Assessing the Risk of Health Impacts Associated with Asian Dust in Japan

P1-H2

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Our study revealed a significant increase in ***allergy-related symptoms***, including ocular, nasal, respiratory, and systemic issues, on days with ***Asian Dust*** (AD) compared to non-AD days. A strong association between AD and ***headaches*** was also observed, emphasizing the health risks posed by the resurgence of AD occurrences due to ***climate change***.

INTRODUCTION

Simulation studies have indicated an expected increase in the frequency of Asian Dust (AD) occurrences due to large-scale climate change. While the influx of AD into Japan had been decreasing over the past decade, recent years have seen a resurgence, raising concerns about its health implications once again. This study aimed to investigate the short-term effects of AD on the health of individuals, particularly concerning symptoms like allergies, among healthy individuals.
This study aimed to compare the risk of symptom onset on AD days versus non-Asian Dust days, utilizing the results of self-perceived symptom surveys conducted via web questionnaires among residents of Yonago City, a region susceptible to Asian Dust influx.

Figure 1. Location of the survey area and observation area at Yonago and Matsue City, Japan.

METHODS

From 2013 to 2015, a daily web-based diary survey was conducted among 104 volunteers residing in Tottori Prefecture. Participants reported their self-perceived symptoms on a four-point scale for various categories. The surveys also collected data on outdoor time, mask usage, and air purifier usage. Asian Dust indicators included both classifications by the Japan Meteorological Agency and more detailed assessments using LIDAR (Light Detection and Ranging) installed in Matsue City. Analysis was performed using generalized linear mixed models.

RESULTS

The odds ratios for symptoms significantly increased on Asian dust day were as follows: ocular 1.7 (1.0-2.9), nasal 1.6 (1.05-2.55), respiratory 1.9 (1.1-3.17), skin 2.2 (1.3-3.55), and systemic 2.1 (1.2-3.6). Significant associations between LIDAR (AD) and symptoms were observed, with odds ratios for nasal symptoms at 1.5 (1.1-1.9), respiratory symptoms at 1.6 (1.2-2.2), and systemic at 1.5 (1.1-1.9). Furthermore, in LIDAR (AD) analysis, a relationship was found between increasing LIDAR concentration and increasing symptoms for nasal, throat, and respiratory symptoms (all P for Trend <0.01). Among the symptoms examined with LIDAR (AD), particularly strong associations were observed for sneezing (P<0.001), throat irritation (P<0.01), cough (P<0.01), and headache (P<0.0001).

Figure 2. Daily levels of LIDAR dust particles (non-spherical particles) extinction coefficient (/km), LIDAR non-mineral dust particles (spherical particles) extinction coefficient (/km), and JMA-judged AD day during the study period (2013–2015)

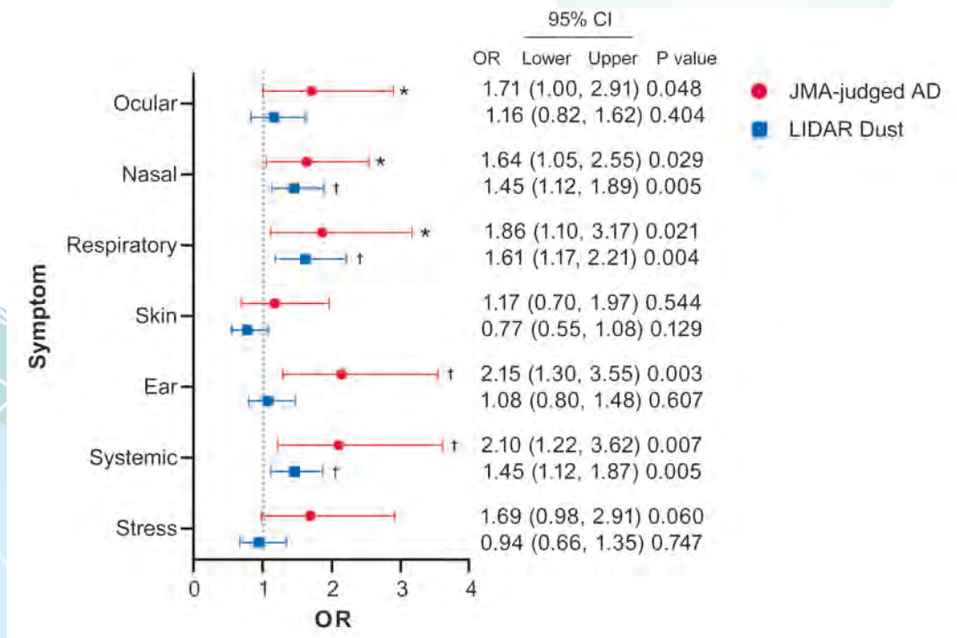

Figure3. Association among JMA judged AD day, LIDAR AD day (dust extinction coefficient cut off 0.0355/km), and symptoms (>1) by generalized linear mixed model
JMA, Japan meteorological agency; AD, Asian dust; LIDAR, light detection and ranging; OR, odds ratio
Adjusted by pressure, precipitation, temperature, humidity, wind, NO2, Ox, SO2, pollen, LIDAR non-dust, past illness, present illness, smoking, prescription, sex, age, time to outside over 3 h, mask-wearing, open-window, air purification, clothesline, drying futon outside.
＊P value for <0.05, † P value for <0.01

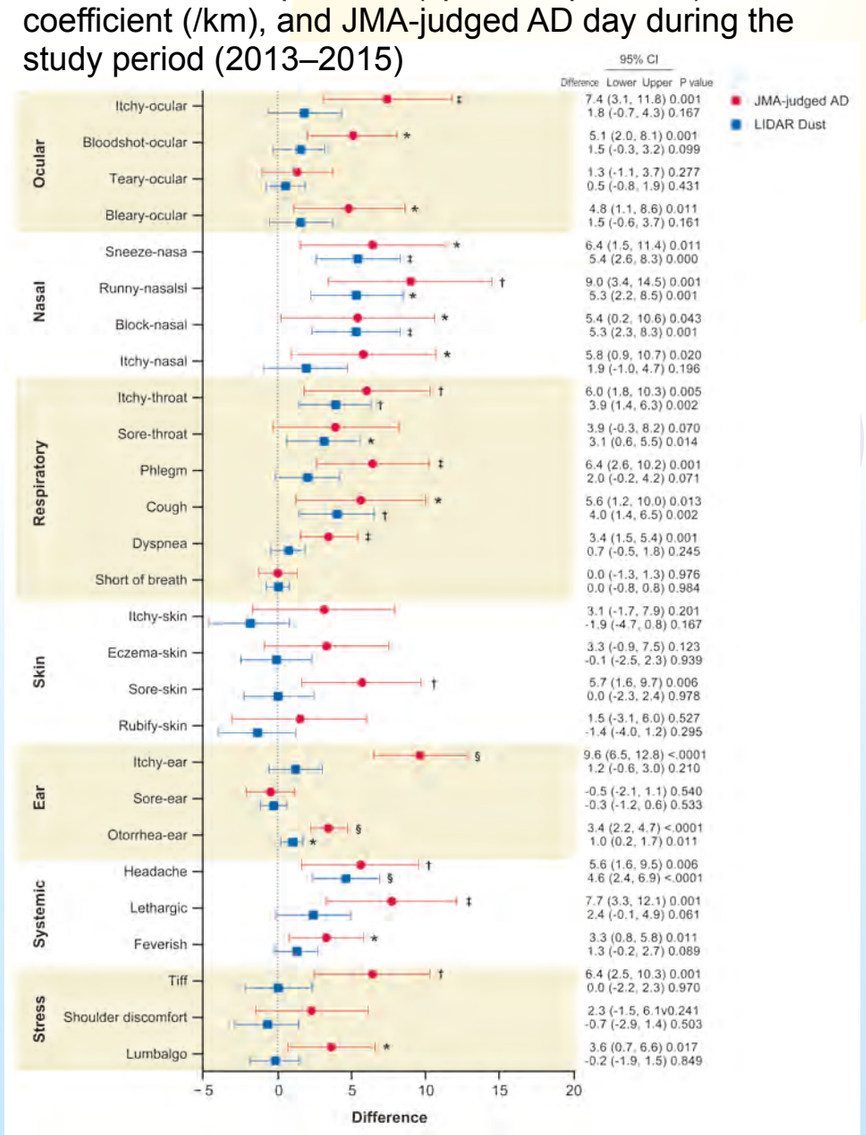

Figure4.
Symptoms differences among JMA judged AD day, LIDAR dust AD day (dust extinction coefficient cut off 0.0355/km), and non-AD day analyzed by linear mixed model
JMA, Japan meteorological agency; AD, Asian dust
Adjusted by pressure, precipitation, temperature, humidity, wind, NO2, Ox, SO2, pollen, LIDAR non-dust, past illness, present illness, smoking, prescription, sex, age, time to outside over 3 h, mask-wearing, open-window, air purification, clothesline, drying futon outside.
a Indicating to how many out of 100 people experience a 1-point increase in score
*P value for <0.05, † P value for <0.01, ‡ P value for <0.001, § P value for <0.0001

CONCLUSIONS

In addition to the previously reported impacts on the nasal and respiratory system, a strong association between AD and headaches was suggested. The potential role of dust allergens in exacerbating sinusitis-induced headaches supports these findings.