



The burden of disease attributable to ambient PM_{2.5}-bound PAHs exposure in Nagpur, India



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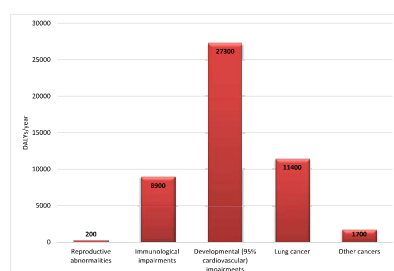
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HIGHLIGHTS

- We assessed PM_{2.5}-bound PAHs in urban, peri-urban and rural areas of Nagpur.
- We estimated the DALYs/year resulting from the PAHs exposure.
- Average annual levels of total PM_{2.5}-bound PAHs in Nagpur was 458 ± 246 ng/m³.
- The PAHs exposure caused about 49,500 DALYs, annually.
- PAH-related burden from developmental impairments was the largest.

GRAPHICAL ABSTRACT



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ABSTRACT

Exposure to PM_{2.5}-bound polycyclic aromatic hydrocarbons (PAHs) can elicit several types of cancer and non-cancer effects. Previous studies reported substantial burdens of PAH-induced lung cancer, but the burdens of other cancer types and non-cancer effects remain unknown. Thus, we estimate the cancer and non-cancer burden of disease, in disability-adjusted life years (DALYs), attributable to ambient PM_{2.5}-bound PAHs exposure in Nagpur district, India, using risk-based approach. We measured thirteen PAHs in airborne PM_{2.5} sampled from nine sites covering urban, peri-urban and rural areas, from February 2013 to June 2014. We converted PAHs concentrations to benzo[a]pyrene equivalence (B[a]P_{eq}) for cancer and non-cancer effects using relative potency factors, and relative toxicity factors derived from quantitative structure-activity relationships, respectively. We calculated time-weighted exposure to B[a]P_{eq}, averaged over 30 years, and adjusted for early-life susceptibility to cancer. We estimated the DALYs/year using B[a]P_{eq} exposure levels, published toxicity data, and severity of the diseases from Global Burden of Disease 2016 database. The annual average concentration of total PM_{2.5}-bound PAHs was 458 ± 246 ng/m³ and resulted in 49,500 DALYs/year (0.011 DALYs/person/year). The PAH-related DALYs followed this order: developmental (mostly cardiovascular) impairments (55.1%) > cancer (26.5%) or lung cancer (23.1%) > immunological impairments (18.0%) > reproductive abnormalities (0.4%).

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