

Assessing health risks of exposure to Asian dust among healthy individuals

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Background/Aim: Asian dust carried by winds to Japan was on the rise since the year 2000, but has now become irregular due to large-scale climate change. It has been suggested that Asian dust affects the eyes, nose, and respiratory system; however, similar symptoms have also been reported in people exposed to pollen and particulate matter (PM_{2.5}), not derived from Asian dust. Although it is unknown how the components of Asian dust affect health, we suggest that windborne Asian dust may affect the skin (Onishi et al 2012). To investigate this hypothesis, we conducted a long-term survey using web questionnaires, regarding subjective symptoms among the residents of Yonago City, which is at the front lines of windborne Asian dust. We calculated the odds ratio of the development of symptoms on a day with Asian dust, as compared to a day without Asian dust.

Methods: We administered diary-style web questionnaires to 104 volunteers who lived in Yonago City between 2013 and 2015. The subjects answered questions regarding symptoms related to the nose, throat, eyes, respiratory system, skin, body temperature, occurrence of headaches, and stress levels, as well as about the occurrence of common cold and influenza. The results were evaluated using a 6-level subjective symptom score (29 variables in total). We used the Japan Meteorological Agency's method of determining the occurrence of Asian dust on each day. Data on climate (temperature, humidity, and atmospheric pressure) were used as covariates. The data were analyzed using t-test, as well as linear and logistic mixed models, and subjected to a multifaceted investigation, including covariate adjustment.

Results: Statistically significant differences were observed in 23 of the 29 variables, between participants' symptoms on the days with Asian dust and the days without Asian dust. The difference in scores for skin tenderness on the days with Asian dust compared to the days without Asian dust was 0.11 (95% CI: 0.06-0.15, $p < 0.001$), suggesting that it is associated with Asian dust. Moreover, the odds ratio for the development of skin tenderness on the days with Asian dust compared to the days non-AD day was 2.39 (95% CI: 1.30-4.39, $p = 0.005$) with adjustment for daily weather conditions. A strong correlation was also observed for symptoms in the eyes, nose, and throat.

Conclusions: The effect of Asian dust on the eyes, nose, respiratory organs, and skin was confirmed by the data collected over 3 years. We also confirmed that the participants developed symptoms related to the skin, which are considered a characteristic of exposure to Asian dust. In the future, we plan to study symptoms related to the skin using Light Detection and Ranging (LIDAR) as an indicator of Asian dust, and investigate the synergistic effects of pollen, other air pollutants, heavy metals, and microorganisms with Asian dust.

Keywords: Asian dust, Health risk assessment, Allergic symptoms