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NEWS

SEX-SPECIFIC ASSOCIATIONS OF LONG-TERM AIR POLLUTION EXPOSURE WITH CORONARY ARTERY STENOSIS ON CARDIAC CT

PURPOSE

Exposure to air pollution is associated with cardiovascular mortality. However, evidence on the relationship between air pollution and obstructive coronary artery disease (CAD) is lacking. The purpose of this study was to evaluate the association of long-term air pollution exposure with coronary artery stenosis on cardiac CT.

METHODS AND MATERIALS

Adult patients who had undergone coronary CT angiography at one of three hospitals between 2015-2023 were retrospectively evaluated. Luminal stenosis was categorized using CAD-RADS 2.0 stenosis categories and obstructive CAD was defined as >50% diameter stenosis. Mean daily fine particulate matter ($PM_{2.5}$) and gaseous nitrogen dioxide (NO_2) air pollution concentrations in the 10-year period prior to cardiac CT were assessed based on direct measurements from the nearest monitoring station to each patient's home. Ordinal logistic (CAD-RADS categories) and logistic (obstructive CAD) regression models were adjusted for sex, distance to monitoring station, rural residence, CT unit, and socioeconomic status.

RESULTS

2,172 patients were included (51.5% male, mean age 58.2±12.3 years). Median 10-year exposure to $PM_{2.5}$ was 7.5 (range 4.6-9.3) µg/m3 and NO_2 was 12.2 (range 2.0-20.2) parts per billion (ppb). A 1 µg/m3 increase in ten-year $PM_{2.5}$ exposure was associated with 1.24 times greater odds of moving to a higher CAD-RADS stenosis category (OR 1.24; 95% CI: 1.04, 1.48, P=0.02) and 1.33 times greater odds of obstructive CAD (OR 1.33; 95% CI: 1.01, 1.75, P=0.04). A 1 ppb increase in ten-year NO_2 exposure was associated with 1.04 times greater odds of obstructive CAD (OR 1.04; 95% CI: 1.01, 1.09, P=0.03), although the association with CAD-RADS stenosis category was not significant (OR 1.02; 95% CI: 0.99, 1.05, P=0.09). When stratified by sex, a 1 µg/m3 increase in ten-year $PM_{2.5}$ exposure was associated with 1.47 times greater odds of moving to a higher CAD-RADS stenosis category in men (OR 1.47; 95% CI: 1.16, 1.87, P=0.002); however, the association was not significant in women (OR 1.03; 95% CI: 0.79, 1.35, P=0.81, interaction term P=0.03). A 1 ppb increase in ten-year NO_2 exposure was associated with 1.04 greater odds of moving to a higher CAD-RADS stenosis category in men (OR 1.04; 95% CI: 1.00, 1.07, P=0.02); however, the association was not significant in women (OR 1.01; 95% CI: 0.98, 1.05, P=0.51, interaction term P=0.28).

CONCLUSIONS

Higher long-term exposure to air pollution, particularly $PM_{2.5}$, is independently associated with coronary artery stenosis and obstructive CAD in men but not women.

CLINICAL RELEVANCE/APPLICATIONS

Atherosclerosis may be one of the underlying pathophysiological mechanisms by which air pollution leads to adverse cardiovascular outcomes in men.