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SHORT COMMENTARY

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Effect of Air Pollution on the Occurrences and Death of COVID-19

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ABSTRACT

Air contamination continues to be the leading environmental risk factor for all causes of death, leading to substantial years of lives and economic decline adapted to incapacity increased deaths in air pollution in past pandemics, in 1918, Spanish Flu and in 2003 with SARS-CoV-1. The host susceptibility and respiratory virulence are increased and viral clearance is decreased. Therefore, there is a question about the effect of air contamination on the current 2019 coronavirus pandemic (COVID-19). History and research have until now been concerned with the huge potential consequences of the COVID-19 air pollution pandemic. In order to validate this correlation, more epidemiological and environmental research is necessary. Moreover, countries must leverage air emissions reduction funds to benefit their wellbeing and enhance their possible impact on future pandemics.

KEYWORDS: COVID-19, Air Pollution, Particulate Matter (PM), Household Air Pollution (HAP)

INTRODUCTION

The Earth is currently affected by a global health crisis, which this year is estimated to cause 4.2 million or more deaths; that of air pollution. The most significant environmental risk factor for all-cause mortality is contaminated air. The risk is increased at least 100 million disability-adjusted (DALY) which USD225 billion annually and has also raised by cancer, chronic pulmonary and cardiovascular disease.[1] The morbidity caused by air pollution and its effect on today's condition should not be ignored in the middle of our alarming coronavirus pandemic. Mortality from air pollution, especially during pandemics, cannot be understated. The devastating 1918 Spanish Influenza Pandemic saw a 10% increase in mortality in large coal-capacity cities. Patients who were living in regions of elevated air pollution indices (API) had a 200% higher relative risk of mortality than people in areas with low API during the new century pandemic of serious respiratory syndrome related to Coronavirus-1 (SARS-CoV-1 in 2003).[2] However, 91% of the world's population remains in regions outside the minimum air pollution standards of the World Health Organization. Therefore, is there a doubt whether air emissions will affect current 2019 coronavirus pandemic (COVID-19)?

Effects of air pollutants on host susceptibility to infection: Air pollutants increase host susceptibility to respiratory virus infections by increasing viral receptor sepsis and decreasing surfactant intake.[3] It also reduces viral clearance by deteriorating the antigen and phagocytoses caused by macrophages, expression of normal, cytototoxic T cells and the proliferation of viral products, which adversely affect the capacity of the host to respond properly to infections. Moreover, air pollution increases the virulence of respiratory diseases. The minimum infectious dose of murine cytomégalovirus has decreased by 100 and the infection of rhinovirus has increased as the viral receptor is increased. In Italy, there has been a rise in NO2 environmental standards, along with a 4 percent spike in acute respiratory infections.[3] Particles of less than 2.5 µm (PM2.5) in diameters can mitigate the spread of the virus by inducing alveolar macrophage releases of IL-1, IL-6 and TNF-α to cause significant pro-inflammatory conditions.

This can lead to a minimization of pigmentation. The resulting inflammation will result in damage to the pulmonary morbidity and asthma (PMD) and an increase in susceptibility to cardiac disease, not just because asthma can be caused by heart disease, but because it modifies the autonomous process and accelerates atherosclerosis. In addition, the Enzyme 2 receptor (ACE2) transforming angiotensin is regulated by high sub chronic exposure to particles that play a major role in the airborne epithelial infestation of the SARS-CoV-2 virus.[4] A statistically significant link was also seen between ARDS and air

quality such as PM2,5, ozone, and in particular adults in the elderly. The ARDS has also been seen. For COVID-19, the high death rate of ARDS is significant.[5]

Household air quality predisposal: The impact of household air contaminants (HAP) on sensitivities to respiratory infections is sometimes overlooked. HAP accounts for almost 16% of the worldwide burden of environmental waste. Their consequences can also not be underestimated, as 3.55 million deaths occurred in 2010. In tandem with contiguous smoking tobacco, a third of the world uses strong fuel for cooking and heating, which can intensify inflammatory illnesses and lead to acute lower respiration issues. HAP can cause dysregulation of antioxidants: oxidizing ratio, reduction of antioxidants and the promotion of oxidant tension. This alteration in the natural lung is possible to lead to an increased risk of pulmonary infections and the defence mechanism of HAP for combating lung infections is also being altered. Cigarette smoke for example will increase the receptor-dependent connection between *streptococcus sp.* and the respiratory epithelium. The level of HAP deprivation, and the total spread of poverty and HAP, is indissolubly linked to low socioeconomic conditions. The risk of these exposures could be higher, particularly in developing and urban poor people in rich countries throughout the world, with more extreme COVID-19 outbreak.[6]

Early proof of COVID-19: So far the history and science of the COVID-19 pandemic have been directed at an immense impact in future for air pollution. Any of the most devastated countries, including China, Northern Italy and New York, have an index of poor air quality. In northern Italy Lombardy and Emilia-Romagna are especially important as one of the most polluted regions in Europe. In this region, the mortality rate was 12% compared with 4.5% elsewhere in Italy.[7] In reality, the increase in the mortality rate of COVID-19 was found to increase by 8% in the US, and by 15% in New York alone, over more than 3,000 counties.[5] The frequency and mortality of COVID-19 is likely to be optimistic as with pandemics. This theory needs more epidemiological tests. In four European countries, Italy, France, Spain and Germany, study recently measured tropospheric NO_2, which is an atmospheric pollution marker. Synthesis of pro-inflammatory cytokines that are linked with increased COVID-19 mortality was associated with prolonged sensitivity to NO_2 to background conditions such as high blood pressure. 78% of all deaths in Italy and Spain revealed that air quality was concentrated, around five fatality hotspots found.[7] In England, London and the Midlands with the largest concentration of air pollutants had highest injury and fatality rates.[8] The contrary has been seen in regions with less air pollution to endorse this idea. Indeed, SARS-CoV-2 RNA was isolated from particulates in a sample in Bergamo, Northern Italy, which indicated a level playing field to the air quality particle matter for COVID-19. This can be used as a possible reason for higher COVID-19 load in high air quality areas as well as a proxy for recovery of diseases.[9]

Imperative measures: The evidence above should be a wake-up call to policymakers concerned with global health. Many environmental authorities have failed to react to air pollution, particularly when air pollution is increasingly seen to have an effect on past, present, and nearly certain future pandemics. The Paris Agreement, which calls for climate change to have less of an impact, is a central part of their success. In order to mitigate the impacts of COVID-19 and improve human wellbeing, but also to curb climate change, it is now necessary to consider the worldwide linkages of climate and air pollution as well as to reduce air pollutants by aggressive and more relevant policies.

CONCLUSION

The relation between air pollution and mortality is a sobering glimpse into the unprecedented economic and social upheaval caused by SARS-CoV-2. The Paris Agreement, which alone reduces pollution and saves up to a million lives every year, should remain confirming its commitment to the global war on climate change. Countries should maximize funding for reducing air emissions, implement innovative satellite imaging pollution management technology and build cross-sector pollution protection networks for betterment of health and enhancing potential effects on current and future pandemics.

REFERENCES

1. Cohen AJ, Brauer M, Burnett R, Anderson HR, Frostad J, Estep K, et al. Estimates and 25-year trends of the global burden of disease attributable to ambient air pollution: an analysis of data from the Global Burden of Diseases Study 2015. The Lancet.

2017;389(10082):1907-18. https://doi.org/10.1016/S0140-6736(17)30505-6
2. Cui Y, Zhang Z-F, Froines J, Zhao J, Wang H, Yu S-Z, et al. Air pollution and case fatality of SARS in the People's Republic of China: an ecologic study. Environ Health. 2003;2(1):15. https://doi.org/10.1186/1476-069X-2-15.
3. Faustini A, Stafoggia M, Colais P, Berti G, Bisanti L, Cadum E, et al. Air pollution and multiple acute respiratory outcomes. Eur Respir J. 2013;42(2):304-13. https://doi.org/10.1183/09031936.00128712
4. Lin C-I, Tsai C-H, Sun Y-L, Hsieh W-Y, Lin Y-C, Chen C-Y, et al. Instillation of particulate matter 2.5 induced acute lung injury and attenuated the injury recovery in ACE2 knockout mice. Int J Biol Sci. 2018;14(3):253-65. https://doi.org/10.7150/ijbs.23489
5. Wu X, Nethery RC, Sabath BM, Braun D, Dominici FJM. Exposure to air pollution and COVID-19 mortality in the United States: Strengths and limitations of an ecological regression analysis. Sci Adv. 2020;6(45):eabd4049. https://doi.org/10.1126/sciadv.abd4049.
6. Gordon SB, Bruce NG, Grigg J, Hibberd PL, Kurmi OP, Lam HKB, et al. Respiratory risks from household air pollution in low and middle income countries. Lancet Respir Med. 2014;2(10): 823–60. https://doi.org/10.1016/S2213-2600(14)70168-7.
7. Thomas KV, Bijlsma L, Castiglioni S, Covaci A, Emke E, Grabic R, et al. Comparing illicit drug use in 19 European cities through sewage analysis. Sci Total Environ. 2012;432:432-9. https://doi.org/10.1016/j.scitotenv.2012.06.069.
8. Travaglio M, Popovic R, Yu Y, Leal N, Martins LM. Links between air pollution and COVID-19 in England. Environ Pollut. 2021;268(Pt A):115859. https://doi.org/10.1016/j.envpol.2020.115859.
9. Setti L, Passarini F, De Gennaro G, Barbieri P, Perrone MG, Borelli M, et al. SARS-Cov-2RNA found on particulate matter of Bergamo in Northern Italy: first evidence. Environ Res. 2020; 188: 109754. https://doi.org/10.1016/j.envres.2020.109754

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