Vaping combined with smoking is likely as harmful as smoking cigarettes alone

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Smoking traditional cigarettes in addition to using e-cigarettes results in harmful health effects similar to smoking cigarettes exclusively, according to new research published today in the American Heart Association's flagship journal *Circulation*.

Smoking, a well-known link to cardiovascular disease and death, appears to be on the decline. While the use of e-cigarettes, known as vaping, is increasingly popular, there has been limited research on the impact of vaping on the body.

In a large data analysis of more than 7,100 U.S. adults ages 18 and older, researchers studied the association of cigarette smoking and e-cigarette use with inflammation and oxidative stress as biomarkers. Inflammation and oxidative stress are key contributors to smoking-induced cardiovascular disease and their biomarkers have been shown to be predictors of cardiovascular events, including heart attack and heart failure.

"This study is among the first to use nationally representative data to examine the association of cigarette and e-cigarette use behaviors with biomarkers of inflammation and oxidative stress," said Andrew C. Stokes, Ph.D., assistant professor of global health at Boston University School of Public Health in Boston and first author of the study. "Given the lag time between tobacco exposure and disease symptoms and diagnosis, identifying the association between e-cigarette use and sensitive biomarkers of subclinical cardiovascular injury is necessary for understanding the long-term effects of newer tobacco products such as e-cigarettes."

Researchers used data from the Population Assessment of Tobacco and Health (PATH) Study, a nationally representative longitudinal cohort in the U.S. This study's analysis was restricted to adults 18 years and older from Wave 1 of the survey, which was administered from 2013 to 2014 and included the collection of blood and urine samples.

Five biomarkers of inflammation and oxidative stress were analyzed. Participants were slotted into four categories based on the use of traditional cigarettes and e-cigarettes within a 30-day period: nonuse of cigarettes and e-cigarettes; exclusive vaping; exclusive cigarette smoking; and dual use of cigarettes and e-cigarettes. To test the robustness of initial results, the scientists repeated the analyses in subgroups of respondents, including those with no past 30-day use of any other tobacco products.

Of the study participants, more than half (58.6%) did not use cigarettes or e-cigarettes; nearly 2% vaped exclusively; about 30% smoked cigarettes exclusively; and about 10% used e-cigarettes and traditional cigarettes.

The analysis found:

- Participants who vaped exclusively showed a similar inflammatory and oxidative stress profile as people who did not smoke cigarettes or use e-cigarettes.

- Participants who smoked exclusively and those who used cigarettes and e-cigarettes had higher levels across all biomarkers assessed compared to participants who did not use cigarettes or e-cigarettes.
- Compared to participants who smoked exclusively, those who vaped exclusively had significantly lower levels of almost all inflammatory and oxidative stress biomarkers. However, participants who used cigarettes and e-cigarettes had levels of all inflammatory and oxidative stress biomarkers comparable to those who smoked exclusively.

"This study adds to the limited body of research we have on biologic measures in those using e-cigarettes," said study co-author Rose Marie Robertson, M.D., FAHA, deputy chief science and medical officer of the American Heart Association and co-director of the Association's National Institutes of Health/Food and Drug Administration-funded Tobacco Center of Regulatory Science, which supported the study. "I believe it has an important message for individuals who may believe using e-cigarettes while continuing to smoke some combustible cigarettes reduces their risk. This commonly-seen pattern of dual use was not associated with lower levels of inflammatory markers, and thus is not likely to offer a reduction in risk in this specific area."

Researchers also conducted extensive analyses to test the results against the influence of related behaviors such as the use of other tobacco products and marijuana, and secondhand smoke exposure. The results remained consistent across the additional analyses.

The large population sample of this study makes the findings applicable to the U.S. adult population. One of the study's limitations is its cross-sectional approach of looking at population data at one point in time, which makes it impossible to establish causality.

Researchers said the study highlights the importance of continued public education regarding the risks of cigarette smoking and the failure of dual use to reduce risk.

"The results could be used to counsel patients about the potential risk of using both cigarettes and e-cigarettes," Stokes said. "Some people who smoke cigarettes, pick up e-cigarette use to reduce the frequency with which they smoke cigarettes. They often become dual users of both products rather than switching entirely from one to the other. If e-cigarettes are used as a means to quit smoking, cigarette smoking should be completely replaced and a plan to ultimately attain freedom from all tobacco products should be advised."

More information: Association of Cigarette and Electronic Cigarette Use Patterns With Levels of Inflammatory and Oxidative Stress Biomarkers Among US Adults, *Circulation*. 2020; 143:00–00. DOI: 10.1161/CIRCULATIONAHA.120.051551

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