

#ISEE2021

33rd Annual Conference of the International Society for Environmental Epidemiology

Promoting Environmental
Health and Equity in
a Shifting Climate



August 23-26, 2021

Abstracts'
E-Book



Local Academic Host:
Columbia University
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ABSTRACT E-BOOK

August 24, 2021 / 11:30 - 13:00 / Grand Central Hall (Hall 5)

TRADITIONAL ORAL SESSION 12

Environmental Exposures and Neurodevelopment

Chairs: Youssef Oulhote, United States & Raanan Raz, Israel

O-TO-062

Air pollution » Particulate matter

Systematic Review and Meta-analysis on Association Between Air Pollutants and Hippocampal Volume from Magnetic Resonance Imaging in Adults

Erica Balboni, Tommaso Filippini, Marco Vinceti

Department of Biomedical, Metabolic and Neuronal Sciences, University of Modena and Reggio Emilia, Modena, Italy

BACKGROUND AND AIM: The neurotoxicity of air pollutants has been actively investigated in recent years, and there is increasing epidemiological evidence suggesting that air pollution can adversely affect the central nervous system. In neurodegenerative disease, one important diagnostic biomarker is volume reduction in a key brain structure, the hippocampus, as assessed with neuroimaging techniques. Few epidemiological articles investigated the association of hippocampal volume with air pollution, with inconsistent results. In this paper, we aimed to estimate such association through a systematic review and meta-analysis.

METHODS: Scopus and PubMed literature databases were searched through 31 March 2021. Eligibility criteria were: 1) assessment of air pollutant levels; 2) assessment of hippocampal volume through structural magnetic resonance imaging; 3) reporting of correlation coefficients along with standard error. We performed a meta-analysis using a random-effects model.

RESULTS: We retrieved four studies using linear regression models to evaluate the possible effect of air pollutants on hippocampal volume of adult populations. The investigated air pollutants were nitrogen dioxide (NO₂) and particulate matter, with diameter $\leq 2.5\mu\text{m}$ (PM_{2.5}) and $\leq 10\mu\text{m}$ (PM₁₀). All studies used a similar methodology based on standard spatial coordinates of images, and considered intracranial volume as a covariate. We found that hippocampal volume was inversely associated with PM_{2.5} concentration (β regression coefficient -7.90, 95% confidence interval (CI) -14.60 to -1.20) and more slightly with PM₁₀ concentrations (β -1.70, 95%CI -3.96 to 0.57), whereas no association with NO₂ concentrations emerged (β -0.29, 95%CI -1.13 to 0.55).

CONCLUSIONS: Our results suggest that PM_{2.5} and less clearly PM₁₀ have an adverse effect on hippocampal volume, a phenomenon associated with cognitive decline and increased risk of neurodegenerative disease. These epidemiologic findings appear to be biologically plausible especially for PM_{2.5}, also taking into account some studies carried out in animals.

Keywords: Neurotoxicity, Neuroimaging, Magnetic Resonance Imaging, Hippocampus, Meta-analysis, Nitrogen dioxide