

KNOWLEDGE AND PERCEPTION OF VAPING HEALTH RISKS AMONG ADULTS IN JEDDAH, SAUDI ARABIARasha Hegazy^{1*}, Randa ALGhoraibi², Rawan Aljedaani², Lama AlShangiti², Ghadi Al-Ghamdi²¹Department of Physical Therapy Faculty of Medical Rehabilitation Sciences, King Abdul-Aziz University, Saudi Arabia; ²Department of Respiratory Therapy, Faculty of Medical Rehabilitation Sciences, King Abdul-Aziz University, Saudi Arabia**Abstract****Background:** E-cigarettes are becoming increasingly popular among teenagers and young adults throughout the world. It is generally a battery-operated gadget to deliver nicotine, taste, and additional substances.**Objectives:** The main objective of this study is to investigate the level of awareness and perception of electronic cigarette health risks among adult residents in Jeddah, Saudi Arabia.**Method:** A cross-sectional study aimed to understand the level of awareness and perception of adults aged between 18 to 45 in Jeddah, Saudi Arabia, about e-cigarettes through an online survey. The questions assessed their knowledge and understanding in terms of the safety and health issues of e-cigarettes.**Results:** Out of 624 targeted respondents, 426 fulfilled the inclusion criteria and filled the questionnaire producing a response rate of 68.3%. The findings revealed that a majority of respondents (77.5%) reported personal acquaintance with individuals who vape. Moreover, 59.2% expressed the belief that vaping is not safer than regular cigarettes and tobacco products. Concerns about the presence of dangerous chemical substances in electronic cigarettes were shared by 69.0% of participants. Additionally, 82.9% believed that the flavors used in electronic cigarettes are harmful. Notably, a high percentage (95.1%) of respondents expressed the view that exposing children to electronic cigarette vaping is unsafe. Concerning secondhand exposure, 78.6% believed that exposing nonsmokers to electronic cigarette vaping can cause harm. Furthermore, a substantial majority (85%) considered vaping to be unsafe for pregnant women compared to tobacco cigarettes. Lastly, 63.5% did not perceive vaping as a safer alternative to nicotine patches or gums.**Conclusion:** Our research reveals that the majority of participants in Jeddah are acquainted with individuals who vape. While most respondents are aware of the health risks associated with vaping, some have doubts regarding these risks. Therefore, we recommend increasing awareness campaigns to educate the population about the potential hazards of vaping.**Keywords:** Awareness. Vaping. Smoking. Saudi Arabia

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Background

Herbert A. Gilbert filed a U.S. patent application in 1963 that had an early prototype of the modern e-cigarette and received its patent in August 1965. The application aimed to create a "smokeless nontobacco cigarette," intending to offer "a safe and harmless means for and method of smoking" by substituting heated, moist, flavorful air for burning tobacco and paper. The flavor components would be heated without combustion using a battery-operated heating element (Gilbert 1965). Another early noncombustible product marketed as a substitute for tobacco products containing nicotine was the Favor cigarette, which debuted in 1986 (United Press International 1986; Ling and Glantz 2005).

Electronic cigarettes, also known as E-cigarettes (ECs), are vaping devices powered by lithium-ion batteries (Hutzler C et al., 2014). It is made up of a heating element, a power source, and a tank or cartridge that holds an "e-liquid" made of glycerol and propylene glycol and contains flavors and nicotine (Kumar PS et al., 2019). While certain electronic cigarette brands may not have nicotine in them (Hutzler C et al., 2014), the majority produce vapor that contains nicotine ranging from 4-20 mg per puff, as well as flavors like propylene glycol and glycerin (Staudt MR et al., 2018).

According to a study conducted by (Besaratina et al. in 2021), the Centers for Disease Control and Prevention (CDC), the United States Food and Drug Administration (FDA), state and local health departments, and other clinical and public health partners have been dealing with a nationwide outbreak of vaping-related severe lung illnesses, also known as "e-cig, or vaping, product use-associated lung injury (EVALI)". Another study (Tsai et al., 2020) discovered that continuous exposure to e-cigarette aerosols induced increased arterial stiffness, vascular endothelial alterations, enhanced angiogenesis, cardiorenal fibrosis, and atherosclerotic plaque development in animal models. E-cigarette aerosol inhalation also affects pulmonary physiology, including increased airway responsiveness, airway blockage, inflammation, and emphysema. Overall, these human investigations of acute and subacute e-cigarette exposure and usage demonstrate that vaping worsens asthma and COPD, induces pathological alterations in the small airways, and disrupts innate immunity in the lungs.

Materials

Surveys were made and collected using Google Forms. Data collection and analysis using Microsoft Excel 2016 and IBM SPSS software package version

25.0 (IBM Corp. Released 2017. IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp). Qualitative data were described using numbers and percentages. The Shapiro-Wilk test was used to verify the normality of distribution. Quantitative data were described using range (minimum and maximum), mean, standard deviation, median, and interquartile range (IQR). The significance of the obtained results was judged at the 5% level. The used test was the chi-square test for categorical variables, to compare different groups for statistical analysis.

Method**Study design and participants**

This cross-sectional study aimed to understand the level of awareness and perception

of adults in Jeddah, Saudi Arabia, about e-cigarettes. Responses to online survey posts on Google Forms will be collected. The study's participants' voluntary involvement is protected by our assurance of their privacy.

Procedure

In the self-administered online survey, we utilized 11 questions. For each question, the answers ranged from 2 to 3. We adopted a random sample method to get a more scientific result to represent the study's whole targeted population. The questionnaire was made publicly online on a Google form and disseminated around the area via social media platforms. Then, we gathered information and conducted an analysis to provide numerical statistics about e-cigarettes. We asked the participants if indoor vaping should be outlawed. Further questions regarding the subjects' knowledge of vaping safety included: Do subjects believe e-cigarettes are safer than nicotine patches and gums, do they believe e-cigarettes are safer than regular cigarettes and tobacco products, do they believe e-cigarettes are approved by the Saudi FDA, do e-cigarettes generate only water vapor. Then we asked the participants if e-cigarettes contain harmful substances like nicotine, carboxylates, metals, and volatile organic materials in addition to small particles, whether the flavors and preservatives used in electronic cigarettes are hazardous, is exposing children to vaping is safe or not, can a child swallowing nicotine solutions from cartridges result in death, can indoor vaping harm non-smokers in the same surroundings as smokers and whether vaping is a better option for pregnant women than smoking tobacco. Particular questions about the use of e-cigarettes were asked. Finally, the survey contained demographic

questions about nationality, gender, age, highest academic degree obtained, employment, and income.

Validation

To validate the questionnaire, questions were translated into Arabic and validated by an expert. Also, a pilot study was done, which included 43 participants selected randomly. The data were then analyzed by SPSS using a reliability test which showed an overall Cronbach's alpha of 0.778. The test showed acceptable reliability of the questionnaire.

Measures we used statistical package for the social sciences (SPSS) to measure

- The percentage of people aware of and use e-cigarettes
- The percentage of people who stopped traditional smoking after switching to vaping,
- The percentage of people who started traditional smoking after vaping

Outcome variables

- The Perception, knowledge, and awareness of the population on e-cigarettes
- The percentage of e-cigarette usage among the population.
- The percentage of people who vape led to quit or start traditional smoking.

Results

This cross-sectional study was carried out on adults between the ages of 18 and 45 in Jeddah. Out of 624 targeted respondents, only 426 fulfilled the inclusion criteria and filled the questionnaire producing a response rate of 68.3% (Table 1).

Discussion

We found that the majority of the participants (63.4%) disagreed and answered "No" to the question if they believed that vaping is a safer option than nicotine patches or nicotine gum, and this is in accordance with the results of (Alfaraj et al., 2019) research, where the majority (53.8%) answered "No" as well.

When asked if the participants believed that electronic cigarette usage is authorized by the Saudi Food & Drug Administration (SFDA), the majority of 44.1% answered with "No", this is in accordance with the study by (Alfaraj et al., 2019) research. Where the majority (49.9%) answered "No" as well.

In our study, we asked if electronic cigarettes just emit water vapor. And we found that 66.9% out of 426 between the ages of 18-45 said that not only water vapor is emitted from e-cigarettes. Similar to the study done by (Alfaraj et al., 2019) they found 54.1% out of 1080 answered no.

In our study, we found that 59.2% believed that vaping was not safer than regular cigarettes and tobacco products. This contradicts a study done by (Abou-Elkher et al., 2016) that showed more than one-third (41.6%) of respondents who are familiar with e-cigarettes think they can help smokers quit, while 31.9% think they are less dangerous than regular cigarettes and 5.6% don't think they're harmful at all. This difference may be because electronic cigarettes are promoted in their country as safer products than traditional cigarettes and as smoking cessation devices.

In our research, we found that 69% believed that in addition to small particles, e-cigarettes include hazardous chemicals which means nicotine, carboxylates, metals, and volatile organic compounds, and 25% were not sure. According to a study done by (Alfaraj et al., 2019), they found that 46% out of 1080 said yes, there is dangerous content, and 35.6% were not sure.

In our study, we asked the participants if they believed that the flavors or preservatives used in electronic cigarettes were safe. And we found that 82.9% think the flavors or preservatives used in electronic cigarettes are dangerous. Similar to (Alfaraj et al., 2019) study, which found that 70.4% answered yes. Also, a similar finding in a study done by (Aghar et al., 2020) showed that the flavorings and chemicals included in the e-cigarette aerosol are dangerous, according to 62% of the participants.

In our study, we found that 95.1% of the respondents believed that it is unsafe to expose children to electronic cigarettes. In a similar study done by (Alfaraj et al., 2019), 90.6% believed it is unsafe. Also, (Peterson et al., 2017) study supports our findings as it shows that children can suffer several deleterious impacts from passive cigarette smoke exposure. Moreover, according to (Peterson et al., 2017) smoking during pregnancy has a negative effect on a child's ability to breathe, grow their heart, brain, and lungs, and increases their chance of developing obesity, behavioral issues, and cardiovascular disease as adults.

Table 1: Number and percentage distribution of participants regarding safety and health issues of electronic cigarettes.

	No	%
Do you believe that vaping is a safer option than nicotine patches or nicotine gum?		
No	270	63.4%
Yes	33	7.7%
Not Sure	123	28.9%
	No	%
Do you believe that electronic cigarette usage is authorized by the Saudi Food and Drug Administration (SFDA)?		
No	188	44.1%
Yes	82	19.2%
Not Sure	156	36.6%
	No	%
Only water vapor is emitted from electronic cigarettes		
False	285	66.9%
True	31	7.3%
Not Sure	110	25.8%
	No	%
Do you believe that vaping is safer than regular cigarettes and tobacco products?		
No	252	59.2%
Yes	121	28.4%
Not Sure	53	12.4%
	No	%
Vaping/electronic cigarettes contain dangerous chemical substances like nicotine, carboxylates, metals, volatile organic materials in addition to small particles		
False	21	4.9%
True	294	69.0%
Not Sure	111	26.1%
	No	%
Do you believe that preservatives or flavors used in electronic cigarettes are not harmful		
No	353	82.9%
Yes	25	5.9%
Not Sure	48	11.3%
	No	%
Do you believe that exposing children to electronic cigarettes vape is safe?		
No	405	95.1%
Yes	11	2.6%
Not Sure	10	2.3%
	No	%
Do you believe that nicotine solutions in cartridges can cause death		
No	31	7.3%
Yes	226	53.1%
Not Sure	169	39.7%
	No	%
Is vaping indoors causes harm to nonsmokers within the same environment (secondhand smoking) in case of exposure to the aerosol emitted from electronic cigarettes?		
No	39	9.2%
Yes	335	78.6%
Not Sure	52	12.2%
	No	%
Do you consider vaping safer for a pregnant woman than traditional tobacco cigarettes?		
No	362	85.0%
Yes	24	5.6%
Not Sure	40	9.4%
	No	%
Do any of your family members or friends vapes		
No	96	22.5%
Yes	330	77.5%

We asked the participants if nicotine solutions in cartridges could cause death. We found that 53.1% believed that nicotine solutions in cartridges could cause death, and 39.7% were not sure. In a similar study done by (Chen et al., 2015), it was shown that ingestion of e-liquid can be fatal. A 24-year-old lady intentionally consumed up to 3000 mg of liquid nicotine intended for e-cigarette use. After about 10 minutes of cardiopulmonary resuscitation, she was discovered with pulseless electrical activity and returned to spontaneous circulation (ROSC) with a pulse rate of 106 beats per minute and a blood pressure of 74/53 mmHg. She had active supportive care, but she finally passed away. Also, a similar study done by (Seo et al., 2016) showed that e-cigarette usage is rising with little knowledge of the dangers of liquid nicotine. Despite the best efforts of doctors, they were unable to prevent the child's hypoxic brain injury from becoming deadly and irreparable.

In our research, we found that 78.6% said due to exposure to the aerosol released by electronic cigarettes when vaping inside, it is harmful to nonsmokers present in the same space. In a similar study done by (Alfaraj et al., 2019) when they asked the participants if aerosol emitted from e-cigarettes could be harmful to non-smokers, about 69.3% thought it was harmful. Also, another study supports our participants' beliefs, and it was done by (Schober et al., 2014). The outcome of this study demonstrates that they assessed the concentrations of e-cigarette pollutants in indoor air and tracked their impact on FeNO release and the individuals' urine metabolite profiles. They discovered that FeNO levels had risen in 7 out of 9 people. These findings demonstrate that e-cigarettes do emit certain contaminants, some of which may be harmful to the health of both users and bystanders. E-cigarettes and nicotine liquids should be formally controlled and labeled with suitable warnings of any potential health consequences, notably toxicity risk in youngsters, in consideration of consumer safety.

Most of the participants (85%) expressed doubt regarding the safety of vaping as a substitute for traditional cigarettes for pregnant women. Similar to the findings of (Aghar et al., 2020) that showed about 89.5% out of 352 participants believe that E-cigarettes are not suitable for pregnant women. Also, our findings were in line with the findings of (Alfaraj et al., 2019). In contrast, (Wagner et al., 2017) found that 64.27% of 445 pregnant women believed that electronic cigarette is a safe alternative for pregnant females. These beliefs may originate from advertising E-cigarettes as it is a safe and good option in comparison to traditional tobacco cigarettes.

Conclusion

In summary, our research reveals that a significant majority of participants in Jeddah are acquainted with individuals who vape. While most respondents are aware of the health risks associated with vaping, a portion of them doubt these risks. We recommend increasing awareness campaigns to educate the population about the potential hazards of vaping.

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