

Occupational Exposure to Air Pollutants and Higher Risk of COPD in Construction Workers: A Meta-Analysis Study

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Abstract

Introduction: Construction sites generate high levels of air pollution, contributing to more than 4% of particulate matter in the atmosphere. Literature indicates that on-site pollution is an important factor that contributes to lung impairments in construction workers. Chronic obstructive pulmonary disease (COPD) and acute respiratory distress syndrome (ARDS) are known to be exacerbated because of exposure to a variety of construction pollutants mainly particulate matter (PM₁₀, PM_{2.5}). **Methods:** We conducted a systematic review and meta-analysis to assess whether exposure to construction site pollutants is associated with impairment of pulmonary parameters like Forced vital capacity (FVC), Forced expiration volume in 1 sec (FEV₁) and FEV₁/FVC. A total of 221 publications of observational studies were reviewed and 18 were selected; the data of which were meta-analyzed. **Results and Discussion:** In all studies the test subjects (construction workers) exposed to occupational air pollutants showed significantly lower FVC and FEV₁ as compared expected levels ($p \leq 0.01$). The calculated Odds ratio indicates that there is positive association between COPD as compared to ARDS and exposure to pollutants.

Keywords: Pulmonary health, construction workers, Pollution

INTRODUCTION

Air pollution is the degradation of air quality by anthropogenic or natural causes due to the introduction of harmful quantities of pollutants into the Earth's atmosphere.^[1] Globally, construction industry-generated pollution has been recognized as a major contributor to a noxious environment leading to human ill-health.^[2] Construction sites not only generate high levels of fine dust but also produce volatile organic compounds, hydrocarbons, sulfur dioxide, silicon dioxide, carbon monoxide, and lead.^[3] This construction dust classified as PM₁₀ is invisible to the naked eye, and includes silica, asbestos, inorganic dust fumes, asphalt, oxides of nitrogen, sulfur, carbon, and cement dust.^[4]

Workers at the construction sites are directly exposed to these pollutants which adversely affect their health. Studies have documented increased incidence and frequency of respiratory impairments, inflammations, and chronic obstructive and restrictive lung diseases in construction workers from diverse

geographical locations.^[5] Chronic obstructive pulmonary disease (COPD), a heterogeneous inflammatory lung condition defined by obstructed airflow is typically caused by long-term exposure to noxious particles or gases. Emphysema and chronic bronchitis that causes COPD present with symptoms that include breathing difficulty, cough, mucus production, and wheezing.^[6] Another condition *acute respiratory distress syndrome (ARDS)* is triggered by injury to the alveolar-capillary barrier resulting in fluid accumulation in alveoli, leading to hypoxia and acute respiratory failure. Long-term exposure to air pollutants is associated with a greater chance of developing ARDS particularly in persons exposed to conditions that cause trauma.^[7] COPD develops due to prolonged exposure to irritants/pollutants resulting in alveolar damage while ARDS develops due to a sudden trauma-like infection causing inflammatory fluid buildup.^[8]

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