1.069 Particulate Matters (PM10, PM2.5 and PM1.0) and Gaseous Pollutants Exposure to Indoor Environment and the Association of Fine PM with Lung Function in Dhaka city, Bangladesh.

Early Career Scientist

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Abstract:

$PM_{1.0}$ (particulate matter with an aerodynamic diameter ≤1.0 μm), $PM_{2.5}$ (particulate matter with an aerodynamic diameter ≤ 2.5 μm) and PM_{10} (particulate matter with an aerodynamic diameter ranging from 2.5 to 10 μm) were measured at indoor environment in various residential houses in Dhaka from August to October, 2017 using Aerocet 531S, and PM_{10} were collected using dual channel dust sampler. Atomic Absorption Spectroscopy (AAS) was used for analyzing metals in PM_{10} samples. Simultaneously, NO_2 and TVOC concentrations were measured using Aeroqual 500 series. Samples were collected from living room over 15 hours. Peak flow rate of the occupants was recorded using Peak expiratory flow meter. Mean $PM_{1.0}$ concentration was found highest in houses of Khilkhet (62.75 μg/m^3) and lowest in Mirpur (34.88 μg/m^3). The average indoor $PM_{2.5}$ concentrations for Khilkhet, Rampura, Mirpur, Dholaipar were 92.33, 66.60, 58.20, 86.80 μg/m^3, respectively. The average PM_{10} concentration for houses of Dhaka was 203.94 μg/m^3 which is four times higher than the guideline limit value (50 μg/m^3). The I/O ratios of all the sampling sites were less than one, indicating that the outdoor PM originated from vehicular emissions directly enter the indoor environment of homes and thus increasing their con-centration levels. Six metals Fe, Ni, Zn, Ca, Mg and Pb were quantified from PM samples. Enrichment factor showed that non-crustal sources are responsible for high concentration of Zn and Pb. Average NO_2 concentrations was found almost thrice than threshold values. A negative association between $PM_{1.0}$, $PM_{2.5}$ and peak flow rate indicated the reduction of lung function with increasing exposure. This is the first-time study in Bangladesh about the exposure to fine particles and their relation with lung function. As fine and ultrafine particles can penetrate deeper into the lung, rapid actions should be taken by the government to reduce their emission.