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Accumulation of PM10 and Associated Metals Due to Opencast Coal Mining Activities and Their Impact on Human Health

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Abstract : The goal of this study was to assess the characteristics of the airborne dust created by opencast coal mining and its relation to population hospitalization risk for skin and lung diseases in Margherita Coalfield, Assam, India. Air samples were collected for 24 h in three 8-h periods. For the collection of particulate matter (PM10) and total suspended particulate matter (SPM) samples, respiratory dust samplers with glass microfiber filter papers were used. PM10 was analyzed for Cu, Cd, Cr, Mn, Zn, Ni, Fe and Pb with Flame Atomic Absorption Spectrophotometer (FAAS). SPM and PM10 concentrations were respectively found to be as high as 1,035 and 265.85 μg/m³ in work zone air. The concentration of metals associated with PM10 showed values higher than the permissible limits. It was observed that the average concentrations of the metals Fe, Pb, Ni, Zn, and Cu were very high during the winter month of December, those of Cd and Cr were high during the month of May and Mn was high during February. The morphology of the particles studied with scanning electron microscopy (SEM) gave significant results. Due to opencast coal mining, the air in the work zone, as well as the general ambient air, was found to be highly polluted with respect to dust. More than 8000 patient records maintained by the hospital authority were collected from three hospitals in the area. The highest percentage of people suffering from lung diseases are found in Margherita Civil Hospital (~26.77%) whereas most people suffering from skin diseases reported for treatment in the ESIC hospital (47.47%). Both PM10 and SPM were alarmingly high, and the results were in conformity with the high incidence of lung and other respiratory diseases in the study area.

Keywords : heavy metals, open cast coal mining, PM10, respiratory diseases
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