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**Association between air pollution exposure and handgrip strength as a marker of frailty: findings from the French CONSTANCES cohort**

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**ABSTRACT**

BACKGROUND AND AIM - Air pollution exposure negatively affects human health and might also be linked to frailty. We aimed to evaluate whether exposure to air pollution is associated with poorer handgrip strength, a marker of frailty. METHODS - Data from the enrollment phase of the French CONSTANCES cohort participants aged 45-years and more were analyzed cross-sectionally. Modeled concentrations of PM<sub>2.5</sub>, black carbon, and NO<sub>2</sub> from the ELAPSE land-use regression model were assigned to the residential address of each participant. Sex-specific maximum handgrip strength (HGS<sub>max</sub>) was used as an outcome in multilevel linear regression models adjusted for a set of confounders (reported as  $\beta$  and 95% confidence interval (CI)), using the center of recruitment as a clustering factor. Subgroup analyses were performed across different levels of urbanicity and different personal variables including clinical risk factors. RESULTS - Of the 53,379 participants (mean age 57.4 $\pm$ 7.2 years), 50.3% were women. The median concentration of PM<sub>2.5</sub>, black carbon, and NO<sub>2</sub> was 16.1 (IQR=3.8)  $\mu$ g/m<sup>3</sup>, 1.6 (IQR=0.7) 10<sup>-5</sup>/m, and 22.5 (IQR=13.7)  $\mu$ g/m<sup>3</sup>, respectively. HGS<sub>max</sub> in men was significantly higher than in women (42.1 vs. 25.6 kg). Exposure to all the three pollutants was associated with lower HGS<sub>max</sub> in both sexes (e.g.  $\beta$ = -0.08; 95% CI: -0.11: -0.04 in men, and  $\beta$ = -0.08; 95% CI: -0.12: -0.04 in women per 3.8  $\mu$ g/m<sup>3</sup> exposure to PM<sub>2.5</sub> in the adjusted model). Significantly stronger associations were found for all three pollutants (in single pollutant models) in men aged 65 years and older compared to younger men. Men with diabetes, depression, and cardiovascular disease tended to have poorer HGS<sub>max</sub> associated with exposure to all of the pollutants. Stratified results for women were less conclusive. CONCLUSIONS - In this large general population study, air pollution was associated with poorer HGS, especially in men. It is of importance because HGS is a marker of general well-being and frailty.

**KEYWORDS:** Frailty; Handgrip strength; Black carbon; Particulate matters; Nitrogen dioxide; CONSTANCES Cohort

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