Experts Find Association Between African Dust Transport and Acute Exacerbations of COPD

New research by environmental experts with the University of Miami Miller School of Medicine and their collaborators has found that Saharan dust outbreaks observed in Miami elevate the concentration of particulate matter exposure, which can affect both the lungs and heart. The outbreaks can also increase the risk of acute exacerbation of chronic obstructive pulmonary disease (COPD), a chronic inflammatory lung disease that causes obstructive airflow in the lungs.

In the study, published in the August issue of the *Journal of Clinical Medicine*, experts state that dust events are likely to become more frequent and intense with changing climate and weather patterns.

"Dust storms originate from drylands, which constitute approximately 40 percent of the world surface and account for 30 percent of the world population," said lead author Miguel Pardinas, M.D., a pulmonologist at UM/Jackson Memorial Hospital. "Dust impacts are not restricted to local areas because airborne dust can be transported thousands of miles away from its origin source."

In the study cohort, 296 patients with chronic obstructive pulmonary disease were followed between 2013 and 2016. To
identify dust events and quantify particulate matter exposure, experts used two techniques.

The first was Light Detection and Ranging—a remote sensing method used to examine the Earth's surface. Light pulses, combined with other data recorded by the airborne system, generate precise, three-dimensional atmospheric distribution of aerosols by altitude. The second was satellite-based Aerosol Optical Depth, a quantitative estimate of the number of aerosols present in the atmosphere. Aerosols released into the atmosphere, such as fires and dust storms, affect human health.

The study found that dust duration and intensity increased yearly during the study period. Aerosol Optical Depth increased by 51 percent, and particulate matter increased by 25 percent during dust events. Additionally, it was found that one day of dust exposure was associated with 4.9 times higher odds of acute exacerbation of chronic obstructive pulmonary disease.

Ambient temperature exposure also showed a significant association with acute exacerbation of chronic obstructive pulmonary disease. The risk of the disease lasted up to 15 days after the dust exposure, declining from 10 times higher on day zero to 20 percent higher on day 15.

The largest source of atmospheric dust, scientists of the study said, is the Sahara-Sahel region in North Africa. The dust originating from this region reaches different parts of the world, including the Americas across the Atlantic Ocean. In the U.S., the largest number of dust storms occur in western states, such as Arizona, California, Washington, and
Nevada, specifically during the early afternoon hours of summer months.

This study, said researchers, provides epidemiological evidence of the association between acute exacerbation of chronic obstructive pulmonary disease and exposure to the transported dust originated in another continent.

"Understanding the environmental risks of acute exacerbation of chronic obstructive pulmonary exacerbation is important given its potential for improving clinical recommendations regarding individual behavior modification during discrete dust and/or pollution events," said senior study author Naresh Kumar, Ph.D., associate professor at the Miller School of Medicine's Department of Public Health Sciences.

Experts state that there is a need to develop strategies to engage multiple stakeholders to manage the adverse health effects of dust exposure, ranging from developing real-time disease-specific health risk to training healthcare professionals in assessing the health risk of time-lagged dust exposure among their patients to engage them in dust exposure avoidance.

Co-authors of the study also included Paquita Zuidema, Ph.D., professor in the Department of Atmospheric Sciences in the University of Miami's Rosenstiel School of Marine and Atmospheric Science, and Miller School of Medicine's Mehdi Mirsaedi, M.D., M.P.H., associate professor of medicine and public health, and Vice-Chair of the Miami Veterans Affairs Healthcare System, and Michael Campos, M.D., associate professor of clinical medicine.

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