



# Lifestyle trends with major health implications Series 1: Vaping

## Introduction

This is a part of editorial series examining the current trends in lifestyle behaviors which have major health implications especially among the young. In this series-1 we look at the science behind vaping. “Vaping” is a common term used to denote the use of e-cigarettes, electronic nicotine delivery systems (ENDS), alternative nicotine delivery systems (ANDS), mods, vape pens, vaporizers, vapes etc. The tobacco epidemic is one of the biggest public health threats the world has ever faced, killing over 8 million people a year around the world. More than 7 million of those deaths are the result of direct tobacco use while around 1.3 million are the result of non-smokers being exposed to second-hand smoke. [1] For a century, manufacturers, scientists, entrepreneurs, and public health leaders have promoted or recommended product changes that might remove some of the harmful elements in cigarette smoke (2). E-cigarettes are among the latest products claiming to be a less harmful or safer alternative to heated tobacco and smoking tobacco. E cigarettes were developed to substitute conventional cigarettes and reduce the health implications among known users / adult smokers, but the rising trend of vaping among new users and especially the youth is matter of growing concern. E-cigarettes do not contain tobacco, but many of them contain nicotine, which comes from tobacco. Because of this, the Food and Drug Administration (FDA) USA classifies them as "tobacco products." E-cigarettes are now the most commonly used tobacco product among youth, surpassing conventional cigarettes. [2]

**E-Cigarettes:** People assume that the aerosol produced by e-cigarettes is vapor. The fact is that e-cigarettes produce an aerosol made up of tiny particles, which is different from vapor. E-cigarettes come in different shapes and sizes and there are many types of e-cigarettes, including disposable devices, refillable devices, and devices with pre-filled cartridges or pods as shown in **Figure-1**. Most devices / e-cigarettes are composed of a battery, a reservoir for holding a solution that typically contains nicotine, a heating element or an atomizer, and a mouthpiece through which the user

**Figure-1 Types of E-cigarettes**



(Source: Photo by Mandie Mills, CDC)

puffs in **Figure-2**. The device heats a liquid solution (often called e-liquid or e-juice) into an aerosol that is inhaled by the user. The aerosol which now contains nicotine and other substances is inhaled into the lungs and is absorbed into the blood stream. E-liquid typically uses propylene glycol and/or glycerin as a solvent for nicotine and flavoring chemicals. [2] Certain devices use e-liquids which contain VOCs (volatile organic compounds), heavy metals and chemicals like formaldehyde. [3]

## Types of E cigarettes


**Disposable e-cigarettes** come pre-filled and may be rechargeable. They are not designed to be refilled.

**Refillable e-cigarettes** are rechargeable and have a tank or chamber that is filled with e-liquid. Some refillable devices can be modified to change the amount of aerosol produced or the strength of the delivered substance.

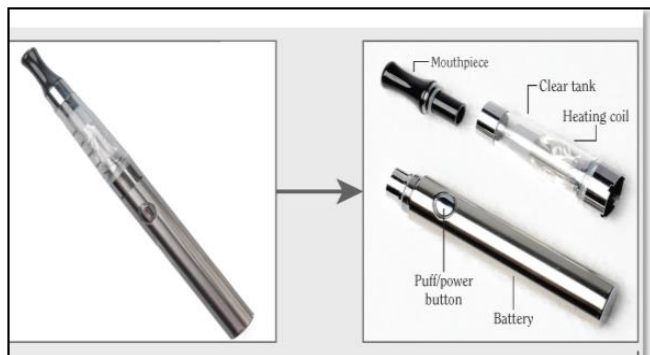
**E-cigarettes** with a pre-filled cartridge or pod are rechargeable and intended for reuse. [4]

One of the primary features of the more recent generation of devices is that they contain larger batteries and are capable of heating the liquid to a higher temperature, potentially releasing more nicotine, forming additional toxicants, and creating larger clouds of particulate matter. [5]

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**Figure 2: Vaping pen**



(Source: Photo by Mandie Mills, CDC)

### Are they safer than conventional cigarettes?

E-cigarette aerosol generally contains fewer harmful chemicals than the deadly mix of 7,000 chemicals in smoke from conventional cigarettes however, this does not make e-cigarettes safe. [6] Studies are still ongoing with regard to the long-term health effects of using e-cigarettes

### Health implications:

According to the WHO, nicotine which is the primary ingredient in these devices/ e cigarettes is highly addictive and harmful to health and nicotine exposure in pregnant women can adversely affect the development of the fetus. [7] Nicotine can harm the parts of an adolescent's brain that control attention, learning, mood, and impulse control. [2] Moreover, added implications come from the solvents, flavorants and other ingredients like VOCs volatile organic compounds, heavy metals and chemicals like formaldehyde which are toxic and carcinogenic.

Flavorings such as diacetyl, a chemical linked to a serious lung disease. Some flavorings used in e-cigarettes may be safe to eat but not to inhale. [4] Alarmingly most of these devices can be customized/ adulterated to deliver illegal drugs and substances. The mixing of primary active compounds with contaminants and/or pyrolysis of chemicals in the e-liquid (some of which are gases [e.g., ketene] and not easily measured in biologic samples [8] is likely to produce a chemical milieu with its own unique toxicity.

E-cigarette or vaping product use- associated Lung injury (**EVALI**) also called “vaping-associated pulmonary injury (**VAPI**)/ respiratory distress syndrome” (**VARDS**) for symptomatic vaping-exposed hypoxemic patients who also have abnormal chest imaging is a syndrome characterized by respiratory failure with an intense inflammatory response. Histopathologic features described in EVALI include OP (organising pneumonia), DAD (diffuse alveolar damage), acute eosinophilic pneumonia, diffuse alveolar haemorrhage, acute fibrinous pneumonitis with organisation, foamy or vacuolated macrophages, foamy or vacuolated pneumocytes, intra-alveolar fibrin, bronchi-olitis, bronchiolar mucosal ulceration, interstitial oedema, neutrophilic inflammation, chronic interstitial inflammation, pigmented macrophages. [8] EVALI should be

interstitial oedema, neutrophilic inflammation, chronic interstitial inflammation, pigmented macrophages. [8] EVALI should be suspected in patients with ALI (acute lung injury) who have a history of vaping or other use of e-cigarette-related products. Cancer risk and vaping: Some substances (heavy metals, formaldehyde etc.) found in e-cigarette vapor have been linked to an increased risk of cancer. [9] Burns and blast injuries have been reported due to malfunction of these devices, which is plausible given the temperature in these devices may reach up to 250° C.

Popcorn lung and vaping. "Popcorn lung," or bronchiolitis obliterans (BO), refers to a type of inflammation in the lungs that causes wheezing, coughing, and shortness of breath. It can lead to scarring of the lungs' tiny air sacs, along with thickening and narrowing of the airways. Diacetyl, found in many e-cigarette flavors, is one known cause for this condition. [9]

### Role of e-cigarettes in smoking cessation:

A Cochrane systematic review revealed that nicotine e-cigarettes can help people to stop smoking for at least six months. Further the review showed that they work better than nicotine replacement therapy, and probably better than e-cigarettes without nicotine and, may work better than no support, or behavioral support alone, and they may not be associated with serious unwanted effects. However, the authors were of the opinion that more evidence was needed, particularly about the effects of newer types of e-cigarettes that have better nicotine delivery than older types of e-cigarettes, as better nicotine delivery might help more people quit smoking. [10] A recent study in the NEJM found that the addition of e-cigarettes to standard smoking-cessation counseling resulted in greater abstinence from tobacco use among smokers than smoking-cessation counseling alone. [11]

The CDC, USA has stated that research is uncertain on whether e-cigarettes, in general, increase smoking cessation and further add that in order for adult smokers to achieve any meaningful health benefits from e-cigarettes, they would need to fully switch to e-cigarettes and stop smoking cigarettes and other tobacco products completely. The CDC also stated that the FDA has not approved e-cigarettes as a quit smoking aid, and more research is needed on whether e-cigarettes are effective for quitting smoking and to better understand the health effects of e-cigarettes. [12]

### Bottom line:

E-cigarettes are not safe for youth, young adults, pregnant women, and adults who do not currently use tobacco products. It is advisable to avoid vaping till more information is available. Consult a health care professional to understand the risks involved.

### What is needed?

1. Need for more research with regard to the short term and long-term health effects of using e-cigarettes.
2. Studies on the health effects of secondhand exposure to e-cigarettes.
3. Regulate the marketing and sale of e-cigarettes and ENDS.
4. Strictly prohibit the use of e-cigarettes and ENDS among children and young people.

5. Incorporate child resistant packaging and the inclusion of health warnings.
6. Prohibitions on adulterated and misbranded products.
7. E-cigarettes /ENDs to be made to medicines standard.
8. Regulation of nicotine levels in products.
9. Monitor trends in the use of e-cigarettes in children and young people, and how best to prevent experimentation and the slide to addiction.
10. Training in smoking cessation is essential across the healthcare system.
11. An informed approach should be adopted when discussing these devices. Advice should be conveyed in an evidence-based manner.
12. People should consult a doctor / certified health care personnel to make an informed decision or for any queries related to ENDs / e-cigarettes.

**Disclaimer:** This editorial is for informational purposes only. Tobacco & Nicotine products or related products are harmful to health and use of tobacco and/or nicotine products can cause serious diseases / conditions. The use of tobacco, nicotine products by individuals under the age of 18 (or 21 in some regions) is prohibited by law. Always consult a health care professional for advice related to tobacco or Nicotine products. The information provided here is not intended to promote or endorse any tobacco or Nicotine products. Please be aware of the legal implications and follow the laws in your region with regard to tobacco, nicotine and related products.

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