

Shock Study Finds E-Cigarettes May Raise Risk of Heart Failure

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STORY AT-A-GLANCE

- › Similar to smoking, using e-cigarettes, or vaping, is linked to an increased risk of heart failure
- › Those who had used e-cigarettes at any point in their lifetime were 19% more likely to develop heart failure compared to those who never had
- › Compared to nonsmokers, vapers are also more likely to have a heart attack or coronary artery disease
- › An epidemic of young people are also facing e-cigarette or vaping use-associated lung injury, known as EVALI, which can lead to hospitalization and death
- › E-cigarettes shouldn't be regarded as a tool to quit smoking, as they typically contain nicotine and are designed to get you to keep using them – much like cigarettes

It's a myth that electronic cigarettes (e-cigarettes) are safer for your health than regular cigarettes. Similar to smoking, using e-cigarettes, or vaping, at any point during your lifetime is linked to an increased risk of heart failure, according to research published by the American College of Cardiology.¹

It's a concerning finding for the 4.5% of U.S. adults – 11% among those aged 18 to 24 – who use the products.² Among high school and middle school students, cigarette use is at an all-time low. Instead, e-cigarettes – also known as vapes and vape pens – are the

most commonly used tobacco product, with more than 1 in 4 using them daily and 1 in 3 using them at least 20 of the last 30 days.³

Perhaps drawn in by their fruit and candy flavors — 9 out of 10 youth who vape use flavored e-cigarettes — or the misconception that they're safe, young people who use e-cigarettes could be setting themselves up for a lifetime of health problems.⁴

E-Cigarettes Increase Heart Failure Risk by 19%

Using health data from the National Institutes of Health, researchers tracked 175,667 people with an average age of 52 for 45 months. Those who had used e-cigarettes at any point in their lifetime were 19% more likely to develop heart failure compared to those who never had.

"More and more studies are linking e-cigarettes to harmful effects and finding that it might not be as safe as previously thought," Dr. Yakubu Bene-Alhasan, a physician at MedStar Health in Baltimore and the study's lead author, said in a statement. "The difference we saw was substantial. It's worth considering the consequences to your health, especially with regard to heart health."⁵

Heart failure is a chronic, progressive condition where the heart muscle is unable to pump enough blood to meet your body's needs for blood and oxygen. While the heart hasn't stopped working, its pumping power is weaker than normal or it is not able to fill with enough blood. The increased risk from vaping was statistically significant for heart failure with preserved ejection fraction (HFpEF) but not for heart failure with reduced ejection fraction (HFrEF).

Heart failure with preserved ejection fraction, or diastolic heart failure, occurs when the heart muscle contracts normally but the ventricles do not relax as they should during heart filling. In heart failure with reduced ejection fraction, also known as systolic heart failure, the heart muscle does not contract effectively, and the amount of blood pumped out to the body is less than normal.

Animal studies have also revealed that e-cigarette uses causes changes in the heart relevant to those that occur in heart failure. Previous human studies tied risk factors for heart failure development with vaping.

"I think this research is long overdue, especially considering how much e-cigarettes have gained traction," Bene-Alhasan said. "We don't want to wait too long to find out eventually that it might be harmful, and by that time a lot of harm might already have been done. With more research, we will get to uncover a lot more about the potential health consequences and improve the information out to the public."⁶

You're More Likely to Have a Heart Attack if You Vape

Bene-Alhasan described the featured study as "one of the most comprehensive studies" to evaluate the link between e-cigarettes and heart failure to date. However, research previously revealed that vaping also raises heart disease risk.⁷

The study, presented at the 2019 American College of Cardiology's Annual Scientific Session, found that adult e-cigarette smokers have a significantly higher risk of heart disease and mental health problems than nonsmokers, even after controlling for known risk factors such as body mass index and high blood pressure. Compared to nonsmokers, vapers were:⁸

- 34% more likely to have a heart attack
- 25% more likely to have coronary artery disease
- 55% more likely to suffer from depression or anxiety than nonsmokers with the same risk factors

Study author Dr. Mohinder Vindhyal, assistant professor at the University of Kansas School of Medicine Wichita, said in a news release:⁹

"When the risk of heart attack increases by as much as 55% among e-cigarettes users compared to nonsmokers, I wouldn't want any of my patients nor my family members to vape. When we dug deeper, we found that regardless of how

frequently someone uses e-cigarettes, daily or just on some days, they are still more likely to have a heart attack or coronary artery disease."

Further, according to the American College of Cardiology, e-cigarettes may be as harmful to the heart as smoking cigarettes. It noted, "Research showed that using either e-cigs or regular tobacco led to similar levels of stiffness in the aorta, the main artery in the heart. Both raised blood pressure."¹⁰

How Do E-Cigarettes Work?

E-cigarettes deliver nicotine, flavorings and other chemicals in the form of an aerosol, which users inhale. To mimic the act of smoking without burning tobacco, e-cigarettes contain a battery that powers up an atomizer — a heating element to vaporize the e-liquid.

E-liquid is the fluid that provides the flavor and, in many cases, the nicotine content of e-cigarettes. While most e-cigarettes contain nicotine, many young users said they weren't aware of this. JUUL e-cigarettes, which are shaped like a USB flash drive, may contain as much nicotine as 20 regular cigarettes in a single pod.¹¹

The e-liquid is held inside a cartridge, which may be refillable. Many e-cigarettes have a sensor that detects when a person takes a puff and activates the heater. Others have a manual switch that users must press to activate the device. When this occurs, the heat from the atomizer coil vaporizes the e-liquid in the cartridge, creating an aerosol, or "vapor."

The vapor is inhaled and exhaled, releasing the vapor into the air, which looks somewhat like smoke but is actually a mist of fine particles.

Toxic Compounds Are Common in Vapes

What exactly is in e-cigarette liquid and vapors? A review published in the journal *Life* outlined some of the toxic compounds in e-cigarettes and their potential consequences

to humans:¹²

Glycols – Propylene glycol and glycerol, also known as vegetable glycerin, are among the most common compounds in e-cigarette liquid. Propylene glycol typically makes up the base, which is then mixed with flavorings, coloring and other chemicals. When glycols are heated during vaping, they become oxidized and decompose, leading to toxic breakdown products that are inhaled.

A University of North Carolina study found that when propylene glycol and vegetable glycerin are inhaled via e-cigarettes, it led to decreased glucose transport and metabolism in airway cells. "We propose that repeated/chronic exposure to these agents are likely to contribute to airway damage in e-cigarette users," researchers explained.¹³

Nicotine – Nicotine was detected even in nicotine-free e-cigarettes. One inhale may expose users to up to 35 milligrams of the compound.

Metals – Multiple toxic metals are found in e-cigarette vapor, including lead, chromium, tin, silver, nickel, cadmium, aluminum and even mercury.

Tobacco-specific nitrosamines – These highly toxic compounds may be carcinogenic and are found in e-cigarettes that contain tobacco flavoring.

Carbonyls – These compounds, which include formaldehyde and acetaldehyde, are carcinogenic and, one study found, "detected in the vapors of almost all ECs."¹⁴

Volatile organic compounds (VOCs) – Benzene, styrene, ethylbenzene and toluene are examples of VOCs found in e-cigarettes. In addition to causing cancer, they can lead to headaches and damage to the liver, kidneys and central nervous system.

Phenols – Long-term exposure to phenols may lead to anorexia, liver damage, weight loss and diarrhea, while inhalation may lead to irritation of the eyes, skin and mucous membranes.

Acrolein – This weedkiller, which was used as a chemical weapon during World War I, causes lung injury and chronic obstructive pulmonary disease. It may also cause asthma and lung cancer.¹⁵

E-Cigarettes Might Harm Immune Function

Neutrophils, a type of white blood cell, serve as an initial defense mechanism in the immune system.¹⁶ They circulate in the body, capturing and neutralizing bacteria and other pathogens that could lead to illness. A team from the University of Birmingham gathered neutrophils through blood samples from healthy volunteers who had neither smoked nor vaped.

The researchers exposed these neutrophils to 40 puffs of unflavored vape, which is considered a low daily exposure level.¹⁷ Half of the samples were exposed to nicotine-containing vape, while the other half were exposed to nicotine-free vape.

The exposure did not kill the cells, but it significantly impaired their mobility, rendering them unable to protect the body effectively. Lead study author Aaron Scott, associate professor in respiratory science at the University of Birmingham explained:¹⁸

"We found that after short, low-level exposure to e-cigarette vapor, the cells remain alive but can no longer move as effectively and are unable to carry out their normal protective functions. Interestingly, vapor from e-liquids which did not contain nicotine also had the same negative effects as vapor from e-liquids which did contain nicotine.

E-cigarettes are a proven, lower harm, tool to help smokers quit smoking but our data adds to current evidence that e-cigarettes are not harmless and highlights the need for to fund longer-term studies in vapers."

The phenomenon may be due to a buildup of microfilament, specifically F-actin. Neutrophils exposed to vapor from e-cigarettes had high concentrations of F-actin,

which resulted in the cells being less able to move and function.¹⁹ Conventional smoking is also known to affect neutrophils.

The findings could have significant implications for lung health in e-cigarette users, as neutrophils typically protect the lungs by moving from the blood to the site of potential injury.²⁰

E-cigarette or vaping use-associated lung injury, known as EVALI, is also possible. It refers to severe lung illness that occurs in those using e-cigarettes, possibly due to vitamin E acetate and other compounds in the products.²¹ In 2020, an outbreak of at least 2,807 EVALI cases occurred in the U.S., most requiring hospitalization, and deaths were reported.²²

"At its core, EVALI is a serious disease that primarily affects the lungs and results in a substantial number of hospitalizations and deaths in a relatively young and otherwise healthy population across the United States," Meghan Rebuli, assistant professor in the Department of Pediatrics in the University of North Carolina School of Medicine, said in a news release.²³

"This epidemic is largely caused by the unregulated and quickly evolving nature of the e-cigarette industry and certainly highlights the need for continued action by both researchers and government agencies."²⁴

Avoid E-Cigarettes as a Tool to Quit Smoking

Remember, e-cigarettes are designed to get you to keep using them – much like cigarettes. They also typically contain nicotine, which means using them can lead to addiction and prolonged dependency on nicotine – also just like cigarettes. The National Academies of Sciences has also noted that e-cigarettes may cause youth vapers to transition to the use of cigarettes.²⁵

Swapping regular smoking for vaping is simply trading one poison for another. A better way to quit – whether you're tackling conventional cigarettes or e-cigarettes – is to

focus on getting your lifestyle into a positive, healthy state. Regular daily movement is important,²⁶ as is healthy eating.

An excellent supportive tool, especially for dealing with cravings that come with quitting smoking, is the **Emotional Freedom Techniques (EFT)**. This can help you reprogram your body's reactions to cravings, helping you quit smoking successfully. Mindfulness-based apps are another tool you can use, which may help reduce activity in the posterior cingulate cortex (PCC) area of your brain. In smokers, the PCC is activated in response to smoking cues.²⁷

Sources and References

- ¹ Forbes April 2, 2024
- ^{2, 3, 4} U.S. CDC, NCHS Data Brief No. 475, July 2023
- ^{5, 6, 7, 8, 9} American College of Cardiology March 7, 2019
- ¹⁰ American College of Cardiology, CardioSmart, E-Cigarettes
- ¹¹ U.S. CDC, Quick Facts on the Risks of E-cigarettes for Kids, Teens, and Young Adults
- ¹² Life (Basel). 2023 Mar; 13(3): 827., 3. Composition of E-Cigarettes
- ¹³ Am J Physiol Lung Cell Mol Physiol. 2020 Dec 1; 319(6): L957–L967
- ¹⁴ Preventive Medicine December 2014, Volume 69, Pages 248-260, Carbonyls
- ¹⁵ American Lung Association, The Impact of E-Cigarettes on the Lung (PDF)
- ¹⁶ Cleveland Clinic, Neutrophils
- ¹⁷ Technology Networks September 8, 2023
- ^{18, 19, 20} University of Birmingham September 6, 2023
- ²¹ American Lung Association, EVALI
- ²² U.S. CDC, Outbreak of Lung Injury Associated with the Use of E-Cigarette, or Vaping, Products
- ^{23, 24} UNC Health, Newsroom January 3, 2023
- ²⁵ The National Academy of Sciences, Engineering and Medicine January 23, 2018
- ²⁶ Nicotine and Tobacco Research, 2011, 13(8), 756-760
- ²⁷ Neuropsychopharmacology. 2019 Apr 30