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Covid-19 Lockdown and Its Impact on Air Pollution

A. SANKARI NIVEDITHA[1], DR. BALAJI GANESH S, MDS[2*], LAKSHMINARAYANAN ARIVARASU[3]

[1]Saveetha Dental college and Hospitals, Saveetha Institute of Medical and Technical Science(SIMATS), Saveetha University, Chennai-77, Tamil Nadu, India
[2]Scientist, White Lab-Material Research Centre, Saveetha Dental college and Hospitals, Saveetha Institute of Medical and Technical Science(SIMATS), Saveetha University, Chennai-77, Tamil Nadu, India.
[3]Assistant Professor, Department of Pharmacology, Saveetha Dental college and Hospitals Saveetha Institute of Medical and Technical Science(SIMATS), Saveetha University, Chennai-77, Tamil Nadu, India
*Corresponding Author
Email: 151801034.sdc@gmail.com[1], balajiganeshs.sdc@saveetha.com[2], lakshmin.sdc@saveetha.com[3]

Abstract: Air pollution is one of the major problems of recent decades which has a serious toxicological impact on human health and the environment. Air pollution is defined as all destructive effects of any sources which contribute to the pollution of the atmosphere or deterioration of the ecosystem. Air pollution is caused by both human interventions and/or natural phenomena. Air pollution is a mixture of solid particles and gases in the air. It is a type of environmental pollution that affects the air and is usually caused by smoke or other harmful gases. The sources of pollution vary from small units of cigarettes and natural sources such as volcanic activities to large volume of emission from motor engines of automobiles and industrial activities. During this lockdown period, there was a dramatic decrease in air pollution in different parts of the world. This is primarily due to lockdown of industrial establishments. The impact of human civilization during the pandemic provides evidentiary data. There was significant improvement in global air pollution.
The aim of this review is to understand the correlation between COVID-19 lockdown and its impact on air pollution.

Keywords: COVID-19; Pandemic; Environment; Air pollution; Lockdown; Human health

INTRODUCTION

Air pollution is one of the major problems of recent decades which has a serious toxicological impact on human health and the environment. Air pollution is defined as all destructive effects of any sources which contribute to the pollution of the atmosphere and/or deterioration of the ecosystem. Air pollution is caused by both human interventions and/or natural phenomena. Air pollution is a mixture of solid and gases particles in the air. It is a type of environmental pollution that affects the air and is usually caused by smoke or other harmful gases. The sources of pollution may vary from small units of cigarettes and natural sources such as volcanic activities to large volume of emission from motor engines of automobiles and industrial activities (Habre *et al.*, 2014). Car emission, chemicals from factories, dust, pollen, mold spores may be some of the suspended particles.In order to express the magnitude of air pollution of a region, Air Quality Index (AQI) often in addition is termed as Air Pollution Index (API). According to Johnson et al.

"Air Quality Index (AQI) is defined as a measure of air relative to the requirements of one or more biotic species or to any human need "(Johnson *et al.*, 1997). Air quality index (AQI) refers to the particulate size of PM 2.5 in air and PM 10 is considered as the respirable particulate matter with a lesser diameter than PM 2.5 which is unsafe. According to Sharma, AQI includes three major pollutants nitrogen dioxide (NO_2), sulphur dioxide (SO_2) and suspended particulate matter (SPM) (Sharma *et al.*, 2003). AQI is divided into ranges, in which they are numbered, and each range is marked with color codes. AQI of 0-50 (green) is considered good, 51-100 (yellow) is considered satisfactory with little or no risk, 101-200 (red); moderate which is unhealthy for sensitive groups, 201-300 (purple) has health alert and 301-500 (maroon) is considered to be hazardous.

COVID-19 is a highly contagious disease firstly identified in Wuhan, Central of China in December 2019. Due to the contagion of COVID-19 a nationwide lockdown was imposed in India from March 24th. But this nationwide lockdown almost all industrial activities and mass transportation have been prohibited. As a result, the pollution level in 88 cities across the country drastically reduced down only after 4 days of commencing the lockdown according to the official data from the Central Pollution Control Board (CPCB) (Sharma *et al.*, 2020).

India's attempt to quantify integrated air quality started much later only after 1984 in the name of Air Quality Monitoring Programme and up to date only a few handful studies (Swamee and Tyagi, 1999; Gurjar et al., 2008; Beig et al., 2010 etc.) have successfully attempted to quantify and report air quality for megacities of the country (Swamee and Tyagi, 1999; Gurjar *et al.*, 2008; Sahu, Beig and Parkhi, 2011). National Air Quality Index (NAQI) is used for interim estimation of air quality of the megacity Delhi admits the lockdown period, there was a 70% reduction in the AQI reading from the previous year's pollution (Kalia and Ansari, 2020). Kanpur city, India was positioned first as the most polluted city. But during this lockdown period it has decreased 60% that of the previous year's pollution (Rylance *et al.*, 2020). Global concern for air pollution has led to significant attention for analyzing air pollution in the course of the pandemic. China emits 50% nitrogen dioxide in Asia but efforts to control Coronavirus lead to decreased air pollution during the lockdown (Wu *et al.*, no date). Mukesh et al studied the metro logical based forecasting of the Air Quality Index using neural networks (Nagendra, Shiva Nagendra and Khare, 2003).

Overall fall in air pollution in industrial cities during the lockdown period is primarily a result of factories being closed. The industrial hazardous gas emission has drastically decreased. Despite the massive impact on the Indian economy during this pandemic due to complete shutdown of industries it is also important to control pollution after this. The review is considered to be a useful supplement to the since it showed the pollution source control can attenuate the air quality. Such temporary source control in a suitable time interval may heal the environment.Our team has rich experience in research and we have collaborated with numerous authors over various topics in the past decade (Deogade, Gupta and Ariga, 2018; Ezhilarasan, 2018; Ezhilarasan, Sokal and Najimi, 2018; Jeevanandan and Govindaraju, 2018; J *et al.*, 2018; Menon *et al.*, 2018; Prabakar *et al.*, 2018; Rajeshkumar *et al.*, 2018, 2019; Vishnu Prasad *et al.*, 2018; Wahab *et al.*, 2018; Dua *et al.*, 2019; Duraisamy *et al.*, 2019; Ezhilarasan, Apoorva and Ashok Vardhan, 2019; Gheena and Ezhilarasan, 2019; Malli Sureshbabu *et al.*, 2019; Mehta *et al.*, 2019; Panchal, Jeevanandan and Subramanian, 2019; Rajendran *et al.*, 2019; Ramakrishnan, Dhanalakshmi and Subramanian, 2019; Sharma *et al.*, 2019; Varghese, Ramesh and Veeraiyan, 2019; Gomathi *et al.*, 2020; Samuel, Acharya and Rao, 2020)

The aim of the review is to understand correlation between the Covid-19 lockdown and its impact on air pollution.

Air pollution

Air pollution is now the biggest environmental risk for early death and is responsible for about 5 million premature deaths each year from heart attacks, strokes, diabetes and respiratory diseases (Priyadharsini *et al.*, 2018a). Recent studies show that air pollution can impact mental health,worker productivity and even stock market performance. It is a long term exposure causing cumulative effects on health (Correia *et al.*, 2013). The route of air pollution to pollutants to humans has been explained (Deka and Marchwinski, 2014). There is an inflammatory and oxidative effect due to black carbon particles (Deng and Li, 2012). According to WHO about 91% of people of world pollution live in places where air quality exceeds WHO guidelines. This is the major problem of the public health environmental & developmental challenge of our time (Sa *et al.*, 2017).

Impact on human health

Air pollution has various health effects. The health of susceptible or sensitive individuals can be impacted even on low air pollution. Short-term exposure to air pollutants is closely related to COPD (Chronic Obstructive Pulmonary Disease), cough, shortness of breath, wheezing, asthma, respiratory disease, and high rates of hospitalization (a measurement of morbidity) (M, Geetha and Thangavelu, 2019; Shahzan *et al.*, 2019). The long term effects associated with air pollution as chronic asthma, pulmonary insufficiency, cardiovascular mortality (Priyadharsini *et al.*, 2018b). Fine particles of particulate matter have a huge impact on cardiovascular health (Paramasivam, Vijayashree Priyadharsini and Raghunandhakumar, 2020). Inhalation of asbestos dust may cause severe health hazards (Nuvolone *et al.*, 2011). The risk of death in COVID-19 and in long term exposure to air pollution has a similar impact (Smiline, Vijayashree and Paramasivam, 2018). According to Swedish cohort study, diabetes seems to be induced after long term exposure to air pollution (Pope *et al.*, 2002).

SARS fatality & Air Pollution

Severe acute respiratory syndrome (SARS) claims to have a positive association between air pollution and SARS fatality cases (Eze *et al.*, 2014). According to a study the detrimental effect of air pollution has led to the prognosis of the disease in SARS patients (Travaglio *et al.*, no date). In North Italy and the US, high levels of air pollution are linked to the deadlier cases of COVID-19 (Chen *et al.*, 2017). According to Khan the mortality rate of SARS was associated with high air pollutants in Beijing
(Kan, Chen and Tong, 2012). According to Fronies the SARS death rate doubles in polluted cities (Cui *et al.*, 2003).

COVID-19

The coronavirus pandemic impacts millions across the world. The transmission of coronavirus is human to human via droplet or through direct contact (See and Toh, 2020). At present there is no recommended medication or vaccination available (Pratha, Ashwatha Pratha and Geetha, 2017). Antibiotics aren't effective against viral infections (Ashwin and Muralidharan, 2015; Girija, Jayaseelan and Arumugam, 2018; Vaishali and Geetha, 2018; Girija As and Priyadharsini J, 2019; Girija *et al.*, 2019). The antimalarial drug hydroxychloroquine and antiviral drug remdesivir is potential against COVID-19. To limit the spread of the virus social distancing and lockdown plays a key role (Song *et al.*, 2020). The lockdown was first imposed on January 23, 2020 in the city of Wuhan in China; later it was followed by the other countries (Wang *et al.*, 2020). Lockdown emphasis shutting down of business and industrial establishments. The incubation period is about 2-14 days and it may vary. It is a zoonotic virus. The symptoms are respiratory disorders, coughing, fever, shortness of breath, pain or pressure in the chest, confusion, bluish lips and difficulty in breathing and some may be even asymptomatic. The oral cavity is considered as the major portal for the entry of infectious agents like SARS-CoV-2, chlorhexidine (Renuka and Np, 2017) a component of mouth rinse is not efficient with beta-cyclodextrin and citrox helps to reduce the viral load of saliva and nasopharyngeal microbiota (Marickar, Geetha and Neelakantan, 2014; Shahana and Muralidharan, 2016; Carrouel *et al.*, 2020).

Lockdown and Air Pollution

NASA'S Global Modelling and Data assimilation Team reported the dramatic impact on pollution level. There were declines in anthropogenic pollutants like NO2, Co, PM2.5 and PM 10 concentration after lockdown (Quah, Li and Phua, 2020). Some recent scientific studies conducted in a small number of countries (Cadotte, no date) and cities (Achakulwisut *et al.*, 2019) indicated such reductions. There are also some media reports, primarily based on satellite images, about the reduction of air pollution due to lockdown globally.Our institution is passionate about high quality evidence based research and has excelled in various fields ((Pc, Marimuthu and Devadoss, 2018; Ramesh *et al.*, 2018; Vijayashree Priyadharsini, Smiline Girija and Paramasivam, 2018; Ezhilarasan, Apoorva and Ashok Vardhan, 2019; Ramadurai *et al.*, 2019; Sridharan *et al.*, 2019; Vijayashree Priyadharsini, 2019; Chandrasekar *et al.*, 2020; Mathew *et al.*, 2020; R *et al.*, 2020; Samuel, 2021)

CONCLUSION

The impact on air pollution with human civilization provides evidentiary data of the current situation. The overall fall in air pollution is primarily due to factories being closed in industrial cities during the lockdown period. This is a temporary effect due to less vehicle pollution. There was a significant improvement in global air quality during COVID-19 lockdown. The levels of two major air pollutants seems to be dramatically reduced to the pandemic. With the help of this review article we are able to understand the impact on air pollution during COVID-19 lockdown.

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