



E-cigarettes in the Middle East: The known, unknown, and what needs to be known next

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ABSTRACT

The prevalence of electronic cigarettes (e-cigarettes) is increasing globally. Population-level data from several nations suggest that a higher proportion of youth and young adults are using e-cigarettes compared to the general population. Though significant work has been done in Western countries to better understand various aspects of e-cigarette use among youth and young adults, there is limited evidence about this phenomenon in Middle Eastern countries. This commentary summarizes the known aspects of youth and young adult e-cigarette use and the limitations of the evidence in the Middle East. Specifically, the limitations of the current literature indicate an overreliance on university-based samples, the overuse of non-user samples, a lack of studies on behaviour change, high variance in existing data, and a lack of uniform instruments to measure e-cigarette use. Lending from findings in other regions, we identify how these limitations should be addressed through future research to fill knowledge gaps in the Middle East.

1. Background

Electronic cigarettes, or e-cigarettes, became widely available in the last decade with an estimated number of 58.1 million users in 2018 and 68 million in 2020 worldwide (Jerzyński et al., 2021). For youth (ages 12–16) specifically, the global prevalence of past-30-day use is 9.8 % (Sun et al., 2022). Prevalence of current e-cigarette use varies from one country to another, but similarly suggest low prevalence overall and higher prevalence among youth and young adults than the general population: 5.1 % overall in the United States in 2020 (11.9 % among the 18–24 year old subpopulation) (Boakye et al., 2022), 0.9 % overall in China in 2018 (1.5 % among the 15–24 year old subpopulation) (Xiao et al., 2022), and 2.9 % overall in Canada in 2017 (6.3 % among the 15–19 year subpopulation) (Health Canada, 2019). Concerningly, youth e-cigarette prevalence is especially high (e.g. 14.1 % of 15–17 year olds in the U.S.; FDA and Centers for Disease Control and Prevention, 2022).

Estimates of current use in the Middle East are mostly derived from university samples. For instance, a study of students from three universities in the United Arab Emirates found that 23 % of students reported current e-cigarette use (Abbasi et al., 2022). Another study of health science students in Saudi Arabia found that 27.7 % of the sample were current users (Qanash et al., 2019). A third study with Qatar

University students found that 14 % of the students used e-cigarettes (Kurdi et al., 2021). A smaller number of studies in the Middle East provide national estimates of current e-cigarette prevalence. For example, one national study in Jordan reported current e-cigarette use among adults to be 11.7 % (Abdel-Qader & Al Meslamani, 2021).

Aside from university-based samples, the Global Adult Tobacco Survey (GATS; Global Adult Tobacco Survey Collaborative Group, 2020) provides national estimates of e-cigarette prevalence. However, the survey has not been consistently published across the region and all, with the exception of Saudi Arabia, do not have national-level prevalence data. For instance, Jordan has not had a national survey on tobacco in the last 5 years. Though Egypt, United Arab Emirates, Bahrain, and Lebanon had their last survey in 2020, they did not include data on e-cigarettes (World Health Organization, 2021). Saudi Arabia conducted its last survey in 2019 showing low prevalence of current use (3.1 %, World Health Organization, 2020), which is a stark difference from the prevalence of 27.7 % in a university-based sample (Qanash et al., 2019). This difference suggests e-cigarette use is much higher among university populations and the national survey is likely an underestimation of e-cigarette prevalence because the GATS 2020 questionnaire considers e-cigarette users as tobacco users (Global Adult Tobacco Survey Collaborative Group, 2020). Therefore, if a person answers no to tobacco use,

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then there is no chance of reporting them as an e-cigarette user through GATS. Further, the title of the survey and the consent form do not allude to e-cigarette use.

1.1. How are e-cigarettes legislated in the Middle East?

There are differences in e-cigarettes legislation in the Middle East. In Qatar, it is illegal to manufacture, sell, distribute, display, and import e-cigarettes (Campaign for Tobacco-Free Kids, 2022). In Jordan, sales and indoor use are permitted with restrictions: health warnings are mandated, store placement near education or healthcare facilities is prohibited, and advertisement (including social media advertisement) is banned (Campaign for Tobacco-Free Kids, 2022). In Saudi Arabia, retail sales of e-cigarette products is legal and their use is prohibited where tobacco use is prohibited with restrictions: health warnings are mandated, there are ingredient controls of nicotine concentration, and certain flavours or ingredients that are toxic or imply health benefits are not permitted. However, there are no restrictions on sponsorship, advertisement, or promotions (Campaign for Tobacco-Free Kids, 2022). Given the differences in the legislative environment in the Middle East, it is expected to find differences in beliefs, perceptions, attitudes, and awareness about e-cigarette users in the region.

1.2. What do we know about beliefs, perceptions, attitudes, and awareness about e-cigarettes outside the Middle East?

Most of the evidence on e-cigarettes originates predominantly from North America and Europe. Reasons for initiating use for youth and young adult e-cigarette users include availability (i.e., it's easy to find somewhere to purchase one), convenience, ability to use the product discretely, novelty, and curiosity (Kinnunen et al., 2016; Kong et al., 2015; Patel et al., 2016; Romijnders et al., 2018; Twyman et al., 2018). When it comes to the maintenance of use (continued use) among youth and young adults, experimentation, the enjoyable taste, entertainment value, as well as convenience are cited as common reasons (Evans-Polce et al., 2018). Top cited positive aspects of use in current youth and young adult e-cigarette users are experiencing a nicotine rush, enjoying positive social aspects of the behavior, and performing cloud tricks (Al-Hamdani et al., 2020). In addition, gender differences among e-cigarette users are known. For instance, males use e-cigarettes more frequently than females and male youth mostly appreciate nicotine rush as a positive aspect of e-cigarette use while female youth most appreciate tricks (Al-Hamdani et al., 2020; Wamamili et al., 2021).

Across the world, there are wide differences in awareness about e-cigarettes and data on this measure has been collected in different years, which makes comparisons among countries by awareness difficult (Gravelly et al., 2014). Nevertheless, awareness about the products has been generally high since 2013 in Europe and North America (Greenhill et al., 2016). Recent studies have focused on measuring awareness of popular brands, increased awareness among adolescents, and awareness of E-cigarette and Vaping Lung Injury (EVALI), where increased awareness is associated with reduced use and increased cessation (Kre-slake et al., 2022).

1.3. What do we know about beliefs, perceptions, attitudes, and awareness about e-cigarettes in the Middle East?

In the Middle East, studies have explored attitudes and beliefs of the public (including users) about e-cigarette products. All, with the exception of one, studied adults only while none examined youth and young adult e-cigarette use exclusively. The beliefs are mixed and sometimes in varying degrees depending on the study. The belief that e-cigarettes are a smoking cessation tool varied from 20.2 to 69.1 % (Abdel-Qader & Al Meslamani, 2021; Barakat et al., 2021; Dwedar et al., 2019), while the beliefs surrounding e-cigarettes as a reason for smoking initiation among never smokers range from 34.8 to 37.1 % (Barakat

et al., 2021; Dwedar et al., 2019). The beliefs supporting the addictive nature of e-cigarettes ranged from 33.5 % to 41.8 % (Abdel-Qader & Al Meslamani, 2021; Barakat et al., 2021). With respect to beliefs that e-cigarettes are a public health concern, agreements ranged from 36 % to 60.8 % (Barakat et al., 2021; Dwedar et al., 2019) and support for regulating e-cigarette use in public ranged from 41.6 % to 60.5 % (Abdel-Qader & Al Meslamani, 2021; Barakat et al., 2021; Dwedar et al., 2019). The one study with youth in the Middle East surveyed both users and non-users who described e-cigarettes as cool, fun, and flavorful, and cited tricks (e.g., clouds) as an enjoyable aspect (Hammal & Finegan, 2016).

Few studies in the Middle East have examined awareness about the availability of the products, their harms, and tobacco use status of its users, all of which were conducted in recent years. For instance, a study of Saudi students found that 98.7 % heard about e-cigarettes and 91.5 % were aware of their potential harms, though awareness about the addictive potential of e-cigarettes was lower (62.4 %). Just under half of respondents were aware that e-cigarettes are used by individuals who are not tobacco smokers (Shehata et al., 2020). In addition, respondents report very low awareness (under 30 %) about e-cigarettes as a source of second hand nicotine (Aqeeli et al., 2022).

1.4. What is the relationship between e-cigarette use and cigarette smoking?

Adult e-cigarette users who are current smokers often cite their primary motivation for using e-cigarettes as a tool to quit smoking (Patel et al., 2016). There is mixed evidence on the effectiveness of e-cigarette use for smoking cessation. Studies that show some effectiveness of e-cigarettes as a smoking cessation tool tend to examine smokers with high nicotine dependence (Al-Hamdani & Manly, 2021). The potential benefits of e-cigarette use for quitting smoking have to be balanced with the potential for smoking initiation. The odds of smoking initiation are 3.25 times higher for e-cigarette users vs non-e-cigarette users, and odds of relapse are 2.87 times higher among former smokers who are e-cigarette users vs non-e-cigarette users (Baenziger et al., 2021). Further, the risks associated with e-cigarette use and smoking initiation among youth cannot be overlooked (Al-Hamdani & Manly, 2021). The fact that less than one-third of ex-smokers or current smokers who used e-cigarettes did so for smoking cessation and that more than half of adolescent e-cigarette users have no history of smoking cigarettes suggests a net disadvantage of e-cigarette use (Fulton et al., 2018; Health Canada, 2015). The higher odds of former smokers relapsing while using e-cigarettes compared to former smokers who are not using e-cigarettes further corroborates a caution against overstating the benefits of e-cigarettes for cessation (Baenziger et al., 2021).

1.5. What are the limitations and opportunities in the data from the Middle East?

Four main limitations are evidenced in the e-cigarette literature from the Middle East. Addressing these limitations will assist in better understanding the extent of e-cigarette use as well as the beliefs, perceptions, and attitudes that underlie use. Research that addresses these limitations will fill necessary knowledge gaps in the sphere of the global e-cigarette use literature.

1- *University based samples.* Most studies have focused on university student populations. There is a need for more national studies and studies examining e-cigarette beliefs, perceptions, and attitudes that underlie use—specifically among youth and young adults. There is evidence that these beliefs develop early and e-cigarette use is evident among youth younger than 18. Studying younger youth in the Middle East is essential to better understand the magnitude of e-cigarette use and the beliefs, perceptions, and attitudes that influence use among underage users. National studies are needed with

samples that extend beyond university students. GATS could be an avenue for national, multi-country data collection, but it needs to run consistently, even if on a biennial basis as in other countries (e.g., Canadian Student Tobacco, Alcohol and Drugs Survey in Canada; [Health Canada, 2019](#)). It may also require a title change and revisions to ask people whether they are an e-cigarette user without referring to them as tobacco users to better capture e-cigarette prevalence.

- 2- *Studies focused on non-users and absence of studies on behavior change.* Although public opinion is important to gain insights on regulating e-cigarettes, it is crucial to conduct studies exclusively with youth and young adult e-cigarette users in order to get uncompounded insights into beliefs, perceptions, and attitudes towards e-cigarettes and understand how they impact behavior. There is a need to examine e-cigarette use over time and to understand how it relates to smoking as an initiation factor or cessation factor. Therefore, three sets of studies are recommended in the Middle East. First, it is recommended to conduct studies on samples of e-cigarette users only to best understand their beliefs and attitudes towards e-cigarette use. Second, it is recommended to conduct longitudinal studies to identify the percentage of e-cigarette users who transition to smoking initiation. Third, it is equally important to test the effectiveness of e-cigarettes versus nicotine replacement therapy (or other comparatives) as cessation aids among cigarette smokers.
- 3- *Variance in existing data.* Some of the disagreement in beliefs surrounding e-cigarettes in the Middle East are likely a result of sample characteristics, such as cultural or legislative differences. There are likely cultural differences among Middle Eastern populations with respect to beliefs, but the magnitude of those differences is difficult to ascertain given the differences in legislation among the countries. Future studies in the Middle East should identify clusters of countries with similar legislation and test cultural differences with respect to e-cigarette use and beliefs within these clusters.
- 4- *Lack of uniform measures.* Although some studies in the Middle East explored similar topics, the authors used different measures of e-cigarette use. This presents an opportunity for measurement error when using measures that are not validated. Furthermore, the use of different measures complicates comparisons among various populations (e.g., university sample vs general population). Therefore, it is recommended to use standardized and validated measures in the Middle East by extracting some of the ones used in North American/European studies or validate measures and use them uniformly across the region.
- 5- *Lack of data on certain topics.* Although beliefs, attitudes, and harms have been studied in the Middle East, studies on the relationship between e-cigarettes and smoking are limited. Studies on e-cigarette liquid characteristics including nicotine concentration are also lacking. Future studies should address these unexplored topics to better understand them in the Middle East.

2. Conclusion

The Middle East, like other regions in the world, has a notable prevalence of e-cigarette use among youth and young adults. However, there are significant limitations to the evidence produced in Middle Eastern countries regarding this topic. To better understand e-cigarette use in a global context, specifically among youth and young adults, we outline recommendations for how future researchers might better address these limitations when studying populations in the Middle East. To do this, we referenced evidence in other regions and cited key knowledge gaps that should be made a priority among researchers. Specifically, there is an opportunity to fill important knowledge gaps in the global e-cigarette literature through improving the types of samples used, focusing more heavily on current users, and using uniform and validated measures to accurately assess characteristics of e-cigarette use that may be attributed to cultural or geographic differences. Expanding

the evidence base about e-cigarettes in the Middle East will provide a solid foundation for developing effective strategies to better address e-cigarette use among youth and young adults, where exposure to nicotine in these populations is known to be harmful.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

No data was used for the research described in the article.

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