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A Systematic Literature Review of the Impact of COVID-19 Lockdowns in India

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Abstract:
The COVID-19 pandemic has created the largest disruption of education systems in human history, affecting nearly 1.6 billion learners in more than 200 countries. Closures of schools, institutions and other learning spaces have impacted more than 94% of the world's student population. This has brought far-reaching changes in all aspects of our lives. Social distancing and restrictive movement policies have significantly disturbed traditional educational practices. Reopening of schools after relaxation of restriction is another challenge with many new standard operating procedures put in place.
Within a short span of the COVID-19 pandemic, many researchers have shared their works on teaching and learning in different ways. Several schools, colleges and universities have discontinued face-to-face teachings. There is a fear of losing 2020 academic year or even more in the coming future. The need of the hour is to innovate and implement alternative educational system and assessment strategies. The COVID-19 pandemic has provided us with an opportunity to pave the way for introducing digital learning. This article aims to provide a comprehensive report on the impact of the COVID-19 pandemic on online teaching and learning of various papers and indicate the way forward.

I INTERDICTION

The first novel coronavirus (COVID-19) outbreak was reported in Wuhan, China, in December 2019 (Filonchyk et al., 2020; He et al., 2020; Le et al., 2020; Ghahremanloo et al., 2021). Subsequently, COVID-19 has become a serious public health threat worldwide as it transmitted rapidly and caused millions of infections and deaths, especially among the elderly. Therefore, it has been declared as a global pandemic by the World Health Organization (WHO; Gautam, 2020). As of 23 March 2021, COVID-19 had affected 124 million people in 192 countries and territories with 2.7 million deaths around the world (Johns Hopkins University, 2021). COVID-19 is an infectious disease that transmits from human to human through direct contact, droplet and aerosol transmission (Fernandez-Montero et al., 2020; Wang and Du, 2020). To prevent the spread of this infectious disease, the Chinese government took a nationwide contingency plan (followed by other nations) to restrict human activities. More specifically, the Chinese government implemented widespread restricted road traffic and human activities in late January

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to early February 2020 (Chen et al., 2020c). Similar measures have been taken by most of the countries of the world in the form of restricted transportation, and closing of business, economic, social, educational, cultural and recreational activities to control the transmission of the virus (Dantas et al., 2020). During the lockdown, economic activities decreased dramatically, and people were isolated in their homes. Within a short period of time, environmental researchers noticed the positive side effect of the lack of human economic activity. Lockdown measures resulted in the improvement in air quality, as air pollutants such as particulate matter with a diameter of 10 µm or less (PM10), particulate matter with a diameter of 2.5 µm or less (PM2.5), sulphur dioxide (SO2), carbon monoxide (CO), and nitrogen dioxide (NO2) decreased significantly (Fan et al., 2020a; Filonchyk et al., 2020; Lian et al., 2020; Nichol et al., 2020; Pei et al., 2020). Air pollution is a significant environmental health threat to humans. According to the WHO (2016), ambient air pollution caused 4.2 million deaths worldwide and 81 deaths per 100,000 population in China in 2016 (WHO, 2016). Air pollution is a serious concern in China (Dong et al., 2019). In 2016, the country contributed 33%, 24%, and 31% of the world's total emissions of SO2, NO2, and CO, respectively. Nationwide social lockdowns imposed by the national and provincial Chinese governments created an opportunity to evaluate changes in air quality. It is assumed that a decrease in human activities reduce pollutant levels in the atmosphere significantly. The impact of lockdown on China's air quality, which has a significant effect on global air quality, cannot be ignored. This positive impact of lockdown in terms of improvement in air quality in China (ranked 11th based on the average PM2.5 exposure) has not yet been identified adequately in the existing literature. In addition, there are significant heterogeneities in reported changes in the concentration of air pollutants in China during COVID-19 lockdowns. This calls for a comprehensive synthesis of the existing research. Several recent studies called for further research on this context (Chen et al., 2020c; Ming et al., 2020). There are several reasons for selecting China as the study setting. Firstly, with almost 1.4 billion people, China is the most populous country in the world (World Bank, 2017). Secondly, 48 Chinese cities featured among the 100 most polluted cities globally in 2019 (IQAir, 2020). Thirdly, China has an advanced nationwide air pollution monitoring system ensuring the availability of meticulous data (IQAir, 2020). Lastly, due to the COVID-19 outbreak, China imposed very strict lockdown measures in many cities and regions. Therefore, this study attempts to analyze evidence from scientific research articles on the extent of the improvement in China's air quality due to COVID-19-related lockdowns. The objective is to provide a quantitative as well as a narrative synthesis of the recent evidence from the published literature that reported on changes in air quality in China during COVID-19 lockdowns.

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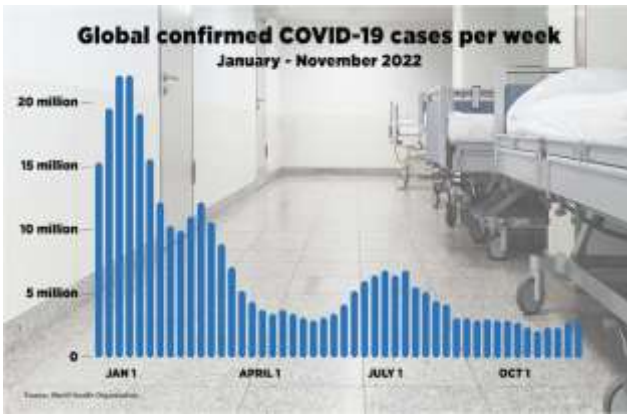

Given the differences in the impacts of partial or full lockdown on China's air quality at the national, provincial and regional level, the current study presented a systematic literature review based on a comprehensive analysis of 35 research articles published since February 2020. This study considered two key issues: Did partial or full COVID-19-related lockdowns improve China's air quality significantly? And what is the level of improvement in air quality measured in terms of the reduction of PM2.5, PM10, SO2, CO, ozone (O3) and NO2 and does it differ across China? The findings of this study may serve as reference for improvement in air quality due to lockdown measures and thus be helpful to policymakers for post-pandemic air quality management.

II RELATED WORK

Coronaviruses establish the subfamily Orthocoronavininae inside the family Coronavidae, and belong to the order Nidovirales, and the realm Riboviria [3]. They are encircled and the most acknowledged RNA virus until date with a nucleocapsid and a superb-experience single-stranded RNA genome with the genome length ranging from * 27 to 34 kilobases [1, 39]. A two-dimensional view of Corona beneath a transmission electron microscopy reveals a characteristic look of ‘‘paying homage to a crown’’ around the virions. [7] This lead to naming the virus ‘‘Corona’’, meaning ‘‘crown’’ or ‘‘halo’’ in Latin. As its RNA patten is closer to SARS, the 2019 Coronavirus is renamed as SARS-CoV-2 pandemic. In 2003, SARS-CoV killed almost 10% of total affected patients (8429) across 29 international locations. MERSCoV was found to be even more lethal with a mortality rate of 30% of the infected patients [35]. Comparatively, the mortality rate of SARS-CoV-2 is very less (2.9%) albeit resulting in a massive outbreak with 491,271 confirmed cases and 22,165 deaths across 198 countries, as on 26th March 2020. This exponential death rate across different regions might not be as serious as Black death which killed around 75 million people in the fourteenth century and Influenza which resulted in 50 million death in 1918 [1], but if proper precautions are not taken there might be a greater chance of SARS-CoV-2 becoming the most devasting pandemic disease of the twenty-first century. In order to overcome the above disastrous scenario and serve as an aid to the healthcare researchers and the Government administrators, our work presents a systematic literature review (SLR) and a comprehensive analysis of 38 research articles on Coronaviruses 2019 (COVID-19). An integrated Research Focus Parallel-ship Network (RFPN) and Keyword Co-Occurrence Network (KCON) is formulated to visualize the major research themes in

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COVID-19 literature. The rest of this paper is organized as follows: ‘‘Systematic literature review’’ section presents the SLR and co-occurrence network analysis. The ‘‘A Comprehensive analysis of reviewed papers’’ section reports a comprehensive analysis of the reviewed papers in consideration with the origin, mutational outbreak and the modes of transmission of SARS-CoV-2, the intervention/control and precaution measures taken by the different counties across the globe against the exponential pandemic growth.

III DRUGS AND TREATMENT PLANS OF COVID-19

The various drug and treatment plans published by different researchers to fight against COVID-19 are compiled. Deng et al. [11] reported a treatment plan based on Arbidol and Lopinavir/Ritonavir (LPV/R). Clinical observation for a period of 5–21 days between Jan 17, 2020, to Feb 13, 2020, was carried out for COVID-19 confirmed patients without invasive ventilation. The patients were administrated Oral Arbidol and LPV/R in combination and monotherapy groups. Chest CT, taken to check pneumonia on Day 7 and Day 14, exhibited a drastic improvement on the patients in the combined group with Arbidol and LPV/R. 94% success rate was observed in the combination group than the monotherapy group (30% success rate). Lai et al. [22] and Zhang et al. [48] reported different forms of COVID-19 such as Pneumonia, Acute Respiratory Disease and Asymptomatic Carrier State. They observed that the highest infection rate is with adults followed by neonates, elderly patients and, children. Ground-Glass Visibility Bilateral interaction was observed in the Chest Imaging of the infected patients. They advocated the usage of drugs such as Remdesivir and Chloroquine to prevent the COVID-19 infection. However, these drugs had no impact on curing COVID-19 infection. Luo et al. [30] proposed the use of the Chinese medicines (CM) containing herbs like radix-astragali, radix-glycyrrhiza, radix-saposhnikoviae, Fructus Forsythia, Lonicerae Japonicae Flos and Rhizoma Atractylodis Macrocephalae to treat COVID-19. These herbs were found effective against SARS and H1N1 Influenza. Evidence from clinical trials, surveys or other population tests suggests that CM are effective to deter infectious respiratory virus diseases. The analysis showed that the CM Category had smaller side effect than the Non-CM Category (Relative Chance 0.36). Chen et al. [7] suggested a treatment plan against COVID-19 based on the transplantation of Mesenchymal Stem Cells (MSCs), which was implemented successfully for the treatment of Virus-Induced Pneumonia and H7N9- Induced ARDS in 2013. 44 Patients with H7N9-induced ARDS were segregated as a Control Group and 17 patients with H7N9-induced ARDS served as an experimental community of Allogeneic Menstrual-Blood-derived MSCs. It was notable that MSCs transplantation greatly decreased the death rate of the experimental community (17.6%) compared to the control group (54.5%). Since H7N9 and COVID-19 share similar

symptoms resulting in multi-organ failure, MSC-based treatment could be a possible alternative for COVID-19 treatment. Shereen et al. [40] analysed the development and pathogenicity of COVID-19 and the prior human coronaviruses-SARS and MERS. They also reviewed the approaches for developing effective vaccines and therapeutic combinations to cope with this viral outbreak. Yuli et al. [45] highlighted the clinical research performed by Dr. Sulianti Saroso, Infectious Disease Hospital, utilizing biochemical assays. The biological samples were obtained from 13 patients with MERS-CoV infection. Viral RNA was insulated and transformed to C-DNA, and used as the guide to identify 12 viral panels based on traditional PCR and sequencing. Viral etiological agents found in patients were Human Metapneumovirus, Enterovirus D68, Rhinovirus C, HCoV 229E, Herpes Simplex Virus Type 1, H1N1, H3N2, Dengue Virus and Rhinovirus A60. The genomes of nine viral agents within various taxa were identified in the MERS-CoV patients, including human metapneumovirus, influenza virus, coronavirus, herpesvirus enterovirus, and paramyxovirus. This study highlights the need for a detailed examination to encounter other secondary viruses that cause more damage than COVID-19. By this method, the mortality rate of COVID19 can be controlled by treating the secondary catalyst viruses responsible for demises.

IV CONCLUSION

This work, a SLR and a comprehensive on COVID-19 are conducted CON analysis determines the three major research themes in the COVID literature as (1) the origin, symptoms and modes of transmission of COVID-19, (2) intervention and mitigation strategies against the spread of COVID-19 and traumatization among the public and (3) drugs and treatment plans of COVID-19. Our comprehensive analysis reveals that COVID-19 originated from the bats and transferred from Wuhan meat market, Hubei province, China through zoonotic mode of transmission. The epidemiological investigation confirms that COVID-19 involves both the asymptomatic and symptomatic transmission with a communicable period of fewer than 3 weeks. The common symptoms include shortness of breath, fever, sputum production, dry cough, sore throat, fatigue, nausea/vomiting, muscle or joint pain, nasal congestion, headache, chills, and diarrhoea. The intervention and mitigation strategies implemented by the governments against the spread of COVID-19 are city lockdown, border closing, strengthening the surveillance to identify the imported COVID-19 cases from other countries, establishing adequate medical team on a rotation basis, reducing patient attendance in hospitals by rescheduling non-critical surgeries, providing e-health care to public, suspicious accidents monitoring, contract tracking and improved airport security hand hygiene, appropriate use of personal protective equipment, universal masking, and creating transparency and public access to disease data using maps/cartograms. For eradication of the COVID-19, the following drugs and treatment plans are proposed in the literature. Nutrition and immunity

enhancers such as Omega-3 polyunsaturated fatty acids (PUFA), Zinc, Vitamin A and C, Chinese medicine, etc., and treatment plans such as Arbidol, Lopinavir/Ritonavir, Convalescent plasma and Mesenchymal Stem Cells and drugs including Remdesivir, Hydroxychloroquine, azithromycin and Favipiravir are analyzed. The development of COVID-19 cured people's RNA-virus related vaccines and avian infectious bronchitis (IBV) vaccine are still under study. We conclude by stating that the current work can serve as an aid to health-care researchers in developing the anti-viral vaccine against COVID-19 and helps the administrators in controlling the spread of COVID-19.

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