

Abstract**[Project Information]**

Project Title : Nationwide Environmental Epidemiological Study to Quantify Health Effects of Short-term Exposure to PM_{2.5} Components

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[Abstract]

Internationally, as well as in Japan, it remains to be determined whether some PM_{2.5} components have strong health effects. To provide novel scientific evidence regarding the health effects of PM_{2.5}, which is necessary to consider comprehensive measures against PM_{2.5}, we performed an environmental epidemiological study examining the associations of PM_{2.5} total mass and its components with mortality and morbidity.

In the environmental study, we collected PM_{2.5} data measured by the Aerosol Chemical Speciation Analyzer (ACSA-14, Kimoto Electric) and summarised the daily mean concentrations of PM_{2.5} total mass and its components, including optical organic carbon (OBC), water-soluble organic carbon (WSOC), nitrate, and sulphate. For the 23 Tokyo wards, we compared the daily mean concentrations measured in the eastern (Koto-ku), central (Chiyoda-ku), and western (Ota-ku) areas, and observed that the concentrations of all four components in the three areas were strongly correlated with each other (correlation coefficient > 0.8). Regarding the urban background concentrations of PM_{2.5} components, the variability of daily mean concentrations was likely small over a relatively wide area.

In the epidemiological study, the study period was April 2017 to December 2019, when automatic PM_{2.5} component measurements by ACSA-14 started at multiple sites. The study areas were seven prefectures (Hokkaido, Miyagi, Tokyo, Aichi, Osaka, Hyogo, and Fukuoka) where urban background concentrations of PM_{2.5} were measured. We obtained information on mortality,

emergency ambulance dispatches, out-of-hospital cardiac arrest of cardiac origin, admission for acute myocardial infarction, and occurrence of cerebral infarction. Short-term exposure to PM_{2.5} total mass was positively associated with all outcomes with or without statistical significance. There was an association between PM_{2.5} total mass and all-cause mortality (an increase of 1.3 % in all-cause mortality [95% confidence interval: 0.7-2.0%] per 10 µg/m³ increase of the average PM_{2.5} total mass concentration on the day of death and the previous day), which is consistent with our previous epidemiological results. When we explored the health effects of PM_{2.5} components, the OBC concentration was associated with mortality, emergency ambulance dispatches, and acute myocardial infarction even after adjustment for other PM_{2.5} components (WSOC, nitrate, and sulphate).

In an environment where the average daily mean concentrations of PM_{2.5} total mass was 11.6 µg/m³ (98th percentile = 29.3 µg/m³), an increased concentrations of PM_{2.5} total mass was associated with increased mortality and morbidity. Among PM_{2.5} components, OBC had statistically significant health effects.

[References]

not applicable

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