

Occupational and Environmental Lung Diseases

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RESPIRATORY OSCILLOMETRY AND SYMPTOM BURDEN IN WORLD TRADE CENTER (WTC)-EXPOSED WORKERS WITH NORMAL SPIROMETRY

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PURPOSE: Rescue/recovery work at the World Trade Center (WTC) disaster site is associated with many physical health outcomes, including respiratory conditions. While over 6,000 Fire Department of the City of New York (FDNY) WTC-exposed workers have a diagnosis of obstructive airway disease (OAD), many others with respiratory symptoms have normal spirometry, creating diagnostic and treatment uncertainty. In some non-FDNY cohorts, respiratory oscillometry better detects persistent respiratory symptoms after WTC exposure than spirometry. This study characterizes the relationship between physiologic indicators of airway dysfunction, as measured by respiratory oscillometry, and lower respiratory symptoms in FDNY rescue/recovery workers with diagnostic uncertainty. We hypothesize that among those with normal spirometry, those with abnormal respiratory oscillometry will have a greater number of respiratory symptoms than those with normal oscillometry.

METHODS: Respiratory oscillometry, spirometry, and bronchodilator testing were conducted at New York University (NYU) Langone Health and Montefiore Medical Center between 2013 and 2024 per American Thoracic Society (ATS)/European Respiratory Society (ERS) standards. Our study included WTC-exposed firefighters and emergency medical services (EMS) personnel who underwent same-day respiratory oscillometry and spirometry testing. Normative values from prior non-FDNY WTC studies classified oscillometry as normal ($R5 < 3.96$ cm H₂O/L/s) or abnormal ($R5 \geq 3.96$ cm H₂O/L/s). Spirometry outcomes (forced expiratory volume in one second (FEV₁), forced vital capacity (FVC), and FEV₁/FVC ratio) were assessed using NHANES III reference equations. Abnormal spirometry was defined as post-bronchodilator FEV₁/FVC, FEV₁, or FVC below the lower limit of normal (LLN). Of 1,242 FDNY WTC-exposed participants with same day oscillometry and spirometry, 852 with normal spirometry were included in the analysis.

RESULTS: There were 252 (29.6%) participants with abnormal respiratory oscillometry, majority were white (93.2%) and male (99.5%), with a median age of 54 years. Most (85.5%) arrived at the WTC on 9/11/2001 or 9/12/2001.

Participants with abnormal oscillometry were more likely to report at least one respiratory symptom (cough, dyspnea, wheezing, or difficulty taking a full breath) compared with those with normal oscillometry (61.9% vs 52.8%). Additionally, they reported more symptoms than those with normal oscillometry, with 32.5% experiencing two or more symptoms compared with 26.7% who had fewer than two symptoms. Regarding symptom type, those with abnormal oscillometry had higher reported wheezing (28.6% vs 23.7%), cough (31.4% vs 25.2%), dyspnea (31.8% vs 28.5%), and difficulty taking a full breath (23.0% vs 21.5%).

Additionally, persistent symptoms were reported in a higher percentage in those with abnormal oscillometry (51.6% vs 40.8%). Compared with normal oscillometry, those with abnormal oscillometry were more likely to report persistent wheeze (23.4% vs 15.5%), difficulty taking a full breath (17.5% vs 13.0%), dyspnea (22.6% vs 19.0%), and cough (23.4% vs 17.5%).

CONCLUSIONS: In participants with normal spirometry, a higher percentage of those with abnormal respiratory oscillometry reported the presence of both any respiratory symptom and persistent respiratory symptoms than those with normal respiratory oscillometry.

CLINICAL IMPLICATIONS: Respiratory oscillometry is valuable for identifying airway dysfunction in those who experience respiratory symptoms despite normal spirometry.

DISCLOSURES:

No relevant relationships by Krystal Clevén

No relevant relationships by Jack Galfund

No relevant relationships by David Goldfarb

No relevant relationships by David Prezant

No relevant relationships by Brandon Vaeth

No relevant relationships by Rachel Zeig-Owens

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