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Environmental pollution and mental health: an epidemiological perspective on risks, mechanisms and prevention

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Background. Environmental exposures are increasingly recognized as potential determinants of mental and neurodevelopmental health. This narrative review examines epidemiological evidence on environmental risks, potential mechanisms and prevention.

Materials and Methods. A narrative review of the literature was conducted in accordance with the methodological principles of the Scale for the Assessment of Narrative Review Articles (SANRA).

Results. Epidemiological evidence suggests associations between mental and neurodevelopmental health and environmental exposures including air pollution, artificial light at night (ALAN), greenness and climate change. Potential mechanisms involve oxidative stress, inflammation, circadian disruption, melatonin suppression, sleep disturbances, and endocrine, metabolic and epigenetic pathways. For ALAN, evidence on autism spectrum disorder (ASD) suggests possible sex-specific differences in susceptibility, although with variable precision. Greenness, assessed through the Normalized Difference Vegetation Index (NDVI), showed a non-linear relationship with ASD risk, with increasing estimates at higher NDVI values but wider confidence intervals, indicating greater uncertainty and a possible role of residual confounding. Climate change may affect mental health through direct and indirect pathways and contribute to psychological distress, including eco-anxiety. From a prevention perspective, reducing harmful environmental exposures, improving living environments and integrating environmental determinants into mental-health policies may contribute to population-level risk reduction.

Conclusions. Environmental health policies should explicitly incorporate mental and neurodevelopmental health protection as a public-health priority. Strengthening environmental surveillance, promoting healthier urban planning and integrating mental-health considerations into climate adaptation strategies could support primary prevention. Future epidemiological research should prioritize longitudinal designs, improved exposure assessment and robust evaluation of preventive interventions to inform evidence-based policies.

References. Baethge C, Goldbeck-Wood S, Mertens S. SANRA—a scale for the quality assessment of narrative review articles. Res Integr Peer Rev. 2019;4:5. Kumar P, Brander L, Kumar M, Cuijpers P. Planetary Health and Mental Health Nexus: Benefit of Environmental Management. Ann Glob Health. 2023;89(1):49. Tordjman S, Najjar I, Bellissant E, et al. Advances in the research of melatonin in autism spectrum disorders: literature review and new perspectives. Int J Mol Sci. 2013;14(10):20508-42.