

Association between exposure to air pollution and late-life neurodegenerative disorders: an umbrella review

学位名	修士（公衆衛生学）
学位授与機関	聖路加国際大学
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Abstract

Background: There is growing concern regarding air pollution as a modifiable risk factor for cognitive impairment, dementia, Alzheimer's disease, and Parkinson's disease. An umbrella review was conducted to collate the available evidence from systematic reviews and meta-analyses investigating the association between exposure to air pollution and risk of late-life neurodegenerative disorders.

Methods: Two reviewers independently searched the PubMed and Embase databases from inception to 22 November 2020 to identify eligible reviews. Included reviews were assessed for quality using the Joanna Briggs Institute (JBI) Critical Appraisal Checklist for Systematic Reviews and Research Syntheses. A narrative overview and visual summary of the findings from both quantitative and qualitative reviews is presented.

Results: Nine systematic reviews met the eligibility criteria, of which 4 conducted meta-analysis (i.e., quantitative reviews) and 5 did not (i.e., qualitative reviews). All reviews were of high quality. A range of air pollutants were assessed in the included meta-analyses; however, only exposure to fine particulate matter (PM_{2.5}) was significantly associated with increased risk of cognitive impairment and Alzheimer's disease. Although associations between exposure to air pollution and late-life neurodegenerative disorders are frequently reported at the individual study level, as seen in the qualitative summary of findings, attempts to quantitatively synthesise these findings generally resulted in little to no support for the strength of the associations. Over- or underestimation of effect size is possible in view of the wide variation in methodologies used across individual studies.

Conclusions: More extensive epidemiologic evidence of the link between air pollution and risk of late-life neurodegenerative disorders is needed, especially from developing countries. Recommendations for improvements in design, analysis, and reporting as summarised in the present review should be considered when planning future studies to increase the consistency, comparability, and utility of their findings.

Keywords: Ageing; Air pollution; Neurodegenerative disorders; Meta-analysis; Systematic review; Umbrella review