

# Climate Change and Respiratory Infections: Pakistan's Public Health Crisis

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The association between climate change and respiratory infections has become an irrefutable global health challenge.<sup>1</sup> In Pakistan, this crisis is worsened by deteriorating air quality,<sup>1</sup> unpredictable rainfall patterns, and a cumulative burden of climate-induced disasters.<sup>2</sup> The effects of climate change on respiratory health, principally in the backdrop of COVID-19, are being felt more sternly than ever before. The rising occurrence of heatwaves, prolonged dry spells, and environmental degradation are crafting conditions that promote respiratory illnesses while concurrently weakening healthcare systems meant to combat them.<sup>2</sup>

Pakistan's major urban centers persistently rank among the most polluted cities in the world. Lahore, Karachi, and Islamabad frequently record Air Quality Index (AQI) levels categorized as hazardous, exposing millions of people to dangerously high concentrations of fine particulate matter (PM2.5).<sup>2</sup> This is mainly concerning as air pollution is a well-documented risk factor for respiratory diseases, including asthma, chronic obstructive pulmonary disease (COPD), and acute respiratory infections such as pneumonia and bronchitis. Studies have shown that long-term exposure to air pollution dwindles the immune response, making individuals more prone to viral respiratory infections.<sup>2</sup>

The concomitant burden of COVID-19 highlighted the effects of poor air quality on respiratory health,

as air pollution was associated with worse disease outcomes.<sup>2</sup> Shifting rainfall patterns also influence respiratory health. Pakistan is experiencing prolonged periods of drought followed by sudden, extreme precipitation events. Extended dry spells result in higher concentrations of airborne dust and pollutants, aggravating respiratory diseases.<sup>2</sup> Conversely, heavy rains followed by flooding lead to increased humidity, which promotes the spread of various respiratory allergens. Such conditions are particularly hazardous for children and the elderly, who are more vulnerable to respiratory illnesses.<sup>3</sup> Climate change also influences the spread and seasonality of infectious respiratory diseases. Increased temperatures and humidity levels alter the transmission dynamics of respiratory viruses, including influenza, respiratory syncytial virus (RSV), and emerging zoonotic pathogens. Warmer temperatures can extend the active periods of these viruses, leading to prolonged or more frequent outbreaks.<sup>4</sup> Climate-related disasters also cause displacement, forcing populations into overcrowded living conditions, facilitating the rapid spread of respiratory infections.<sup>5</sup>

The socio-economic impact of climate-induced respiratory diseases is intense. Hospital admissions for respiratory conditions strain an already overburdened healthcare system, while increased morbidity and mortality result in lost productivity and economic downturns.<sup>6</sup> Low-income populations, who are often forced to live in high-pollution areas with limited access to healthcare, bear the heaviest burden.<sup>7</sup>

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These escalating challenges, demand urgent action. Pakistan must adopt a multi-sectoral approach to mitigate the health impacts of climate change. Strengthening air pollution control measures, enhancing urban planning to reduce exposure to environmental pollutants, and investing in renewable energy sources are critical steps. Strengthening the health systems' responsiveness especially through primary healthcare particularly in vulnerable populations. The growing evidence linking climate change to respiratory diseases demands immediate policy attention. Pakistan must safeguard public health, protect the environment, and build climate resilient health systems.

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