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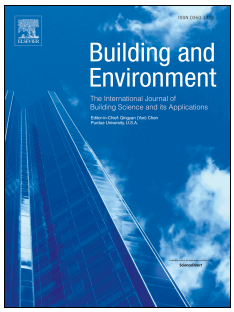

Exposure assessment of children to particulate matter and gaseous species in school environments of Pune, India

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Exposure assessment of children to particulate matter and gaseous species in school environments of Pune, India

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Abstract

Indoor air quality of schools is a subject of great significance for the assessment of the effects of children exposure to air pollution. In order to characterize the indoor air quality, coarse and fine particulate matter (PM) levels, concentration of gaseous pollutants (CO_2, SO_2, NO_2, O_3) and major anions, elemental concentration, morphology and risk assessment were evaluated from the samples collected in different naturally ventilated schools in Pune, India. Mass concentration of both coarse and fine PM exceeded 5 times WHO standards, which clearly indicates the insufficient fresh air in school buildings of Pune in terms of PM. The average concentration of gaseous pollutants were within prescribed limits of NAAQS except CO_2 which was higher in concentration than the limit set for confined spaces, thus showing the inadequate air exchange rates in the studied schools. The Ca showed significant dominance among the analyzed metals in both fraction of PM followed by Mg, Na and K. Cd showed higher bioavailability index among the carcinogenic metals leading to health hazards to exposed children. The cancer risk for Cr, Cd, Ni, and Pb in both sized PM were much higher than the acceptable limits of USEPA. Average anionic concentration followed the similar pattern for both sized fraction of PM and the trend was NO_3^-> SO_4^{2-}>Cl^- > F^-. The morphological analysis revealed the presence of various shaped particles composed of various constituents of Si, C and Ca. Questionnaire survey and personnel interview showed the prevalence of cold, running nose, cough, fever and eye irritation among the studied school children exposed to the PM and gaseous species. The health problems such as cold, cough and fever were found to be the main cause of absenteeism of children.

Keywords: Indoor air quality, Schools, Bioavailability, Cancer risk, Morphology

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