Protecting COPD Patients from Particulate Matter: Evidence-Based Interventions and Strategies

Jung-Kyu Lee

Organization Seoul National University, SMG-SNU Boramae Medical Center, Department of Internal Medicine
Current Position Associate Professor

Educational background

2012-2014 M.A., Seoul National University

Professional experience

2021-Present Associate Professor, Seoul National University, SMG-SNU Boramae Medical Center, Department of Internal Medicine
2015-2021 Assistant Professor, Seoul National University, SMG-SNU Boramae Medical Center, Department of Internal Medicine

Exposure to ambient particulate matter (PM) significantly worsens outcomes in chronic obstructive pulmonary disease (COPD). Short-term increases in PM2.5 and PM10 are consistently associated with higher risks of exacerbations, emergency visits, hospitalizations, and mortality, while long-term exposure accelerates lung function decline and raises cardiorespiratory death risk, even below current regulatory thresholds. Mechanistically, oxidative stress and airway inflammation explain the heightened susceptibility in COPD.

Interventions to reduce PM exposure fall into several categories. Indoor air cleaning with portable HEPA (often combined with activated carbon) units has the strongest evidence: randomized controlled trials demonstrate reductions in indoor pollutants and fewer moderate exacerbations, with improved quality of life when devices are used consistently. Clean fuel adoption in biomass-using settings reduces household air pollution, though effectiveness requires complete transition. Personal respiratory protection with specified masks lowers exposure during unavoidable outdoor activity, but tolerance is limited in COPD due to increased dyspnea. Behavioral strategies, including air-quality index–guided activity modification, exposure feedback, and patient education, further support risk reduction.

Personalized strategies should integrate exposure patterns, disease severity, resources, and mask tolerance, embedded within COPD management plans.