

SHORT COMMUNICATION

Is vaping harmful to your body?: A short communication**Perada Kantakam^a, Peerapat Krittanan^a, Krit Jirakanwisal^b, Sirin Saranyutanon^{a*}**^a Faculty of Allied Health Sciences, Burapha University, Chonburi, Thailand^b Department of Pathology, The University of Texas Medical Branch, Galveston, TX, USA* Corresponding author: *sirin.sa@go.buu.ac.th*

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Abstract. The increasing use of electronic cigarettes (e-cigarettes) or vaping among youth and young adults has become a significant global public health concern. E-cigarettes, introduced as smoking cessation aids in 2007, have gained popularity due to their appealing flavors and perceived safety. However, evidence suggests that vaping can lead to serious lung injuries and other health issues due to hazardous chemicals. This review examines the prevalence of vaping, its health effects, and provides recommendations for users. E-cigarette use has surpassed traditional cigarette use among US youth, with a notable rise in vaping marijuana and CBD. In Asia, e-cigarette use has also increased significantly. Despite the absence of many toxins found in traditional cigarettes, vaping still poses health risks, including respiratory, cardiovascular, hepatic, renal, and oral diseases. The variability in contaminants and user behaviors complicates the assessment of e-cigarettes' negative effects. High vaping usage, particularly with nicotine, can lead to addiction and long-term health issues. Comprehensive research and policy regulation are essential to mitigate these risks and protect public health

Keywords: E-Cigarette, Epidemic, Teenager Health hazard, Vaping

1. Introduction

Recently, the use of electronic cigarettes (e-cigarettes) or vaping has increased popular among teenagers. Vaping usage has increasingly awareness as a global public health problem (Besaratina and Tommasi 2019). Vaping, the most widespread form of electronic nicotine delivery device is comparable to traditional cigarettes. The presence of nicotine in vaping devices and a highly addictive component, elucidates the widespread and enduring nature of smoking. Vaping/E-cigarettes are a category of innovative nicotine or tobacco products that

have experienced a swift surge in popularity in recent times (Hernandez-Perez et al. 2023). Nevertheless, there are other vaping designs that emulate the appearance of a pen or a USB port (Dinardo and Rome 2019). Moreover, it is not just the intake of nicotine that leads to addiction, but various studies have shown that nicotine-containing vaping or e-cigarettes with distinctive flavors have the capacity to strongly attract a significant proportion of adolescents (Zhu et al. 2014; Dube et al. 2023; Jones and Salzman 2020). For abovementioned, there are important convincing for initiated teenager and who have never previously smoked. In 2007, Vaping devices were first introduced to the US market to help for smoking cessation, have become popular because of their various flavors and lack of harmful health effects. However, there is progressively evidence that vaping may result in serious lung injuries because of the significant levels of hazardous chemicals (Dinardo and Rome 2019). Therefore, this short communication reviews prevalence of vaping, health effects and recommendations for e-cigarettes or vapes users. However, vaping usage is still debatable and controversial owing to the law regulation, the impact on user's health, and toxic chemical component in the device.

2. Prevalence of e-cigarette

Previously, vaping usage became more common among US youth than traditional cigarettes in 2014 (A Report of the Surgeon General 2016). E-Cigarette use, and vaping marijuana (cannabis) are popular among US adolescents. The compound in the cannabis plant is a Cannabidiol

(CBD) that significantly increased in use. In 2023, Hongying Daisy Dai and colleagues reported the prevalence of youths vaping CBD was high, especially e-cigarette users and Hispanic and sexual minority populations (Dai et al. 2023).

In Asia, the prevalence of e-cigarettes and vaping in India almost doubled, from 1.6 to 3.3 million between 2014 and 2019 (Azeem et al. 2022). Moreover, Thongsutt T et al. reported the result of undergraduate pharmacy students' knowledge and attitudes toward vaping use in Thailand via questionnaire study. Their data revealed that approximately 98.6% of the participants recognized vaping, however the individuals were unaware of and had misconceptions regarding the legal framework, harmful components in vaping vapor, and the potential for developing dependence (Thongsutt et al. 2023). Hence, a significant proportion of current generations that engage in vaping are concerned due to the controversial implications for their health.

3. Impact of vaping use on health

It is often believed that the lack of contaminants in vaping, except from nicotine, renders it a safer alternative for cigarette cessation (Oh and Kacker 2014). Nevertheless, several studies have been conducted to assess the safety and toxicity of vaping, employing both *in vivo* and *in vitro* approaches and revealed that vaping has the effect on human health and body system (Figure 1). One of the initial human studies examined nine volunteers who vaped with and without nicotine for two hours in a well-ventilated room. There were detectable levels of ultrafine particles made of propylene glycol (PG) in the lungs after using vaping, according to the results of this abrupt investigation. In addition, the study observed that vaping containing nicotine generated a rise of (Nitric Oxide) NO exhaled by users and induced substantial inflammation of the airways (Schober et al. 2014). In the latest research on humans, the researchers found that teenager mixed users (those who use both vaping and

traditional tobacco) had considerably greater quantities of metabolites of harmful substances such as benzene, ethylene oxide, acrylonitrile, acrolein, and acrylamide in their urine compared to adolescent vaping-only users. Additionally, vaping-only users had significantly elevated urine levels of hazardous metabolites like acrylonitrile, acrolein, propylene oxide, acrylamide, and crotonaldehyde in comparison to non-smokers, achieving as much as twice the registered values (Rubinstein et al. 2018). The abbreviation EVALI represents e-cigarette or vaping use-associated lung injury which is initially referred to be VAPI (vaping associated pulmonary disease). Vaping usage was immediately associated with this serious lung disease that developed rapidly. EVALI can induce an appearance of the symptoms including dyspnea, asthenia, and thoracic discomfort (Rebuli et al. 2023). Along with these findings, there have been reported that individuals who used vaping within 90 days may develop EVALI (Layden et al. 2020). The effects of vaping on the respiratory system have been studied in human and animal research. Vaping vapor could interfere with surfactant composition and function. In an animal model, the surfactant layer was disrupted, and gas exchange disturbances were induced by Propylene Glycol (PG), an organic solvent in vaping (Graham et al. 2022; Madison et al. 2019). A controlled experiment involving randomly selected individuals showed that inhaling vapor from vaping led to impaired gas exchange. This was evidenced by alterations in oxygen levels measured through the skin and decreased lung performance (Chaumont et al. 2019). Besides, vaping consumption has been shown to impair immune system activity, one study reported that introducing human alveolar macrophages (AMs) to e-cigarette/vaping extract raised levels of chemokines and inflammatory cytokines and may cause an inflammatory response of AMs in the lung (Scott et al. 2018). In the context of cardiovascular disease, the zebra fish model was used to assess the impact of vaping on health. Administering zebrafish

to nicotine only had no influence on heart function, whereas exposure to cigarette smoke or vaping aerosol resulted in more severe impairment. Cardiac contraction is powered by the sarcomere, which serves as the basic operational element. Sarcomeric genes including *MLC2v* and *MYL6* were downregulated in vaping aerosol-treated samples (Palpant et al. 2015). On top of that, detrimental impacts of vaping on the liver, renal, and oral system have been determined such as causing larger histological damage in rat liver, showing an increased cotinine and uric acid as well as mouth symptoms such as black tongue, oral mucosal sores, and blisters among vaping users (El Golli et al. 2016; Kim, Kim, and Kang 2021; Yao et al. 2017)

4. Future outlooks and conclusions

As of now, there is insufficient scientific or compelling data to support an advantageous consequence associated with the use of e-cigarettes or vaping. As time passes, vaping gadgets have undergone rapid development and gain popularity among teenagers. It is challenging to assess the negative effects of e-cigarettes due to the variability in contaminants and signs of illness based on fluid elements, gadget advancement, and user behavior. High vaping usage, especially with nicotine, can lead to nicotine reliance and addiction to tobacco or cigarette smoke, especially among adolescents. Epidemiological investigations

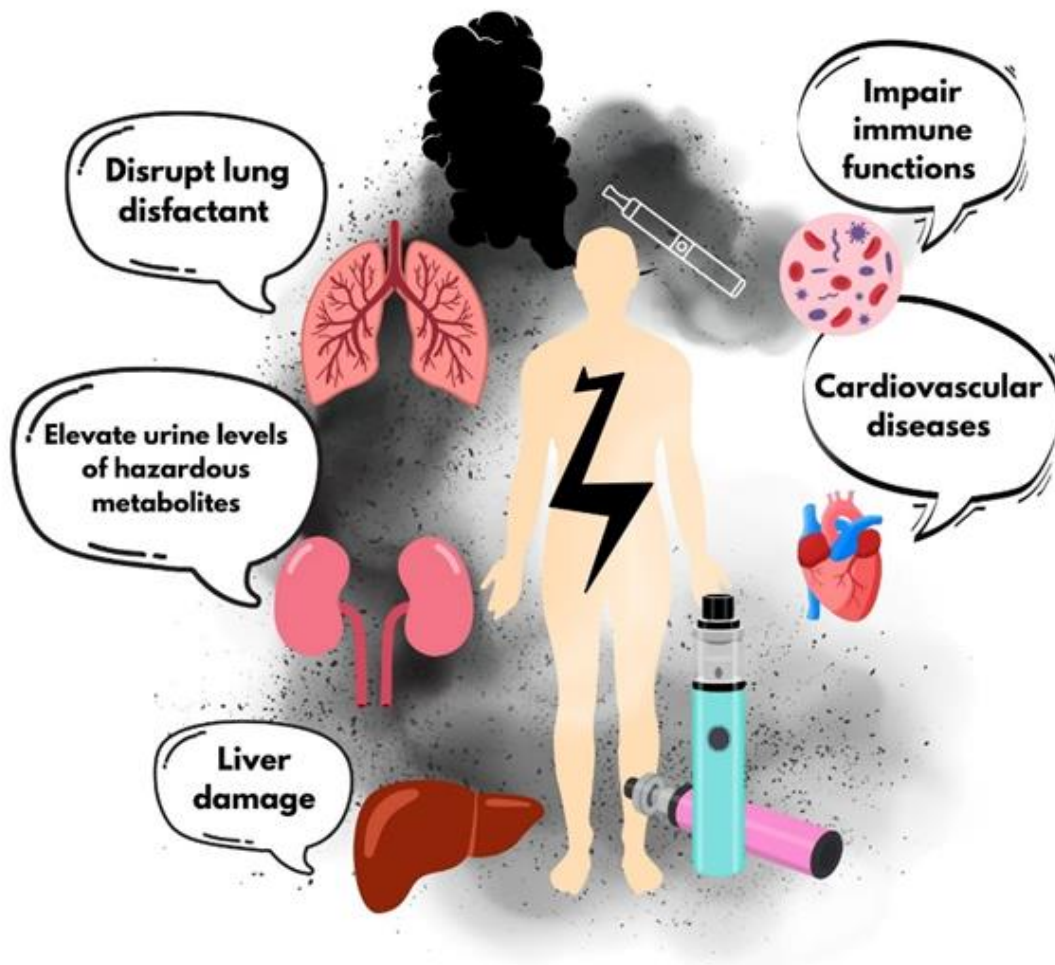


Figure 1: Effect of vaping on human body

Connect vaping/e-cigarette consumption to lung disease, whereas in vitro and in vivo studies indicate long-term respiratory health risks and impair immune functions, causing cardiovascular, hepatic, and oral diseases. However, the differences in results highlighted the necessity for broader studies that are more applicable to clinical practice. Most people who smoke cigarettes are also vaping, and the combination of these two forms of smoking has a more negative impact on health than consuming each product alone. To improve the health of present and future generations, research should take advantage of policy variability in vaping/e-cigarette regulation, including expedited tobacco control.

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