COVID-19 mortality and exposure to airborne $PM_{2.5}$: A lag time correlation

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Abstract

COVID-19 has escalated into one of the most serious crises in the 21st Century. Given the rapid spread of SARS-CoV-2 and its high mortality rate, here we investigate the impact and relationship of airborne $PM_{2.5}$ to COVID-19 mortality. Previous studies have indicated that $PM_{2.5}$ has a positive relationship with the spread of COVID-19. To gain insights into the delayed effect of $PM_{2.5}$ concentration (μgm^{-3}) on mortality, we focused on the role of $PM_{2.5}$ in Wuhan City in China and COVID-19 during the period December 27, 2019 to April 7, 2020. We also considered the possible impact of various meteorological factors such as temperature, precipitation, wind speed, atmospheric pressure and precipitation on pollutant levels. The results from the Pearson's correlation coefficient analyses reveal that the population exposed to higher levels of $PM_{2.5}$ pollution are susceptible to COVID-19 mortality with a lag time of >18 days. By establishing a generalized additive model, the delayed effect of $PM_{2.5}$ on the death toll of COVID-19 was verified. A negative correction was identified between temperature and number of COVID-19 deaths, whereas atmospheric pressure exhibits a positive correlation with deaths, both with a significant lag effect. The results from our study suggest that these epidemiological relationships may contribute to the understanding of the COVID-19 pandemic and provide insights for public health strategies.

Keywords

Correlation analysis, COVID-19, Lag time, Mortality, $PM_{2.5}$