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A REVIEW ON IMPACT OF COVID 19 ON AMBIENT AIR QUALITY OF DIFFERENT COUNTRY DURING THE LOCKDOWN

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ABSTRACT
The COVID-19 pandemic has caused unprecedented disruptions worldwide, including the implementation of lockdowns and travel restrictions. This study examines the impact of COVID-19 lockdowns on ambient air quality in different countries. The study analyzes air quality data from various monitoring stations in different countries before, during, and after the lockdowns. The results indicate that the lockdowns have led to a significant reduction in air pollution levels, mainly due to reduced vehicular traffic and industrial activities. The study finds that the largest reductions in air pollution levels were observed in highly industrialized countries such as China and India, where air pollution levels are typically high due to heavy industries and transportation. In contrast, the impact of lockdowns on air quality was less pronounced in less industrialized countries with relatively lower levels of air pollution. Overall, this study highlights the effectiveness of lockdowns in reducing air pollution levels, providing evidence for policymakers to consider long-term strategies to maintain a cleaner environment.

Air quality in different country during lockdown

COVID 19 is pandemic which affect the human life globally. Due to lockdown human being restricted to outing from home to control the disease. Most of the industries and transport were freeze due to lockdown which cause extreme changes in air quality across the world. China notified the World Health Organization (WHO) of multiple cases of atypical pneumonia in Wuhan, a metropolis with a population of 11 million people in central Hubei Province, on December 31, 2019. SARS-CoV-2, a brand-new virus, was discovered on January 7, 2020. (WHO, 2020a). To stop the spread of COVID-19, Chinese authorities closed down public transportation, educational institutions, business hubs, parks, and other places where people congregate (Muhammad et al. 2020). The World Health Organization (WHO) confirmed that COVID-19 was transmitted from person to person by respiratory droplets in January 2020. (WHO, 2020). Later that month, authorities reported a cluster of COVID-19 cases in Wuhan. The outbreak quickly spread throughout the entire nation and developed into an epidemic (Dutheil et al., 2004). So because of this restriction in public transport, industrial shutdown and outing, scientist of many countries examined the ambient air quality. After the lockdown, Wuhan's average monthly air quality index (AQI) was 59.7, which is 47.5% lower than the same time from 2015 to 2019 (113.6) and 33.9% lower than it was before the closure (January 23, 2020). Compared with the conditions before the lockdown, fine particulate matter (PM2.5) decreased by 36.9% and remained the main pollutant. The biggest drop in nitrogen dioxide (NO_2) was around 53.3%, and ozone (O_3) climbed by 116.6% (Lian et al 2020). Further research in China revealed that there may not have been any appreciable reductions in SO_2 and CO concentrations because life-sustaining businesses, including as thermal power plants and the heating industry, continued to operate throughout the epidemic (Song et al, 2021). According to the findings in shanghai, each station's NO_2, PM2.5, PM10, and SO2 levels decreased by between 30 and 40% during the COVID-19 epidemic compared to 2018–2019. At roadside and non-roadside stations, CO exhibited a modest drop of 28.8% and 16.4%, respectively. On the other hand, O_3 concentrations rose by 5.7% and 30.2%, respectively, at non-roadside sites (Wu et al, 2021). We discovered that air quality significantly improved after city lockdowns. Within a short period of time, the locked-down cities' AQI decreased by 19.84 points (PM2.5 decreased by 14.07 g m3) in comparison to the control group. In addition, the use of other kinds of anti-virus measures resulted in an improvement in air quality in cities without explicit lockdowns. Le et al (2020) stated that during the coronavirus disease 2019 (COVID-19) pandemic in China, there was no motor vehicle traffic and no production, which made it possible to evaluate the effectiveness of air pollution control. Satellite and

ground-based studies show that some emissions decreased by up to 90% during the city-lockdown. Extreme particle matter levels unexpectedly appeared at the same time in northern China.

On February 25, 2020, the first COVID-19 case in Brazil was officially confirmed (Dantas et al, 2020). In comparison to the five-year monthly mean, significant decreases in NO (up to 77.3%), NO_2 (up to 54.3%), and CO (up to 64.8%) concentrations were seen in the urban area during partial lockdown. On the other hand, an increase of Urban regions with heavy traffic saw an increase of 30% in ozone concentrations, which is likely connected to falling nitrogen monoxide levels. Although the partial lockdown helped to improve the air quality, it's vital to address the negative repercussions on social aspects, especially in light of the catastrophic economic effects and the deaths brought on by COVID-19 (Nakada et al, 2020), Ghahremanloo et. al, (2021) uses satellite remote sensing to examine how the coronavirus outbreak and the subsequent closure of public places have affected the region's air pollution levels. they studied NO_2, HCHO, SO_2, and CO concentrations, Results indicate that most pollutant concentrations are lower than they were in February 2019. In BTH, Wuhan, Seoul, and Tokyo, respectively, NO_2 levels decreased by about 54%, 83%, 33%, and 19%, which was the most notable drop when compared to other pollutants. The impact of quarantine regulations on Quito, Ecuador's air quality was examined. It was discovered using a parametric approach that NO_2 and PM 2.5 concentrations have dramatically dropped with the implementation of lockout measures. But in 2020, O_3 concentrations have significantly risen (Zambrano-Monserrate et al, 2020). The COVID-19's effects on Indian territory's air pollution from January 2020 to April 2020. Mumbai and Delhi are one of the most populated cities. These two cities have observed a substantial decrease in Nitrogen Dioxide (40-50%) compared to the same period last year (Shehzad et al, 2020). Five Indian megacities (New Delhi, Chennai, Kolkata, Mumbai, and Hyderabad) were evaluated by Ravindra et al, (2021) for $PM_{2.5}$ concentration. During the lockdown, the $PM_{2.5}$ concentration drastically decreased in all megacities and reached the national standards. During the lockdown, Kolkata (62%), Mumbai (49%), Chennai (34%), and New Delhi (26%) saw the greatest reductions in $PM_{2.5}$ levels. Poor air quality in cities is associated with more COVID-19 cases and fatalities ($r = 0.504$ and 0.590 for NO_2; $r = 0.744$ and 0.435 for AQI). On the other hand, cities with higher air quality reported lower mortality rates. These findings indicate a relationship between the COVID-19 sensitive areas and AQI hotspots, which raises the possibility that air pollution may aggravate clinical symptoms of the illness (Naqvi et al, 2021). The PM2.5 and PM10 concentrations showed the greatest reductions (between 40 and 60%). The north-west and IGP saw the greatest reduction in PM, followed by the south and the centre. Except for a few sites in the centre region, there was a significant decline (30-70%) in NO_2. Similar trends were seen for CO with a 20–40% drop. The decrease in PM2.5, PM10, NO_2, and increase in O_3 that was seen were all related to the population density. Despite an increase in O_3, Delhi's air quality has improved due to a considerable drop in main pollutants (Singh et al, 2020). Around Iran, the first case of a new coronavirus was identified in the middle of February 2020. Primary pollutant concentrations (SO_2 5-28%, NO_2 1-33%, CO 5-41%, and PM10 1.4- 30%) decreased with changes in geographic distribution (Broomandi et al, 2020).

During the social withdrawal in response to the COVID-19 outbreak, ambient PM2.5, PM10, NO_2, and CO that are notably associated to industrial activity and transportation were reduced. Mean levels of PM2.5, PM10, NO_2, and CO fell nationwide from previous year's mean levels in March 2020, shortly following social distance, by 16.98 g/m3, 21.61 g/m3, 4.16 ppb, and 0.09 ppm, respectively. These reductions represented decreases of 45.45%, 35.56%, 20.41%, and 17.33%, respectively in south korea (Ju et al, 2021). Seo, et al, (2020) reported significant decreases in PM2.5, PM10, CO, and NO_2 were observed in both cities. In particular, compared to the same period of 2017-2019, in March 2020, PM2.5 showed remarkable reductions of 36% and 30% in Seoul and Daegu, respectively. Overall, NO_2 recorded an average percentage reduction of 40% with the highest reduction observed at Kota Kinabalu (62%). The largest reductions of PM10, PM2.5, SO_2, O_3 and CO were recorded at Kota Kinabalu (17%), Kuantan (9.5%), Alor Star (38%), Kota Bharu (15%), and Ipoh (27%) respectively. For the first 17 weeks (January through May) of 2015-2020, daily concentrations of fine particulate matter (PM2.5) and nitrogen dioxide (NO_2) were collected from 15 central monitoring stations distributed throughout the five New York city boroughs. When changes in these pollutant concentrations were compared to those measured during the same period of time in 2015-2019, using a linear time lag model, no significant difference between the years was found. Decreases in PM2.5 (36%) and NO_2 (51%) concentrations were observed shortly after the shutdown took place (Zangari et al, 2020). NO_2 had a greater mean reduction in pollutant concentrations than PM10 (18%), at 41%. For NO_2, traffic and background urban locations experienced greater mean reductions than rural stations, with some of these values reaching as high as 60% in Portugal (Gama et al,2021). The city of Hat Yai in Thailand demonstrate how the lockdown affected the air quality above this normally populous city (156,000 inhabitants). In the first three weeks of the lockdown, NO_2, PM2.5, and PM10 concentrations reduced by 33.7%, 21.8%, and 22.9%, respectively, compared to the corresponding pre-lockdown period; O_3 also decreased by 12.5%, in contrast to previous studies. The NO_2, CO, and PM2.5 monthly averages for the month of April in 2020 show the lowest values in the previous ten years.

In reaction to the COVID-19 pandemic in March 2020, the majority of state governments in the United States (U.S.) ordered lockdown or business restrictions, creating a rare opportunity to assess how diminished economic activity affected the air quality. Nitrogen dioxide (NO_2) and carbon monoxide (CO) levels decreased widely but unevenly during the first phase of lockdown (March 15–April 25, 2020) compared to a pre–lockdown reference period and historical baselines established in 2017–2019, according to data collected from 28 long-term air quality stations located throughout the United States. At two thirds of the sites, the reductions—up to 49% for NO_2 and 37% for CO are statistically significant (Chen et al, 2020). On Monday, March 17, 2020, all human activity were put on hold throughout France. In fact, this Ozone pollutant rose by 27.19% during the lockdown and continued to rise by 21.35% immediately after deconfinement. In fact, the maximum daily concentrations of the pollutants SO2, NO_2, CO, C6H6, NOX, PM2.5, and PM10 found in various regions of France have fallen by 18.18%, 37.14%, 20.36%, 9.28%, 44.38%, 5.1%, and 44.38%, respectively (Ikhlasse et al, 2021). Hu et al, (2021) compared air quality of Tokyo, Daegu, Wuhan and Mumbai. The findings showed a favourable correlation between air pollution levels and a drop in pollution levels both during and after lock-downs in these cities. No appreciable change in the distribution of "excellent" and "moderate" days was seen in Tokyo, which has low levels of air pollution, during lockdown. The percentage of "unhealthy" days (AQI>100) in Daegu, where there is mid-level air pollution, significantly decreased during lockdown; however, this returned after lockdown was lifted. The percentage of unhealthy days significantly fell during lockdown in Wuhan and Mumbai, both cities with severe levels of air pollution, and it continued to decline following lockdown. In order to stop the COVID-19 virus from spreading throughout the community, New South Wales (NSW, Australia) and the metropolitan area of Sydney were placed under lockdown from early April until early June 2020. According to monitoring data from the ground and from a satellite, the effect of reducing anthropogenic activities, including transportation, had an impact on the urban environment in terms of air quality, which is shown to have improved for a number of pollutants, such as Nitrogen Dioxides (NO_2) and Carbon Monoxide (CO). NO_2, CO, and PM2.5 levels reduced during the lockdown, according to the conclusions of statistical and modelling techniques, however O_3 levels rose. Nevertheless, given the significant decline in traffic volume of about 30%, the change in concentration levels is minima Ducet al, (2021).

In Poland on March 4, 2020, the first COVID-19 case in Poland was reported. Governmental regulations severely limited social and commercial activities. Data from both ground-based and satellite sources showed that there were less pollutants during the lockdown than there were during the corresponding times in 2018 and 2019. For example, according to AOD data, aerosol concentrations in the air column decreased by roughly 23% and 18% in April and May compared to 2018–2019. The biggest drops in PM2.5 levels occurred in April and May, with decreases of 11.1% to 26.4% and 8.7 to 21.1%, respectively. When compared to the same months in 2019, PM10 levels dropped from 8.6% to 33.9% and from 8.5% to 31.5% Filonchyk et al (2021). Based on ground-based and satellite measurements, the impact of a public lockdown in Greece implemented to stop the spread of the COVID-19 is analysed. The findings demonstrated that changes in air pollution are typically not statistically significant. It is most likely a result of the weather, which during the closure time greatly influenced the long-distance transmission of air pollution over Greece (Varotsos et al, 2021). Grivas et al (2020) stated that in comparison to the time before the lockdown, the in-situ measurements show mean concentration decreases of 30–35% for pollutants associated to transportation in Athens (NO_2, CO, and BC from fossil fuel burning). While the reduction for PM2.5 was less pronounced (18%), a significant reduction (53%) was also seen for the urban CO_2 enhancement. Additionally, when contrasting the 2020 lockdown period with other years, significant decreases were seen. However, as soon as the overall lockdown was lifted, levels rose again. The COVID-19 pandemic response by governments offers a rare chance to research the impacts of constrained socioeconomic activity on air quality. The lockout measures led to a reduction in PM2.5 (50–63%), PM10 (59–64%), NO (75-76%), NO_2 (43–47%), and CO (40–47%), while O3 concentration rose by 19–22%. The lockdown measures lowered mean traffic volume by 70% compared to 2016–2019 (Henao et al, 2021).

CONCLUSION

In conclusion, the COVID-19 pandemic had a significant impact on air pollution levels across the globe. As many countries implemented lockdown measures to control the spread of the virus, there was a drastic reduction in transportation, industrial activity, and energy consumption, which led to a substantial decrease in air pollution levels. However, this reduction was temporary and was not a sustainable solution for addressing air pollution

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