

Ozone in air pollution is linked to fibroid development in Black women

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Dr Amelia Wesselink Credit: Dr Amelia Wesselink

Higher levels of ozone from air pollution are linked to an increased risk of developing fibroids among Black American women according to a large study published today (Friday) in *Human Reproduction*, one of the

world's leading reproductive medicine journals.

Fibroids are non-cancerous growths that develop in and around the womb. They are diagnosed in 25-30% of pre-[menopausal women](#), but the true incidence is thought to be between 70-80%. Many fibroids do not cause symptoms but when they do, they are one of the main reasons women are admitted to hospital for inpatient care. Symptoms can include heavy or painful periods, stomach and back pain, constipation, frequent need to urinate, and pain or discomfort during sex. In some cases they can affect fertility and pregnancy. Women of African-Caribbean origin are diagnosed with fibroids two to three times more often than [white women](#), and they tend to experience earlier onset of symptoms and more severe disease.

Previous research has shown that Black people are exposed to higher levels of [air pollution](#) than white people in the USA but, until now, there has been no investigation into the association between air pollution and fibroids in Black women.

The study published today investigated concentrations of three environmental pollutants in the air in 56 US metropolitan areas between 1997 and 2011: particulate matter smaller than 2.5 microns (PM2.5), nitrogen dioxide (NO₂) and [ozone](#) (O₃). The 21,998 premenopausal Black women who lived in these areas and were included in the research were part of the ongoing Black Women's Health Study. They answered questionnaires every two years and were followed up until 2019.

During the 14-year follow-up period, 6238 (28.4%) of women reported having fibroids diagnosed by a doctor and confirmed by ultrasound or surgery. Average (median) concentrations of ozone were 36.9 parts per billion (ppb), with a range of 25.4 to 55 ppb.

After adjusting for factors that could affect the results, such as

education, smoking, body mass index, diet and whether or not the women had been pregnant, the researchers found that the risk of self-reported fibroids increased with increasing levels of ozone in the atmosphere, but not with PM2.5 or NO2.

Ozone was linked to a 35% increased risk of fibroids among the 20% of women exposed to the highest levels of ozone (42-55 ppb) - a rate of 33.6 cases per 1000 women, compared with the 20% exposed to the lowest levels (25-33 ppb) - a rate of 31.4 cases per 1000 women. The association was stronger among women aged less than 35 years and for women who had been pregnant.

First author of the study, Dr. Amelia Wesselink, an Assistant Professor in the Department of Epidemiology at Boston University School of Public Health (Massachusetts, USA), said: "We were surprised to see an association for ozone but not for PM2.5 and NO2. The mechanisms that we think could explain the association between ozone and fibroids are also relevant for the other pollutants, so this was an unexpected finding. It may reflect that there is a mechanism unique to ozone that we are missing, but it might also mean that there is factor that we've not been able to measure that could affect the results. For example, we were unable to account for vitamin D exposure and vitamin D deficiency is a suspected risk factor for fibroids."

Biological mechanisms that might be involved in the link between ozone and fibroids include an immune inflammatory response; oxidative stress (an imbalance between molecules in the body, leading to cell and DNA damage); high blood pressure that could lead to fatty deposits on artery walls; and activation of the body's stress response.

Dr. Wesselink said that the [increased risk](#) of fibroids among Black women was not explained by known risk factors, or by socioeconomic status, or access to or quality of health care.

"We are still trying to figure out what specific exposures explain this disparity. Possible explanations that are under investigation include stress throughout life due to systematic oppression and racism; vitamin D deficiency; and environmental factors like air pollution, which we know are inequitably distributed across populations in the United States.

"There have now been three studies suggesting a link between air pollution and fibroids, but ours is the first to show this in Black women. Because Black women are inequitably exposed to air pollution, these findings have important implications for racial disparity in fibroids."

The study has some limitations. These include the way exposure to air pollution was measured; the fact that women reported doctors' diagnoses of fibroids, which could have led to an under-estimation of the problem; and that the researchers were unable to measure factors that could affect the results, such as vitamin D exposure.

Dr. Wesselink said: "Vitamin D deficiency is a key hypothesis that is under investigation to explain the racial disparity in fibroids. It is certainly possible that our findings could be explained by vitamin D. This is something that should be considered in future work on this topic."

She concluded: "Further research and additional funding is needed to understand the role of air pollution in fibroid development. For instance, a prospective, ultrasound-based study could identify fibroids, regardless of whether or not they are causing symptoms that lead to [women](#) seeking medical care. In addition, we need to consider the role of other features in the physical and built environment in the development of fibroids; factors such as environmental noise, access to green spaces and other neighbourhood exposures."

More information: Amelia K Wesselink et al, A prospective cohort

study of ambient air pollution exposure and risk of uterine leiomyomata, *Human Reproduction* (2021). [DOI: 10.1093/humrep/deab095](https://doi.org/10.1093/humrep/deab095)

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