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Summary of Recent Research on Air Pollution and the Cardiovascular System

This study investigated the association between low levels of fine particulate matter (PM_{2.5}) and hospitalization due to hypertension. Even for levels well below the US EPA regulatory standard, an increase in annual PM_{2.5} exposure increased the risk of hypertension-related hospitalizations, with the highest increases seen in women, rural and suburban areas, and neighborhoods with lower socio-economic status.

Zhang Y, et. al. Low-Level Airborne Particulate Matter and Risk of Hypertension Hospitalization in Older U.S. Adults. J Am Coll Cardiol. 2026 Apr 8:S0735-1097(26)05646-9. doi: 10.1016/j.jacc.2026.02.5112. Epub ahead of print. PMID: 41984014.

This study used the Korean Genome and Epidemiology Study to compare long-term exposure to coarse particulate matter (PM₁₀) and fine particulate matter (PM_{2.5}) and long term blood glucose levels using glycated hemoglobin (HbA_{1c}) levels. Both long term PM_{2.5} and PM₁₀ exposure was associated with higher HbA_{1c} in non-diabetic adults, with higher increases in the elderly, those with lower educational attainment, rural residents, and never smokers.

Kwak K, et. al. Association Between Long-Term Exposure to Particulate Matter and Glycated Hemoglobin Levels: A Cohort Study from the Korean Genome and Epidemiology Study. J Clin Med. 2026 Apr 7;15(7):2797. doi: 10.3390/jcm15072797. PMID: 41977096; PMCID: PMC13074078.

This prospective cohort study used data from the China Health and Retirement Longitudinal Study to investigate associations between specific chemical components of fine particulate matter (PM_{2.5}) —

black carbon (BC), organic matter (OM), sulfate (SO_4^{2-}), nitrate (NO_3^-), and ammonium (NH_4^+) — and self-reported dyslipidemia (abnormal blood lipid levels) in adults aged 45 and older. All five PM_{2.5} components were significantly associated with increased risk of dyslipidemia, with nitrate (NO_3^-) showing the strongest association. Effects were more pronounced in adults aged 65 and older.

Sun Q, Yu L, Zhang D, et al. Association between PM_{2.5} chemical components and dyslipidemia in middle-aged and older Chinese adults: a prospective cohort study. BMC Public Health. 2026 Apr 23. doi: 10.1186/s12889-026-27514-x. Epub ahead of print. PMID: 42026539.

This cohort study used multistate models to investigate how PM_{2.5} and its chemical constituents — sulfate (SO_4^{2-}), nitrate (NO_3^-), ammonium (NH_4^+), organic matter (OM), and black carbon (BC) — are associated with the progression from normal blood pressure and prehypertension through hypertension and on to cardiovascular disease (CVD) and death. All five PM_{2.5} components were significantly associated with progression from prehypertension to hypertension, and that prehypertension and hypertension in the setting of elevated PM_{2.5} exposure increases CVD risk and cardiovascular mortality. The findings suggest that reducing PM_{2.5} exposure — particularly during the prehypertension phase — could be an important strategy for preventing hypertensive CVD.

Rao M, et al. Ambient PM_{2.5} and Its Components Associated with Dynamic Progression from Different Blood Pressure States to Cardiovascular Diseases and Mortality: The GOLD-Health Cohort. Environ Health (Wash). 2025 Dec 9;4(4):709-719. doi: 10.1021/envhealth.5c00258. PMID: 42022204; PMCID: PMC13096969.

In this time-series study, researchers analyzed nearly 26,000 emergency cardiovascular disease visits at a Beijing hospital over a five-year period to assess how short-term spikes in air pollution affected the frequency of those visits. They examined multiple pollutants alongside weather conditions, finding that

increases in PM_{2.5}, nitrogen dioxide, and sulfur dioxide were each associated with a rise in emergency cardiovascular visits, with sulfur dioxide showing the strongest effect. These associations were more pronounced in men, older adults aged 61–80, and on days with lower temperatures and higher humidity.

Mu H et al. Int J Hyg Environ Health. 2026 May 7;275:114813. doi: 10.1016/j.ijheh.2026.114813.