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Are E-Cigarettes Safer? A Closer Look at Lung Cancer Risk

Ryan Quigley:

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I'm Ryan Quigley and today I'll be discussing the potential relationship between vaping or electronic cigarette use and lung cancer risk, based on a systematic review published in *ESMO Open* in November 2025.

But before we get into that, let's talk about electronic cigarettes for a moment. These devices, also called ECs, are lithium-ion battery-operated and produce aerosols containing nicotine, flavoring agents, glycerin, and propylene glycol. They're often marketed as safer alternatives to conventional cigarettes and as effective smoking cessation aids. However, evidence supporting these claims is limited and inconsistent, and major knowledge gaps persist regarding the long-term respiratory safety of vaping.

With that being said, let's dive in. To evaluate whether EC use is associated with lung cancer incidence, investigators conducted a systematic review of the existing literature. A comprehensive database search identified 2,252 citations, of which five studies met the inclusion criteria. All included studies were non-randomized observational studies published between 2019 and 2024. Two were conducted in the US, two in Korea, and one in Russia. Sample sizes ranged from roughly 3,200 to more than 4.3 million participants.

Overall, the review suggests that EC use may not be harmless, particularly among dual users who consume both conventional cigarettes and e-cigarettes. Among the five studies, four reported positive associations between EC use and lung cancer risk, while one found no significant relationship after adjusting for age and smoking status. In one large cohort study, Kim and colleagues reported that individuals who switched from conventional cigarettes to ECs after cessation had higher lung cancer incidence and mortality compared with non-EC users.

These findings also align with prior mechanistic research suggesting biological pathways through which EC exposure could contribute to cancer risk. EC aerosols can contain aldehydes, volatile organic compounds, and heavy metals capable of inducing oxidative stress and DNA damage. Experimental studies also suggest that EC exposure may increase cytochrome P450 enzyme activity involved in carcinogen metabolism and generate reactive oxygen species that could promote malignant transformation. In addition, emerging research indicates that EC aerosols may alter gene expression and proteomic patterns in ways similar to conventional tobacco smoke.

However, we need to keep in mind several limitations. Substantial heterogeneity existed across the included studies, including differences in study design, population characteristics, exposure definitions, and outcome measurements. In addition, adjustment for confounding variables varied across studies.

From a clinical perspective, these findings highlight the potential importance of assessing EC use during routine patient evaluations and when considering lung cancer risk.

Future research should focus on large prospective cohort studies that clearly distinguish exclusive EC users from dual users and former smokers, incorporate standardized exposure measures and molecular biomarkers, and evaluate outcomes through long-term follow-up.

This has been an *AudioAbstract*, and I'm Ryan Quigley. To access this and other episodes in our series, visit ReachMD.com, where you can Be Part of the Knowledge. Thanks for listening!

Reference:

Mohapatra S, Tiwari A, Kandala A, et al. The risk of lung cancer from vaping or e-cigarette usage: a systematic review. *ESMO Open*. 2025;10(12):105910. doi:10.1016/j.esmoop.2025.105910

