

Elevated Ambient PM₁₀ Levels Affecting Respiratory Health of Schoolchildren in Chiang Mai, Thailand

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ABSTRACT

The health effects from exposure to particulate air pollution during the dry season (February-March) in northern Thailand, a longstanding problem, have become particularly acute since 2007. Although several studies have reported the effect of ambient PM₁₀ levels on airway oxidative stress and pulmonary function among respiratory disease patients, few studies have focused on healthy children, especially in Thailand. We conducted a prospective follow-up study to assess the respiratory health among schoolchildren exposed to different levels of ambient PM₁₀ by comparing exhaled malondialdehyde (MDA) concentrations and pulmonary function indices. Exhaled breath condensate (EBC) samples were obtained from individual participants. MDA in EBC has been proposed as a biomarker of airway oxidative stress. The participants were 54 healthy schoolchildren with median (min-max) age of 11 (10-12) years old from a primary school in Chiang Mai City, Thailand. Questionnaires and EBC samples were collected twice, in the rainy season (July 2011, low PM₁₀ level) and the dry season (March 2012, high PM₁₀ level). It required about 10 minutes to collect EBC samples of 1-3 mL from individual participants, using an EBC-collecting apparatus that was modified specifically for this research from a standard hospital-use apparatus. MDA concentration in EBC was analyzed using HPLC-UV detection. Trained public health personnel performed the pulmonary function tests. The median of exhaled MDA concentrations in the rainy and dry seasons was 0.17 and 0.22 μM, respectively. Mean ± SD of forced expiratory volume in one-second/forced vital capacity ratios (FEV₁/FVC) in the rainy and dry seasons was 94.6 ± 4.4 and 91.3 ± 4.7 percent predicted, respectively. Exhaled MDA concentration significantly increased and the FEV₁/FVC ratio significantly decreased in the dry season (p<0.05). This results shows that elevated ambient