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## Biomass use and COVID-19: A novel concern

Megha Thakur<sup>a,\*</sup>, Esther A. Boudewijns<sup>a</sup>, Giridhara R. Babu<sup>b</sup>, Onno C.P. van Schayck<sup>a</sup>

<sup>a</sup> Department of Family Medicine, Care and Public Health Research Institute (CAPHRI), Maastricht University, P.O. Box 616, 6200, MD, Maastricht, the Netherlands

<sup>b</sup> Public Health Foundation of India, Indian Institute of Public Health-Hyderabad, Bangalore Campus, Bangalore, 560023, India

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### ABSTRACT

Evidence supports the link between air pollution and COVID-19 and thus it is likely that exposure to biomass smoke is associated with COVID-19. The poor, including refugees and migrant workers staying in fragile conditions, are most vulnerable. An outbreak of COVID-19 in a place where the concept of physical distancing is next to impossible could easily overwhelm the public health system. It is thus essential to understand the consequences of being exposed to smoke in relation to COVID-19 infection.

The recent worldwide coronavirus disease-2019 (COVID-19) outbreak leading to a pandemic is a shock for many. It is devastating for many people living in high-income as well as in low- and middle-income countries, making no difference between the background and socio-economic differences of those who are infected. However, people living in the most deprived areas in the world face significant adversities compared to the rest of the population. People living in slums live in proximity to each other and are not able to maintain physical distancing. This will lead to a rapid spread in slums, disproportionately infecting more vulnerable people.

Moreover, most of them are unaware of how to lower their chance of being infected. Even if informed, most of them have no access to either running water or soap. A total lock-down, ordered by governments such as in India and many other countries with large slum communities, imposes greater adversities for slum-dwellers as they have a daily dependence on income in order to keep themselves and their family alive.

An essential but often not so well known issue which might facilitate a considerable outbreak in slum communities is the exposure to indoor smoke. Almost all slum dwellers are exposed to extreme indoor air pollution caused by cooking inside their tiny shacks. Routinely, most women and their young infants are exposed to indoor pollutants during cooking. However, with a total lock-down, the entire family is forced to stay indoors, also during cooking and while men smoke cigarettes inside. It is essential to understand the consequences of being exposed to smoke in relation to COVID-19 infection.

Pollution impairs the first line of defence of upper airways, namely cilia. A person living in an area with high levels of pollutants is thus more prone to develop chronic respiratory conditions and susceptible to any infective agent (Conticini et al., 2020). One of the potential

mechanisms suggested for the association of air pollution and respiratory infections is oxidative stress induced in response to air pollutants (Ciencewiczki and Jaspers, 2007). It can affect the susceptibility and response to viral infections. Research has shown that exposure to air pollutants can reduce the ability of macrophages to phagocytise or inactivate viruses (Ciencewiczki and Jaspers, 2007). Another explanation is that exposure to air pollutants can alter the function of surfactant proteins SP-A and SP-D, which are associated with enhanced susceptibility to respiratory virus infections (Ciencewiczki and Jaspers, 2007). Scientists also suggest suppression of innate immune response and an increased permeability of the pulmonary epithelium in response to exposure to air pollutants (Ciencewiczki and Jaspers, 2007).

Attempts have been made to study the associations between exposure to air pollution or smoking and Severe Acute Respiratory Syndrome coronavirus 1 (SARS-CoV-1), Middle East Respiratory Syndrome coronavirus (MERS-CoV), and Severe Acute Respiratory Syndrome coronavirus 2 (SARS-CoV-2). Analysis of the SARS-CoV-1 outbreak revealed that infected people who were living in more polluted regions in China were twice as likely to die as those in less polluted areas (Cui et al., 2003). A recent study by Conticini and colleagues indicated that a higher prevalence and mortality of COVID-19 in Northern Italy could be partly explained by exposure to a higher level of air pollution (Conticini et al., 2020). Researchers from the United States found significant association between air pollution and COVID-19 deaths (Wu et al., 2020). Interestingly, smoking was found to be significantly associated with MERS-CoV illness (Alraddadi et al., 2014). A recent study among hospitalised patients of COVID-19 from China reported that smokers were fourteen times more likely to die as compared to non-smokers (Liu et al., 2020).

Because COVID-19 has been linked to air pollution and smoking, it

\* Corresponding author. P.O. Box 616, 6200, MD, Maastricht, the Netherlands.  
E-mail address: [meghathakurhp@gmail.com](mailto:meghathakurhp@gmail.com) (M. Thakur).

is likely that there is an association between indoor cooking with biomass and COVID-19 (Afshari, 2020). The poor, including refugees and migrant workers staying in fragile conditions, are most vulnerable (D-19 will not leave b, 2020; Ahmed et al., 2020). They often use solid fuels for cooking and heating inside their poorly ventilated houses, without any chimneys to direct the smoke outside (Ghergu et al., 2016). Therefore, we hypothesize that they are highly susceptible to COVID-19 infection. Because of a lack of readily available evidence, the policy-makers may not prioritise specific actions for this group. However, an outbreak of COVID-19 in a place where the concept of physical distancing is next to impossible could easily overwhelm the public health system.

From a research perspective, there is a need for epidemiological studies to explore the association between exposure to biomass smoke and COVID-19. Strong public health actions, including syndromic surveillance and rigorous testing, must be performed in such communities. Persons with underlying health conditions who have symptoms of COVID-19 should without any delay report to the concerned authorities. The existing scheme to provide the poor with improved cookstoves and cleaner fuels should become a top priority in the long run.

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**Megha Thakur:** Conceptualization, Writing - original draft, Writing - review & editing. **Esther A. Boudewijns:** Writing - review & editing.

**Giridhara R. Babu:** Writing - review & editing. **Onno C.P. van Schayck:** Writing - review & editing.

#### Declaration of competing interests

None.

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