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COVID-19 Pandemic and Environmental Health: Effects and the Immediate Need for a Concise Risk Analysis

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ABSTRACT: COVID-19 pandemic, as another disease emerging in the interface between animals and humans, has revealed the importance of interdisciplinary collaborations such as the One Health initiative. Environmental Health, whose role in the One Health concept is well established, has been associated with COVID-19 pandemic via various direct and indirect pathways. Modern lifestyle, climate change, environmental degradation, exposure to chemicals such as endocrine disruptors, and exposure to psychological stress factors impact human health negatively. As a result, many people are in the disadvantageous position to face the pandemic with an already impaired immune system due to their exposure to environmental health hazards. Moreover, the ongoing pandemic has been associated with outdoor and indoor air pollution, water and noise pollution, food security, and plastic pollution issues. Also, the inadequate infrastructure, the lack of proper waste and wastewater management, and the unequal social vulnerability reveal more linkages between Environmental Health and COVID-19 pandemic. The significant emerging ecological risk and its subsequent health implications require immediate risk analysis and risk communication strategies.

KEYWORDS: COVID-19, pandemic, Environmental Health, One Health, risk analysis, risk communication

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Introduction

Four months after the first confirmed case of COVID-19 in Wuhan, China, on November 17, 2019, the World Health Organization acknowledged this new coronavirus disease as a global pandemic.¹ Since then, due to international commercial connections and traveling, the disease has rapidly spread all over the world, with 96 906 712 confirmed cases and 2 075 902 deaths (January 21, 2021, UTC 08:46).²

COVID-19 constitutes another fatal disease emerging in the interface between animals and humans; scientific community should, therefore, reconsider the importance of the One Health concept, which embraces interdisciplinary initiatives aiming at simultaneously protecting animals, humans, and the natural environment.^{3–6} The role of the Environmental Health—defined as the branch of public health dealing with all the environmental factors with a potential impact on health, such as physical, chemical, biological, social, and psychological factors—in the One Health concept initiative is well established.^{4,7,8}

How Environmental Health is Associated with COVID-19

Modern lifestyle may negatively affect our health.⁹ As a result, many people may be in the disadvantageous position to face the pandemic with an already impaired immune system due to

their exposure to environmental health hazards. Starting from the intrauterine life period, humans are in a constant exposure—willingly or not—to various endocrine-disrupting chemicals, mutagens, carcinogens, hazardous radiation, and psychological stress factors that interact with their immune system.^{10–16} Moreover, food and water security issues, climate change, as well as water, soil, and air pollution are only a few environmental factors with known detrimental effects on human and animal health.^{17–20}

A very important factor with a well-studied detrimental effect in the respiratory system and overall physical state is the low quality of urban air.^{21,22} It is well known that aerosols carry pathogens attached to their surface; moreover, particulate matter contributes to the pathogenesis of pulmonary and cardiovascular diseases, and various types of cancer.^{23–29} Indeed, an association between urban air quality and COVID-19 morbidity and mortality has already been reported, increasing the concern about the potential aerosol transmission of COVID-19.^{30–33} This negative association may also be determined by other environmental factors, such as meteorological conditions including temperature, wind speed, and air relative humidity.^{34,35}

Of note, during the pandemic, in addition to the reduction in noise pollution levels, a reduction in the emission of urban air pollutants was documented; this was attributed mainly to the



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reduction of circulating vehicles due to lockdown measures, thus temporarily improving air quality.³⁶⁻³⁹ On the contrary, indoor air quality has been negatively affected, as a result of the intensification of common domestic activities.^{40,41} Moreover, due to the wide use of disinfectants, masks, and gloves, both the release of many chemical agents in the aquatic environment and plastic pollution are expected to increase greatly.^{42,43} The environmental footprint of the pandemic needs to be thoroughly assessed concurrently with its evolution, and appropriate interventions should be applied. For instance, biomonitoring of many chemical disinfectant agents in aquatic organisms may reveal new environmental health hazards and food security issues.

Furthermore, another challenge to be met is the proper management of medical waste. This could amount to a significant emerging ecological risk to natural ecosystems, especially in areas with no reliable waste management planning or with inadequate relevant infrastructure.⁴⁴ Moreover, the potential transmission of COVID-19 through wastewater requires special attention.⁴⁵ Close monitoring of household waste management should also continue.

The social determinants of Environmental Health, such as low income, poor housing, lack of access to safe drinking water and food, poor hygienic conditions, and inadequate infrastructure significantly interact with the ongoing pandemic as evident by the significant spread in low-income areas not only in Latin America and Asia but in the developed world as well.⁴⁶⁻⁴⁹ These conditions also determine the gravity of the pandemic impact. There are many challenges to be met, such as in the case of living conditions in the developing countries and in areas with clustering of vulnerable populations, for example, refugee camps.^{50,51}

The Immediate Need for Risk Analysis and Risk Communication

Nobody is able to predict the precise outcome of the ongoing health crisis. However, its multidimensional impacts can be mitigated through effective strategies; an inter-disciplinary approach is essential. The One Health concept, aiming at protecting the Environmental Health, may offer a necessary inter-disciplinary arsenal for sustainable management of this and future health crises.

Already-fragile healthcare systems, such as in the case of sub-Saharan countries, find it harder to cope with current pandemic.⁵² Decision-makers should never forget that these countries are obliged to simultaneously deal with other serious health threats such as malaria outbreaks.⁵³

Moreover, the importance of the non-pharmaceutical intervention has been clearly outlined in recent guidance.^{54,55} The prospect of adverse environmental effects of similar and novel interventions should be further discussed within the context of One Health and the prospect of inevitable future pandemics. Both improvement of the health status of the general population, and protection of the aggregate of the environmental factors that

affect both directly and indirectly human health are of paramount importance against the ongoing and future health crises.

Conclusion

In conclusion, the ongoing pandemic may be associated with significant environmental health hazards that need continuous risk analysis and management via the collaboration of all relevant stakeholders. Risk communication strategies will enhance the understanding of the importance of such interventions by lay people and policy makers. Diseases of zoonotic origin, such as Ebola Virus Disease and COVID-19, are constantly revealing the significance of the One Health concept.

Humanity should stand united in the fight against this and future pandemics realizing that this is a multi-faceted effort at many fronts demanding interdisciplinary collaboration. Environmental Health is one of the most important ones.

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