

# Exposure to air pollution in India is associated with more hypertension in women

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Long-term exposure to air pollution has been previously associated with a higher risk of hypertension in high-income countries, where air pollution levels are generally lower than in low- and middle-income

countries. A team led by the Barcelona Institute for Global Health (ISGlobal), an institution supported by "la Caixa," set out to study this association in India, a lower middle-income country where burdens of air pollution and hypertension are projected to increase. The results show that women exposed to higher levels of air pollution at residence have a higher hypertension prevalence.

The study, performed within the framework of the CHAI project and published in the journal *Epidemiology*, studied 5,531 adults from 28 peri-urban villages near Hyderabad city, in Southern India. The researchers measured systolic and diastolic blood pressure of participants and estimated their annual residential exposure to fine particulate matter (PM<sub>2.5</sub>) and black carbon. The participants also answered a survey to determine socio-economic status, lifestyle (including physical activity levels and salt intake), and household characteristics, including the type of cooking fuel generally used (biomass or clean).

Notably, all [study participants](#) were exposed to [fine particulate matter](#) levels above the 10  $\mu\text{g}/\text{m}^3$  limit recommended by the World Health Organisation (WHO). Average exposure to PM<sub>2.5</sub> in this study was 33  $\mu\text{g}/\text{m}^3$ . Based on the blood pressure measurements, almost half of participants (46%) were identified as hypertensive, with high proportions of participants with undiagnosed and untreated hypertension.

The results show that an increase of 1  $\mu\text{g}/\text{m}^3$  in PM<sub>2.5</sub> exposure was associated with a 4% increase in hypertension prevalence in women, as well as a higher systolic and [diastolic blood pressure](#) -an increase of 1.4 mmHg and 0.87 mmHg, respectively-. In men, the association observed was weaker.

"Women spend most of their time near their households in this study area—83% of their daily time as compared to 57% for men—which could explain why we observe a stronger association in women than in

men," explains Ariadna Curto, first author of the study.

The research indicates that [long-term exposure](#) to particulate matter is associated with a higher prevalence of hypertension, regardless of the type of fuel used for cooking. "Other studies have found that women that cook with solid fuels such as biomass tend to have higher blood pressure than those using clean fuels, although our data is not powered enough to support this, our study suggests that the effects of outdoor [air pollution](#) on cardiovascular health may be independent from those of indoor air pollution," she stresses. "In the light of our lack of association with black carbon, it is important to keep in mind that this is a peri-urban area, where the sources and chemical makeup of air pollution differ to urban areas mostly dominated by traffic sources," adds Curto.

Cathryn Tonne, CHAI project and study coordinator, explains that the mechanisms by which air pollution could contribute to high blood pressure "include inflammation and oxidative stress, which may lead to changes in arterial function."

"Although further epidemiological evidence is needed to confirm our findings, ideally through longitudinal studies, these data suggest that public policies aimed at reducing air pollution will greatly benefit cardiovascular health," concludes Tonne.

**More information:** Ariadna Curto et al, Ambient Particulate Air Pollution and Blood Pressure in Peri-urban India, *Epidemiology* (2019). [DOI: 10.1097/EDE.0000000000001014](https://doi.org/10.1097/EDE.0000000000001014)

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