COMPARISON OF PM MASS CONCENTRATION AND PM OXIDATIVE POTENTIAL EXPOSURE METRICS IN RELATION TO CAROTID INTIMA MEDIA THICKNESS WITHIN THE WHITEHALL II COHORT

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Background and Aims The epidemiological evidence that particulate matter (PM) can augment the progression of atherosclerosis remains limited and the specific attributes of PM responsible for observed health effects is unclear. We previously developed a model to predict exposure to PM10 mass concentration weighted by its oxidative potential (OP), a measure of particles' capacity to induce oxidative damage. Our present objective was to estimate the association between PM10 mass concentration and carotid intima media thickness (CIMT), a measure of subclinical atherosclerosis, and to compare the association with that of PM10 weighted by its OP (PM10xOP).
Methods Analysis was based on 2,348 participants of the Whitehall II cohort of British civil servants who had CIMT measured between 2003-05 and lived in Greater London. Weekly PM10 and PM10xOP were predicted at each participants' residence. Primary exposure metrics were defined as predicted PM10 and PM10xOP averaged over 52 weeks prior to CIMT scan. Associations between exposure metrics and CIMT were estimated using generalized linear regression models.
Results Median exposures were 24.4μgm^{-3} for PM10 and 15.6m^{-3} for PM10xOP. An interquartile range increase (5.2μgm^{-3}) in PM10 was associated with a 2.3% (95% CI 0.7%, 3.8%) increase in CIMT without adjusting for covariates. This association increased to 5.0% (95% CI 1.9%, 8.3%) after adjustment for age, sex, smoking, BMI, year and season. An interquartile range increase (1.6m^{-3}) in PM10xOP was associated with a 1.8% (95% CI 0.6%, 3.1%) increase in CIMT in the fully adjusted model. Although the association with CIMT was larger for PM10, the predictive value (AIC) of the two exposure metrics was comparable.
Conclusions This analysis adds to the evidence of the relationship between PM exposure and the extent of atherosclerosis, but also for the first time, incorporates information on the oxidizing characteristics of particles in this relationship.