Assessing the Risk of Health Impacts Associated P1-H2 with Asian Dust in Japan

Kazunari Onishi*(1), Masanori Nojima(2), Hiroaki Terasaki(3), Yasunori Kurosaki(4)

- 1. Division of Environmental Health, Graduate School of Public Health, St. Luke's International University, 3-6-2 Tsukiji Chuo-ku, Tokyo, 104-0045 Japan
- 2. Center for Translational Research, The Institute of Medical Science Hospital, The University of Tokyo
- 3. Department of Architecture and Civil Engineering, Faculty of Engineering, University of Fukui, Fukui, Japan
- 4. Arid Land Research Center, Tottori UniversityDepartment of Life Science, Faculty of Science and Engineering, Kindai University

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.

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), ear 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



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



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).

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 <0.001

CONCLUSIONS

add and with search and a to the owner with a start of the search and the search

Figure 2. Daily levels of LIDAR dust particles (nonspherical 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)

	lichy-ocular -	T.4 (3.1, 11.8) 0.001	MA-judged
1	Bloodshot-ocular -	* 5.1 (2.0, 8.1) 0.000	LIDAR Dust
Ocula	Teary-ocular -	1.3 (-1.1, 3.7) 0.277	
	Bleary-ocular -	* 4.8 (1.1, 8.6) 0.011 1.5 (-0.6, 3.7) 0.161	
sal	Sneeze-nasa –	* 6.4 (1.5, 11.4) 0.011 5.4 (2.6, 8.3) 0.000	
	Runny-nasalsi –	+ 9.0 (3.4, 14.5) 0.001 5.3 (2.2, 8.5) 0.001	
Na	Block-nasal -	* 5.4 (0.2, 10.6) 0.043 5.3 (2.3, 8.3) 0.001	
	Itchy-nasal -	* 5.8 (0.9, 10.7) 0.020 1.9 (-1.0, 4.7) 0.196	
	Itchy-throat -	t 6.0 (1.8, 10.3) 0.005 3.9 (1.4, 6.3) 0.002	
Respiratory	Sore-throat -	3.9 (-0.3, 8.2) 0.070 ★ 3.1 (0.6, 5.5) 0.014	
	Phlegm -	• • • • • • • • • • • • • • • • • • •	
	Cough -	* 5.6 (1.2, 10.0) 0.013 + t 4.0 (1.4, 6.5) 0.002	
	Dyspnea -	* 3.4 (1.5, 5.4) 0.001 0.7 (-0.5, 1.8) 0.245	
	Short of breath -	0.0 (-1.3, 1.3) 0.976 0.0 (-0.8, 0.8) 0.984	
	Itchy-skin -	3.1 (-1.7, 7.9) 0.201 -1.9 (-4,7, 0.8) 0.167	
un	Eczema-skin -	3.3 (-0.9, 7,5) 0.123 -0.1 (-2.5, 2.3) 0.939	
ŝ	Sore-skin –	t 5.7 (1.6, 9.7) 0.006 0.0 (-2.3, 2.4) 0.978	
	Rubify-skin -	- 1.5 (-3.1, 6.0) 0.527 -1.4 (-4.0, 1.2) 0.295	
	Itchy-ear -	§ 9.6 (6.5, 12.8) <.0001 1.2 (-0.6, 3.0) 0.210	
Ear	Sore-ear -	-0.5 (-2.1, 1.1) 0.540 -0.3 (-1.2, 0.6) 0.533	
	Otorrhea-ear -	3.4 (2.2, 4.7) <.0001 1.0 (0.2, 1.7) 0.011	
Systemic	Headache -	1 5.6 (1.6, 9.5) 0.006 4.6 (2.4, 6.9) <.0001	
	Lethargic -	# 7.7 (3.3, 12.1) 0.001 2.4 (-0.1, 4.9) 0.061	
	Feverish -	* 3.3 (0.8, 5.8) 0.011 1.3 (-0.2, 2.7) 0.089	
s	Tiff -	6 .4 (2.5, 10.3) 0.001 0.0 (-2.2, 2.3) 0.970	
Stres	Shoulder discomfort -	- 2.3 (-1.5, 6.1v0.241 -0.7 (-2.9, 1.4) 0.503	
	Lumbalgo –	* 3.6 (0.7, 6.6) 0.017 -0.2 (-1.9, 1.5) 0.849	

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.



Copyright © 2024, KAZUNARI ONISHI, <u>kaznaly@slcn.ac.jp</u> : There is no Conflict of interest in this study.