

Impact relationships with COVID-19 attributable to PM in major cities in India and Asia - health hazards, severity of illness and death -



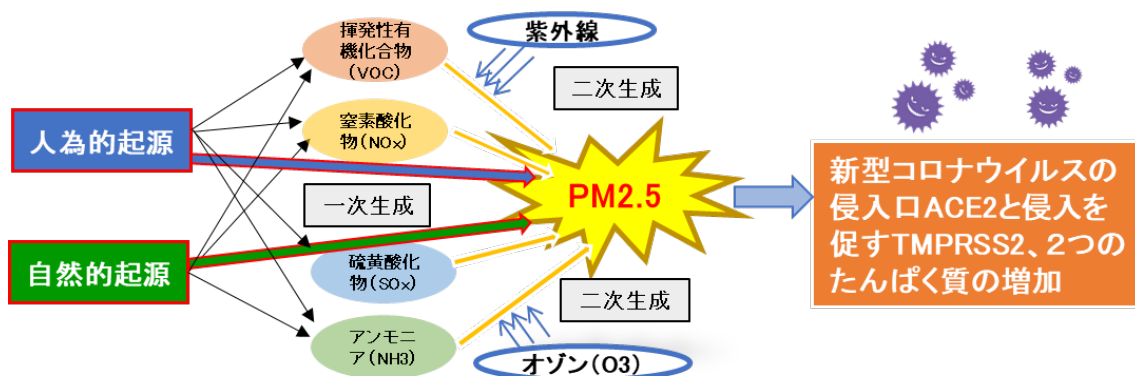
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Research objectives

Air pollutant PM_{2.5} is an ultrafine particulate matter with a diameter of 2.5 μm or less. It is generated through primary or secondary production processes from two sources: anthropogenic sources, such as vehicles and factories, and natural sources, such as volcanoes.

The effects of PM_{2.5} on the body include, but are not limited to, respiratory diseases, lung cancer and cardiovascular diseases, which are now raging all over the world.

In addition to the effects of PM, there is a reported risk of COVID-19 infection leading to severe illness and death. The need for PM control and PM reduction is attracting attention in Asian countries and India. The focus was on 3 major cities in South East Asia (Jakarta, Bangkok and Manila) and 5 major cities in India (Delhi, Kolkata, Mumbai, Chennai and Bengaluru) that are strongly affected by COVID-19 and PM_{2.5}. The spread and severity of COVID-19 infections were then analyzed in relation to PM_{2.5}.



Situation in Asia

The common features of the three cities are that they are the center of the Asian economy, tourism is thriving, traffic is heavy and traffic congestion is severe on a daily basis. Average PM_{2.5} values in 2020, Jakarta: 32.9 $\mu\text{g}/\text{m}^3$; Bangkok: 19.2 $\mu\text{g}/\text{m}^3$; Manila: 12.3 $\mu\text{g}/\text{m}^3$.

Bangkok and Manila showed a decreasing trend, but in Jakarta the PM levels were more than six times higher than the WHO standard.

COVID-19 infection rates Jakarta: 8.10%; Bangkok: 0.22%; Manila: 0.75%.

Mortality Jakarta: 1.57%; Bangkok: 0.90%; Manila: 1.55%.

<India: 14 of the 15 most air-polluted cities in the world, according to WHO. The top five most populous cities in the country have high PM2.5 levels. As shown in the graph below, they are all well above the WHO standard.

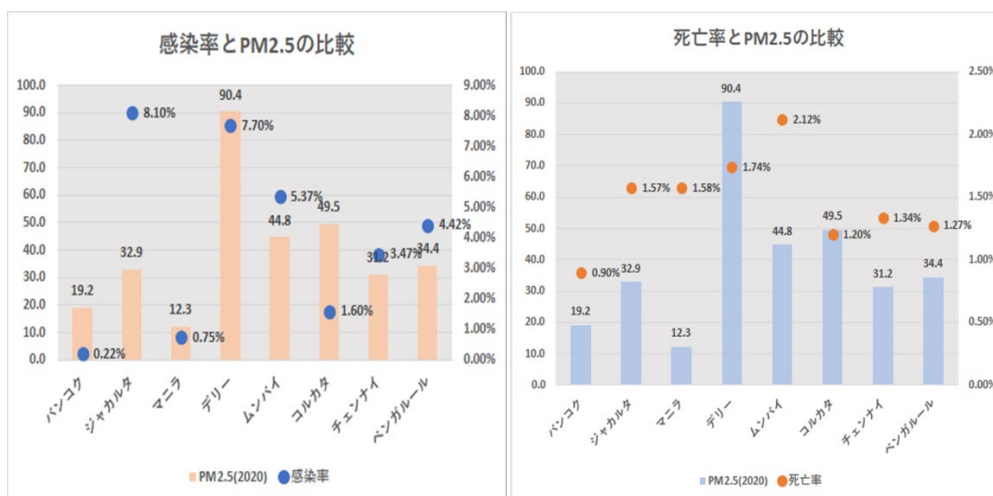
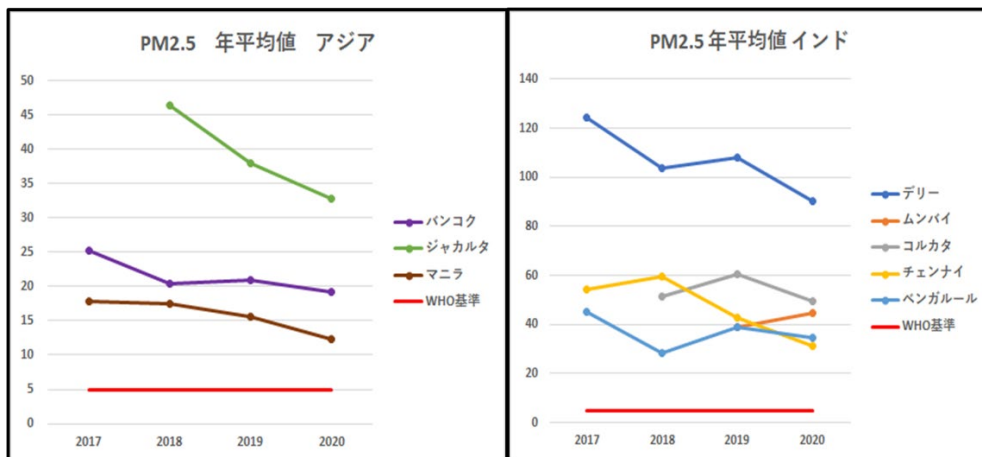
2020 PM2.5 average :

Delhi: 90.4 $\mu\text{g}/\text{m}^3$, Kolkata: 49.5 $\mu\text{g}/\text{m}^3$, Mumbai: 44.8 $\mu\text{g}/\text{m}^3$, Chennai: 31.2 $\mu\text{g}/\text{m}^3$, Bengaluru: 34.4 $\mu\text{g}/\text{m}^3$ *14.9% increase from 2019 only with respect to Mumbai.

COVID-19 infection rates :

Delhi: 7.70%; Kolkata: 1.60%; Mumbai: 5.37%; Chennai: 3.47%; Bengaluru: 4.42%.

Mortality rates Delhi: 1.74%; Kolkata: 1.20%; Mumbai: 2.12%; Chennai: 1.34%; Bengaluru: 1.27%.



Analysis Results

PM2.5 annual mean values in 2020 were significantly higher than the new WHO 2021 standard of 5 $\mu\text{g}/\text{m}^3$ in all studied cities, although there was a decrease due to closure of economic activities (lockdown) etc. due to new coronavirus infections (COVID 19) The 2005 standard of 10 $\mu\text{g}/\text{m}^3$ is also exceeded.

Comparing COVID-19 infection rates, values are low in Bangkok and Manila, where PM2.5 values are stable throughout the year. In contrast, infection rates are higher in Delhi, Mumbai and Jakarta, where PM2.5 is consistently high.

In terms of mortality, the value in Mumbai exceeded 2%; mortality was higher in Delhi, Kolkata, Mumbai and Jakarta, where PM2.5 values were higher, so it is likely that PM2.5 played a role in the severity of COVID 19, but other factors will also be analysed and clarified.