudi youth. The misconception that e-cigarette use helps to quit smoking was one of the important reasons mentioned by several users of these devices. The current paper highlight the prevalence, gender differences and awareness VIS A VIS educational qualification towards e-cigarettes use among young adults in the Kingdom in the year 2021. We aim to provide public health professionals and policy makers an overview so that they can intensify the dissemination of e-cigarettes related health information via media and social platforms, particularly targeting the less educated males and removing misconceptions surrounding the use of these devices through a sustained media campaign directed at all the age groups and organizing awareness programs beginning from the secondary school level.

2. METHODS

The study was conducted after the approval by the Institutional Review Board (IRB) and the ethical committee of the Almaarefa University in September and October 2021 in Riyadh, KSA. A Google form questionnaire was sent via emails and publicized in social media applications targeting young Saudi males and females. The cross-sectional study was completed anonymously and voluntary by 388 respondents. The study assessed the prevalence of e-cigarettes use, knowledge about the harmful effects of e-cigarettes; and attitudes among the Saudi youth. The use of e-cigarettes was correlated with the educational level of the participants.

Data collection method

The participants were asked about their age, gender, educational status and occupation. The questionnaire was developed based on previous surveys done of Saudi youth and young populations across the Middle East and elsewhere in the world.

Survey questionnaire

The participants were sent an anonymous questionnaire Google forms by emails and publicized in social media applications in the English language. They were asked the use of electronic cigarettes within the last 6 months and if their answer was in affirmative, they were asked about their attitudes and knowledge related to the harmful effects of e-cigarettes.

Statistical analysis

The data collection tool was a pretested, pre-coded self-administered questionnaire developed specially for the purpose of this study after consulting literature and epidemiologist. The data was cleared, coded and entered using the Statistical Package for the Social Sciences (SPSS). The results were presented in tables as frequencies and percentages. Graphs were also being used to present data. Suitable statistical tests of significance were used for data analysis. A p-value of 0.05 or less has been considered significant. The privacy of the participants is a priority, all information collected from them after their permission.

3. RESULTS

The study questionnaires were completed by 388 participants. Ever users of E-Cigarettes consisted of 60.3% of participants. Amongst them 14.5% are under the age of 20 years, 71.4% were in ages of 20 to 24 and 14.1% were of 25 or above in age. This difference in the proportion of E-Cigarettes user by age was statistically significant (p=0.0571) (Table 1, Figure 1).

Table 1 The age distribution of users and non-users of E-cigarettes amongst the youth of KSA

Age	Electronic Cigarettes		Total
	Ever-User	Non-user	
<20	34 (14.5%)	37 (24%)	71 (18%)
20-24	167 (71.4%)	96 (62.3)	263 (68%)
≥25	33 (14.1%)	21 (13.6%)	54 (14%)
Total	234 (60.3%)	154 (39.7%)	388 (100%)

P value=0.05

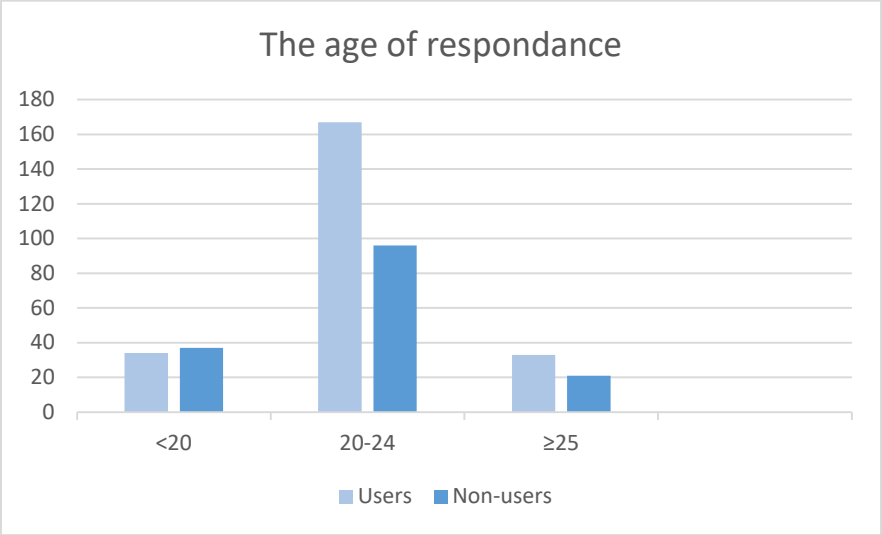

Figure 1 The age distribution of users and non-users of E-cigarettes amongst the youth of KSA

Table 2 Correlation between using E-Cigarettes and gender

Gender	Electronic Cigarettes		Total
	Ever-User	Non-user	
Male	201 (65%)	110 (35%)	311 (80%)
Female	33 (43%)	44 (57%)	77 (20%)
Total	234 (60%)	154 (40%)	388 (100%)

P value=0.000

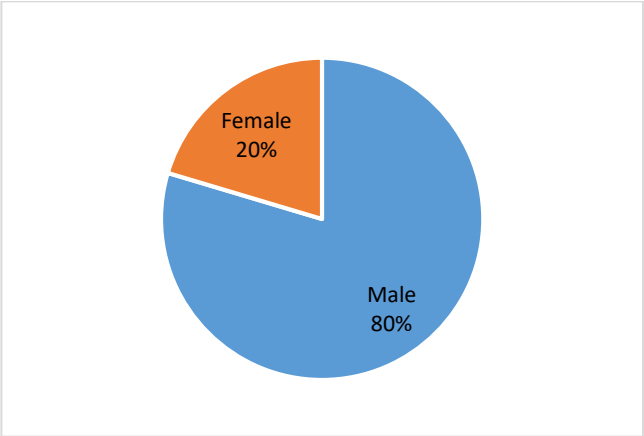

Figure 2 Correlation between using E-Cigarettes and gender

E-Cigarettes use was more prevalent in males with 65% as compared to females which was 43% indicating a strong association of male gender with tendency to vape. This difference in the proportion of E-Cigarettes user by gender was statistically significant (p = 0.0005) (Table 2, Figure 2).

Table 3 Correlation between using E-Cigarettes and level of education

Education	Electronic Cigarettes		Total
	Ever-User	Non-user	
Secondary and below	34 (48%)	37 (52%)	71 (18%)
College	196 (65%)	106 (35%)	302 (78%)
Postgraduate	4 (27%)	11 (73%)	15 (4%)
Total	234 (60%)	154 (40%)	388 (100%)

P value=0.000

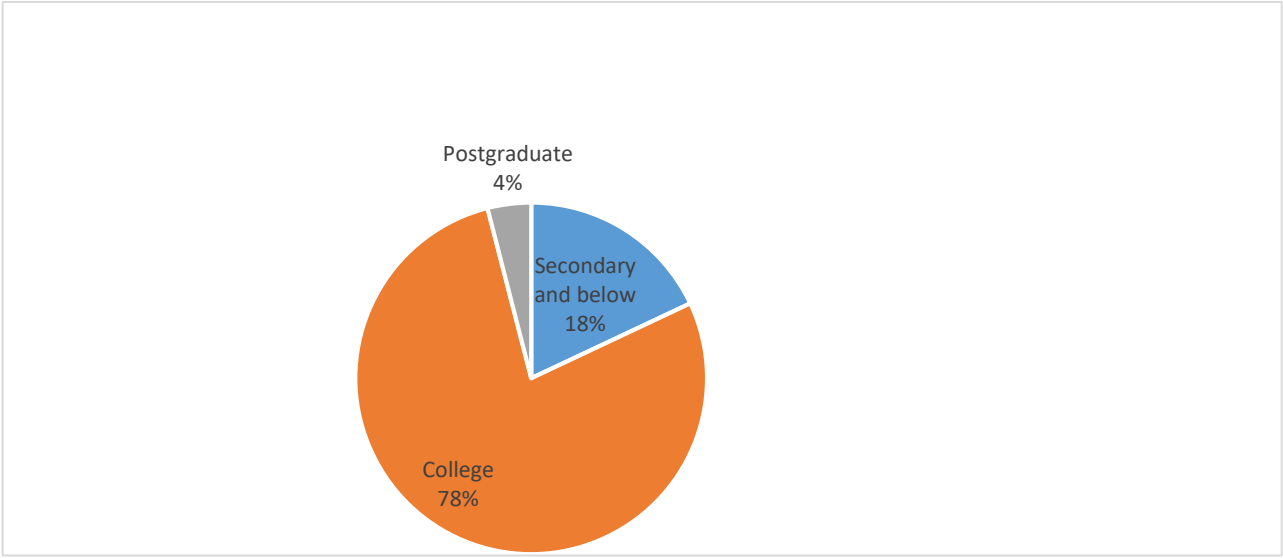

Figure 3 Correlation between using E-Cigarettes and Level of Education

Tendency to vape was more prevalent among college student (65%) and participants who were in secondary level and below (48%) as compared to postgraduate participants (27%) (Table 3, Figure 3).

The level of awareness regarding the harmful effects of vaping was high (43%) amongst the participants in this study. The distribution of awareness among college students was 50%, in secondary level it was 40% whereas in postgraduate level it was 7%. The difference in awareness regarding the educational level was statistically significant (p = 0.0104) (Table 4).

Table 4 The relationship between awareness and level of education regarding E-cigarettes

Education	Awareness			Total
	Excellent	Moderate	Bad	
Illiterate	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Elementary	0 (0%)	1 (100%)	0 (0%)	1 (0.25%)
Intermediate	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Secondary	28 (40%)	42 (60%)	0 (0%)	70 (18%)
College	137 (45.5%)	164 (54%)	1 (0.5%)	301 (78%)
Postgraduate	1 (7%)	14 (93%)	0 (0%)	15 (4%)
Total	166 (43%)	221 (57%)	1 (0.25%)	388 (100%)

P value=0.010

Table 5 The relationship between awareness and age regarding E-cigarettes

Age	Awareness			Total
	Excellent	Moderate	Bad	
<20	34 (48%)	37 (52%)	0 (0%)	71 (18%)
20-24	116 (44%)	147 (56%)	0 (0%)	263 (68%)
≥ 25	16 (30%)	37 (68.5%)	1 (2%)	54 (14%)
Total	166 (43%)	221 (57%)	1 (0.25%)	388 (100%)

P value=0.010

The level of awareness with respect to the age showed that people under 20 years had a moderate level of awareness (52%); whereas same level of awareness amongst 20-25 years old were 55.8% and for the other age range it was 70%. This difference in the proportion of E-Cigarettes user by age was statistically significant (Table 5).

4. DISCUSSION

In our study conducted in Riyadh, KSA in the prevalence of e-cigarettes users was 65% among young population in KSA which was quite high as compared to the previous studies conducted in the KSA and elsewhere in the world. The studies conducted at Qassim University, Al Faisal University, Jeddah, KSA reported a prevalence of 10%, 12.2% and 14% respectively (Kurdi et al., 2021). Three other Universities in KSA reported a prevalence of 27.7%, 25% and 21%. One of the reasons for the higher prevalence in our study may be because our study included youth which were illiterate to PhD students and studies conducted by Qassim and Al-Faisal university included only medical students which may have more knowledge about the harmful effects of e-cigarettes use as compared to the students from the other faculties (Almutham et al., 2019; Habib et al., 2020). In the USA, almost 30% of young adults aged 20-28 years were using e-cigarettes. In another recent study from the USA, 19.6% and 4.7% of high school and middle school students reported current use of these devices. A prevalence of 23% in France, 14% in Qatar, around 24.45% in China, 33.4% in Russia, 55.6% Lithuania, 34.4% in Slovakia, 6.2% in Pakistan. The prevalence in our study was high as compared to all these studies might be because of the inclusion of ex-e-cigarettes users in our study; however, we still think that our figures indicate an alarming rise in the use of e-cigarette users. We suspect that the rise in the users might be because of peers. We observed that the people with a higher level of education show a lesser prevalence of e-cigarettes use as they are more aware of the harmful effects of these devices. Taking these findings into consideration, we suggest that the information regarding the harmful effects and misconceptions regarding e-cigarettes should be directed towards the lesser-educated masses as they are more vulnerable to try and use them. To the best of our knowledge, this is the first study from KSA that correlated awareness of e-cigarettes uses with the educational level of the respondents. In our study, 43% of respondents had a significantly high level of awareness with regard to the harmful effects of e-cigarettes on health as compared to the traditional cigarettes which were almost the same as compared to the study conducted by Qatar University in which 41.9% of students showed marked awareness.

5. CONCLUSION

Unfortunately, vaping is high among the youth and more so in males as compared to females. The level of education plays an important role in determining the use of e-cigarettes with high educational status demonstrating increased level of awareness of harmful effects amongst them.

Ethical Considerations

The ethical approval of the Institutional Review Board (IRB07-27042022-39) in Almaarefa University, College of Medicine was fulfilled before the start of the data collection. The aim of this study was clarified to the participants of this study and the data was kept confidential.

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Authors' contribution

All authors had substantial contribution to the paper, AA and SA and TMA designed the study and prepared the proposal. FA and MA analyzed and interpreted data. ES and MSA and MA wrote results and discussion. ABH and AFM checked the paper from plagiarism and did proofreading. WAK checked and revised every step of this paper. All authors critically reviewed and approved the final draft and are responsible for the content and similarity index of the manuscript.

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Conflict of interest: The authors declare that there is no conflict of interests.

Data and materials availability

All data sets collected during this study are available upon reasonable request from the corresponding author.

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