

Short-term Exposure to Ambient Fine Particulate Matter Increases Hospitalizations and Mortality in COPD

A Systematic Review and Meta-analysis

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BACKGROUND: Many epidemiologic studies have documented variable relationships between ambient particulate matter (PM) and COPD hospitalizations and mortality in cities worldwide.

METHODS: Comprehensive and systematic searches were performed in the electronic reference databases (PubMed, EMBASE, Google Scholar, Ovid, and Web of Science) with specific search terms and selection criteria for relevant studies. Summary ORs and 95% CIs were calculated to evaluate the relationship between short-term exposure to PM with aerodynamic diameters ≤ 2.5 μm (PM_{2.5}) and COPD hospitalizations and mortality. The sources of heterogeneity and the effect of potential confounders were explored using subgroup analyses. Study findings were analyzed using a random effects model and a fixed effects model in COPD hospitalizations and mortality, respectively.

RESULTS: The search yielded 12 studies suitable for meta-analysis of hospitalizations and six studies suitable for the mortality meta-analysis until April 15, 2015. A 10-mg/m³ increase in daily PM_{2.5} (lag days 0-7) was associated with a 3.1% (95% CI, 1.6%-4.6%) increase in COPD hospitalizations and a 2.5% (95% CI, 1.5%-3.5%) increase in COPD mortality. Significant publication bias was not found in studies focusing on the relationship between short-term PM_{2.5} exposure and COPD hospitalizations and mortality.

CONCLUSIONS: Our combined analysis indicated that short-term exposure to a 10-mg/m³ increment of ambient PM_{2.5} is associated with increased COPD hospitalizations and mortality. Further study is needed to elucidate to what extent this relationship is causal, together with other factors, and to elucidate the mechanism by which PM_{2.5} induces activation of cellular processes promoting COPD exacerbations.

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