Indoor Air Pollution and Lung Cancer in China

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Abstract

Although indoor air pollution has been suggested as a risk factor for lung cancer, it has not been fully studied in Chinese population. This study aims to investigate associations between cooking, solid fuel usage, environmental tobacco smoking exposure, housing characteristics and lung cancer in an urban Chinese population, with a focus on non-smoking women. We conducted a case-control study in Taiyuan, China, consisting of 399 lung cancer cases and 466 healthy controls, of which 164 cases and 218 controls were female non-smokers. Indoor PM concentrations, including PM₁₀, PM₂.⁵, PM₇, PM₁₀ and TSP, were measured using a particle mass monitor. Unconditional logistic regression models were used to calculate odds ratios (ORs) and 95% confidence intervals after adjusting for age, education level, annual personal income and pack-years of smoking (when the analyses included smokers). Among non-smoking women, lung cancer was strongly associated with multiple sources of indoor air pollution, including heavy exposure to ETS at work (aOR=3.65), high frequency of cooking (aOR=3.30), and solid fuel usage for cooking (aOR=4.97) and heating (aORcoal_stove=2.00, aORheatable_brick_bed =8.1). Housing characteristics related to poor ventilation, including single-story houses, less window area, no separate kitchen, no kitchen ventilator and rarely having windows open, are associated with lung cancer, with aORs varying between 1.8-3.0. Indoor mean PM levels in the study population are much
higher than WHO guidelines for ambient PM. Mean PM$_{2.5}$ concentration was 74ug/m$^3$, and PM$_{10}$ was 232ug/m$^3$. PM levels in winter are strongly correlated with solid fuel usage for cooking and heating, as well as use of ventilators. PM$_1$ levels in cases’ houses are more than 3 times higher than that in controls’ houses. Our results suggest that exposure to indoor air pollution may play an important role in the development of lung cancer among Chinese female non-smokers. Both reducing pollutant emission and improving ventilation may be preventive measures in control of PM levels inside the house, in order to reduce the development of lung cancer.