



Practice

Perspective

Face mask - An essential armour in the fight of India against COVID-19

Face masks, in the last year or so, have covered a space in public discussion and political debate, which is larger than ever before. To use or not to use and what is an appropriate situation to use face masks constitute some of these discourses. This renewed focus on face masks has come about with the advent of COVID-19. Respiratory infections occur through the transmission of microorganism-containing droplets ($>5-10\ \mu\text{m}$) and aerosols ($\leq 5\ \mu\text{m}$) exhaled from infected individuals during breathing, speaking, coughing and sneezing, the risk of which can be reduced by wearing face mask¹.

The use of face masks at the community level for disease prevention can be traced back to the time of the Manchurian plague (1910-1911)². During this epidemic, the team working on the containment of the disease, suspected airborne transmission of this pneumonic plague and encouraged people to wear gauze masks in addition to quarantining the patients². A few years later, during the 1918 influenza pandemic, inappropriately popularized as Spanish flu, the use of multilayered gauze masks was touted as a prevention tool in Western countries. Unfortunately, the subpar quality and to some extent public reluctance towards using masks were responsible for its poor impact^{3,4}. Almost a century later, with new discoveries and advancements in knowledge of infectious diseases, face masks became the first line of defence against severe acute respiratory syndrome (SARS), Middle East respiratory syndrome (MERS) and now the COVID-19 outbreak caused by the novel coronavirus SARS-CoV-2^{1,5,6}.

In the early days of the COVID-19 pandemic, there were many unknowns about the transmission mode of the virus. Despite this, the East Asian countries such as Hong Kong, Taiwan and South Korea swiftly enhanced wearing of face masks in public places⁷⁻⁹. This behaviour stems from their previous encounters with the epidemics of coronaviruses¹⁰. Contrastingly,

in the West, initial hesitation from some of the government officials to implement mask mandates was associated with a relatively rapid spread of SARS-CoV-2^{11,12}. A study in the United States noted that if face masks were nationally mandated for employees on March 14, 2020, perhaps 19,000-47,000 lives could have been saved by the end of May¹³. A study in Canada estimated a reduction of 25 per cent in weekly COVID-19 cases with mask mandates, and a study in Germany suggested a 40 per cent reduction in daily growth rate of COVID-19 cases with masks^{14,15}.

In India, early advisories related to travel restrictions following the first detection of COVID-19 on January 30, 2020, measures such as screening at the international airports for travellers coming from abroad, flight restrictions, as well as national lockdown since March 24, prevented the COVID-19 numbers from rising rapidly. Subsequently, the use of face masks was encouraged in public. Worth noting against this background is the national serological survey (second round) conducted by the Indian Council of Medical Research across several States, finding only seven per cent of the adult population with antibodies against COVID-19 by mid-September 2020¹⁶, while a similar survey in May-June 2020 identified 0.7 per cent seroprevalence¹⁷. This indicated that a large proportion of the population was yet unexposed and susceptible to the virus. A preliminary analysis of data generated by the third round of the national serological survey, completed in early-January 2021, further indicates that the infection has so far not spread beyond one-fourth of the population and therefore we are far from herd immunity at this stage (unpublished data).

In response to the aforementioned evidence, and in order to keep COVID-19 numbers in check in the festive and winter season, the Government of India launched a *Jan Andolan* campaign to provide targeted nudges *via* posters and billboards at public places or

public service announcements on media platforms. The purpose is to prompt the population towards 'COVID-19 appropriate behaviour'¹⁸. Promoting mask use behaviour is one of the key components of this public health response.

Wearing a mask is not an alternative to physical distancing and hand hygiene, but it is most valuable in scenarios where physical distancing is challenging. Face masks limit the spread of infectious respiratory droplets into the environment. There are three types of face masks available in the market: (i) COVID-19 - cloth masks, (ii) medical masks, and (iii) respirator masks (N95 and N99). The World Health Organization (WHO) recommends cloth masks for general public use, and medical or respirator masks for people at high risk of COVID-19, those with COVID-19 and healthcare workers¹⁹.

Cloth masks block the exhalation of coarse particles and limit the spread of the smaller particles^{20,21}. The filtration efficacy of multilayered cloth masks is 50-70 per cent for respiratory aerosol particles^{22,23}. Effectiveness of cloth mask depends on various factors such as fabric material, number of layers and the fit of the mask. A multilayered cloth mask with at least three layers and a high thread count is preferred²⁴. Cotton blend or other hybrid materials, such as cotton silk or cotton chiffon, are recommended as these have higher filtration than pure cotton^{25,26}. The outer layer of the mask should be of highly hydrophobic material, such as polyester or cotton-polyester blend, to repel the droplets from the environment. The middle layer should also be hydrophobic preferably of non-woven polypropylene fabric, but the inner layer should be hydrophilic to absorb the droplets coming out of the mouth and nose²⁷. Medical masks cover the mouth and nose with a three-layered non-woven material. Medical masks without gap can filter 99 per cent particles larger than 0.3 μm and 75 per cent particles smaller than 0.3 μm ²⁶. N95 and N99 respirator masks are relatively more effective in filtration than the cloth and medical masks. N95 masks without gap can filter 99.9 per cent particles larger than 0.3 μm and 85 per cent particles smaller than 0.3 μm ²⁶.

Strategies to extend the use and reuse of masks depend upon the mask type. Cloth masks are to be washed daily or immediately after use with soap and warm water^{6,28}. Medical masks are generally single use, whereas respirator masks can be cautiously reused after reprocessing during a critical shortage in healthcare

facilities. Vaporized hydrogen peroxide is a relatively reliable and efficient method for decontamination in resource constraint settings, but there are other methods also available such as dry heat pasteurization, ultraviolet irradiation and moist heat²⁹⁻³¹. Further, a relevant point to consider is that the increased use of disposable masks during the COVID-19 pandemic is leading to environmental challenges due to irresponsible dumping³².

Poor air quality has been linked with increased risk of COVID-19 cases. Under stable atmospheric conditions, particulate matters agglomerate with SARS-CoV-2 increasing its permanence and contagiousness in the environment as it travels longer distances³³. A few preliminary studies have reported that people with long-term exposure to air pollution are at risk for higher severity and mortality from COVID-19³⁴⁻³⁷. This is worrisome in the Indian context. The India State-Level Disease Burden Initiative has reported high ambient pollution levels across India, with the annual mean particulate matter <2.5 μm in size levels more than three times the recommended limit of 40 $\mu\text{g}/\text{m}^3$ in several States in north India (Figure)³⁸. Cloth or medical masks are not adequate to protect against air pollution; neither do these provide protection against edge-seal leakage³⁹. N95 or N99 respirator masks are more effective for protection against air pollution⁴⁰, and the associated higher risk of COVID-19. Caution is however, necessary to ensure the quality of face masks if these have to serve their intended purpose well.

It is important to ensure the appropriate use of face mask for it to be effective. A recent survey noted that only 44 per cent of Indians were wearing it properly in compliance with the guidelines. Discomfort and difficulty in breathing were the commonly reported barriers against the use of face mask⁴¹. There are ways to improve the comfort of the wearer and mechanisms to avoid breathing difficulty, which could be shared with the public more broadly using appropriate mass communication strategies⁴². A face mask of adequate quality can be used while exercising in places with risk of transmission of respiratory organisms, without any drop in oxygen saturation of the blood⁴³. It is also important to note that mask use is not recommended in children under two years, in individuals with disabilities such as cerebral palsy and in those not able to remove the mask without assistance⁴⁴.

In conclusion, it is important to appreciate that diligent face mask use is a crucial component of the set

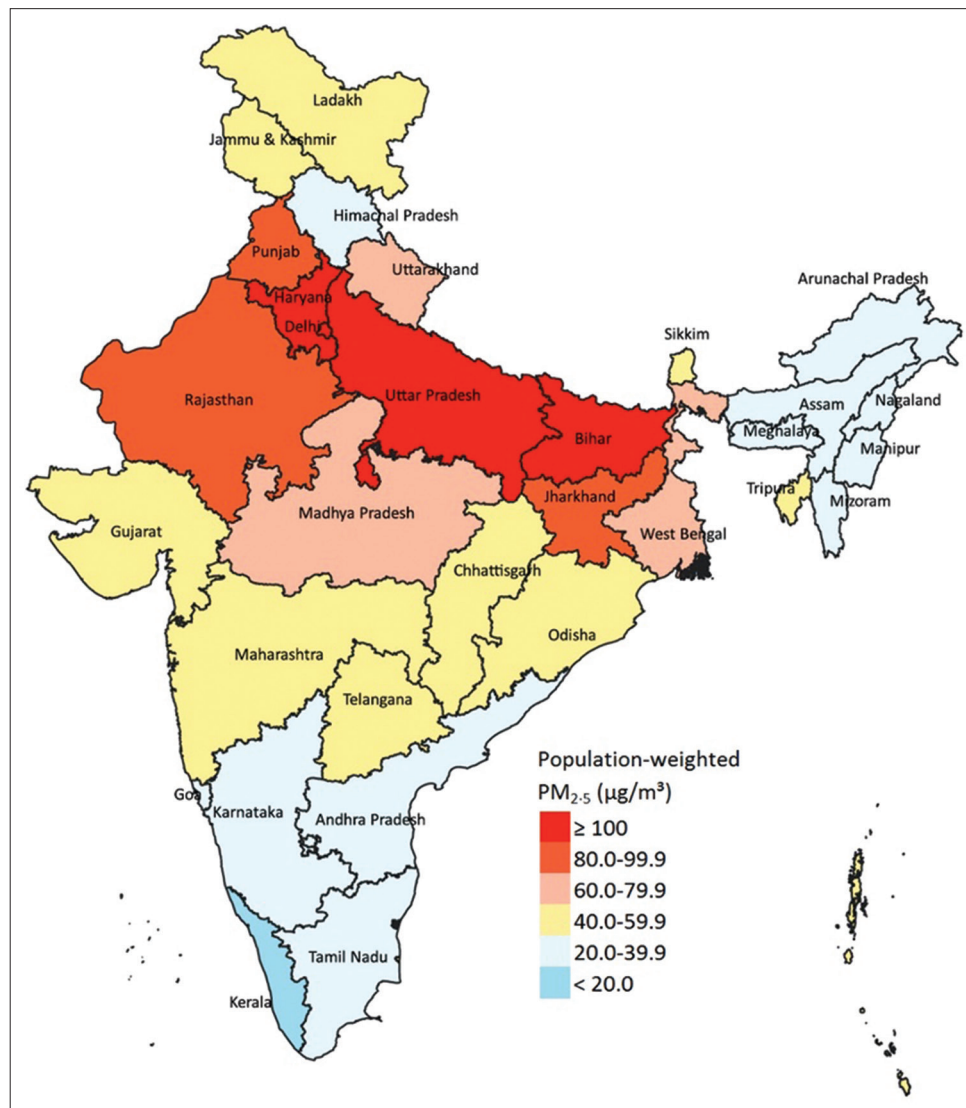


Figure. Annual mean ambient particulate matter $<2.5\ \mu\text{m}$ in size concentration levels in the States of India, 2019. *Source:* Adapted in part from Ref. 38 in accordance with the Creative Commons License (<https://s100.copyright.com/AppDispatchServlet?publisherName=ELS&contentID=S2542519620302989&orderBeanReset=true&orderSource=Phoenix>).

of public health interventions, components of which together build multiple layers of barriers between individuals infected with SARS-CoV-2 and those who are susceptible. Widespread use of face masks coupled with hand hygiene and physical distancing has been found to increase the odds of SARS-CoV-2 transmission control. However, self-reported face mask use has been reported to have increased in some parts of the world separate from government mandates, indicating that supplemental public health interventions are needed to maximize this behavioural change⁴⁵. In addition to limiting the spread of infectious respiratory droplets into the environment, face masks are affordable, easy to use and practical where physical distancing appears

difficult. A local train or a public bus commuting with daily office-goers within and between cities on a typical day in India is the case in consideration here. In situations of mass religious gatherings such *Kumbh mela* or *Haj* transit stations, wearing face masks would be very useful, but this could be challenging to implement so other preventive measures such as vaccination should also be emphasized in these situations. In addition, face masks also reduce the transmission of other respiratory infections such as influenza and tuberculosis. However, using them is the key. Masks on faces could serve as reminders for others, especially in the current environment when people are experiencing prevention fatigue. People wearing masks thus could not only

help in generating peer pressure but also serving as the agents for social change. It would therefore be ideal if every person living in India attempts to wear a proper face mask diligently in public places for now. Face masks are here to stay for some time, as even with the recent introduction of COVID-19 vaccines, the development of vaccine-induced herd immunity is going to take some time. Finally, it is important to recognize that although vaccinated individuals would have less risk of getting symptomatic SARS-CoV-2 disease, they may still be able to spread the virus to others and should therefore use face mask.

Conflicts of Interest: None.

Samiran Panda^{1,#}, Harkiran Kaur³, Lalit Dandona^{3,†} & Balram Bhargava^{2,*}

¹ICMR-National AIDS Research Institute, Pune 411 026, Maharashtra, [#]Division of

Epidemiology and Communicable Diseases,

[†]Indian Council of Medical Research (ICMR),

New Delhi 110 029, ²Department of Health Research (ICMR), Ministry of Health & Family Welfare, New Delhi 110 001 & ³Public Health Foundation of India, New Delhi 110 017, India

**For correspondence:*

secy-dg@icmr.gov.in

Received November 19, 2020

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