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**Environmental Challenges of the Post-Covid Era: A Changed Scenario and its  
Management**

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**Abstract** – The first case of Covid-19 was identified in December 2019 in a 55-year old individual from Hubei province, Wuhan China. Coronavirus (Covid-19) is not just a health problem but it shows positive and negative environmental effects. Improved air quality, clean beaches and reduced noise in the environment are some of the positive effects while easy spread of this virus to nasal passage necessitate people to wear masks use gloves and hand sanitizer on a daily basis resulting in massive amounts of medical waste in the environment which pose negative effect on the environment. Face masks and hand gloves now are in great demand across the globe, which have become an environmental problem. They are not being disposed properly; instead they are thrown into the sea reducing biological oxygen demand of water. They are thrown onto the shoreline and beaches, where aquatic animals mistake them for food. They accelerated the problem of spreading germs. Discarded masks are made of non-woven fabric such as polypropylene; a non-biodegradable and liquid resistant product. Environment and human interaction must be balanced otherwise nature will disrupt. The best possible way must be used and applied to collect discarded masks and gloves to protect the environment. All the regions of the world have to properly deal with clinical waste management generated due to Covid-19 outbreak to preserve the survival of the entire planet including humanity. In this review article, post COVID environmental challenges were discussed. Post-Covid environmental situation must tie with our climate and sustainable environment development goals. An action plan would be developed for saving the environment as it is a global issue and relates to all animals, humans and environment.

**Keywords** - Coronavirus, Disposed, Environment, Facemask, Germs, Gloves, Sanitizer, Waste.

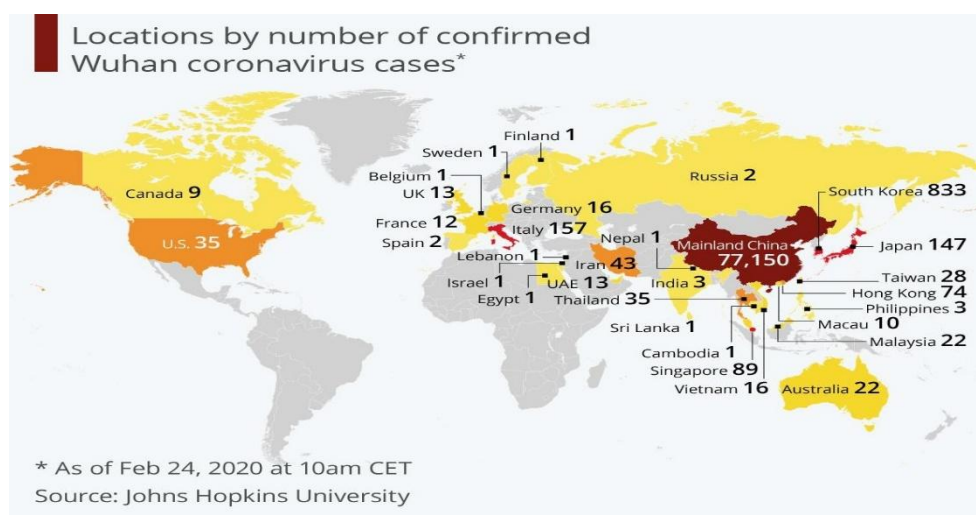
## Introduction

In the last twenty years, the world has experienced the outbreaks and epidemics of many infectious diseases. However, enormous successes have been obtained to control major epidemic diseases in the past. Viral epidemics such as severe acute respiratory syndrome associated corona virus (SARS-CoV), is a novel virus that caused the first major pandemic of the new millennium. SARS-CoV is a respiratory illness, first reported in Asia in February 2003. On 12 March 2003, the World Health Organization (WHO) issued a global alert on SARS. There is currently neither an effective treatment nor a vaccine to prevent infection. Since 2004, there have not been any known cases of SARS reported anywhere in the world. (Vincent *et al.*, 2007; Montagne *et al.*, 2004). In March 2009, the flu outbreak in humans began in Mexico known as H1N1 influenza. The virus is a mixture of four known strains of influenza A virus: One endemic in humans, one endemic in birds and two endemic in pigs (swine). On 11 June 2009, the World Health Organization (WHO) raised the pandemic alert to the highest level, phase 6, (Dotis and Roilides, 2009; Lippi *et al.*, 2010; Rajoura *et al.*, 2011; Datta *et al.*, 2011; Shilpa *et al.*, 2014).

In 2012, the Middle East respiratory syndrome corona virus (MERS-CoV) was first identified in Saudi Arabia. MERS-CoV is a zoonotic virus, which means that it is transmitted between animals and people. Scientific evidence suggested that dromedary camels are a major reservoir host for MERS-CoV. However, the exact role of dromedaries in transmission of the virus and the exact route(s) of transmission are unknown. People with diabetes, renal failure, chronic lung disease, and immunodeficient persons are considered to be at high risk of severe disease from MERS-CoV infection. These people should avoid contact with camels, drinking raw camel milk, or eating meat that has not been properly cooked. No vaccine or specific treatment is currently available; however several MERS-CoV specific vaccines and treatments are in development. (Gautam & Hens, 2020; Giannis *et al.*, 2020).

Another Pandemic all are facing today is the global Pandemic issue of Covid-19. SARS-CoV is thought to be an animal virus from an as-yet-uncertain animal reservoir, perhaps bats, that spread to other animals (civet cats) and first infected humans in the Guangdong province of southern China in 2002. According to Worldometer information, the **corona virus (COVID-19)** is affecting **213 countries and territories** around the world and 2 international conveyances. Corona viruses were first discovered in the 1930s when an acute

respiratory infection of domesticated chickens was shown to be caused by infectious bronchitis virus (IBV). Human corona viruses were discovered in the 1960s (Estola, 1970; Kahn *et al.*, 2005; Mahase, 2020). On February 11, 2020, the WHO Director-General, Dr. Tedros Adhanom Ghebreyesus, announced that the disease caused by this new CoV was a "COVID-19". The World Health Organization (WHO) declared a Public Health Emergency of International Concern (PHEIC) on January 30, 2020, as per the International Health Regulations (IHR, 2005) as it had spread to 18 countries with four countries reporting human to human transmission. According to WHO report (2020), In India, from Jan 30 to 4:36pm CEST, 16 September 2020, there have been 5,020,359 confirmed cases of COVID-19 with 82,066 deaths.



**Figure 1:** The Johns Hopkins Center for Systems Science and Engineering (CSSE) site for Coronavirus Global Cases COVID-19, uses openly public sources to track the spread of the epidemic. Reported 2,647,663, Confirmed Cases of covid-19 including 50,921 Deathson 17 Aug 2020 in India.

## The Pathogenesis of Covid-19

The CoVs have become the major pathogens of emerging respiratory disease outbreaks. They are a large family of single-stranded RNA viruses (+ssRNA) that can be isolated in different animal species. These viruses can cross species barriers and can cause, in humans, illness ranging from the common cold to more severe diseases such as MERS and SARS (Schoeman and Fielding, 2019).

CoVs are positive-stranded RNA viruses with a crown-like appearance under an electron microscope due to the presence of spike glycoproteins on the envelope. There are four structural genes encoding the nucleocapsid protein (N), the spike protein (S), a small membrane protein (SM) and the membrane glycoprotein (M) with an extra membrane glycoprotein (HE) occurring in the HCoV-OC43 and HKU1 betacoronaviruses. The subfamily *Orthocoronavirinae* of the *Coronaviridae* family (order *Nidovirales*) classifies into four genera of CoVs: Alphacoronavirus (alphaCoV), Betacoronavirus (betaCoV), Deltacoronavirus (deltaCoV), and Gammacoronavirus (gammaCoV). Rothan and Berrareddy (2020) reported genomic characterization and showed that probably bats and rodents are the gene sources of alphaCoVs and betaCoVs. However, avian species represent the gene sources of deltaCoVs and gammaCoVs.

Alpha-coronaviruses cause mildly symptomatic or even asymptomatic infections. SARSCoV-2 is a beta-coronavirus and is related to the SARSCoV virus. The whole genome of SARS-CoV-2 is 96% identical to that of a bat coronavirus (Marra *et al.*, 2003; Cao *et al.*, 2020; Beniac *et al.*, 2006). Members of this large family of viruses can cause respiratory, enteric, hepatic, and neurological diseases in different animal species, including camels, cattle, cats, and bats. To date, seven human CoVs (HCoVs) capable of infecting humans have been identified. Some of HCoVs were identified in the mid-1960s, while others were only detected in the new millennium.

## **Impacts of Covid-19**

The pandemic has allowed us to observe what the world's scientists have been saying for years that the interdependence between humanity and biodiversity is so profound that the latter's vulnerabilities is our own. Various studies were performed by scholars to study the effect of Covid-19 on the house arrest on children, renewable energy sector, effect of bio-aerosol, disrupted global economy (Gautam and Trivedi, 2020; Birol, 2020; Chakraborty and Maity, April 2020; Sharma *et al.*, 2020). Coronavirus (Covid-19) is not just a health problem but it shows positive and negative environmental effects.

### a. Positive impacts of Covid-19

Prior to the Pandemic, the air was very toxic due to the amount of greenhouse gases due to which the earth faced rise in temperature resulted in melting of glaciers and rise in sea-levels but after Covid-19 lockdown slight changes in the environment was noticed. (Rutzet *al.*, 2020; Venter *et al.*, 2020; Watts *et al.*, 2020). Also due to lesser human interference, the water bodies have cleared up. The water became so clear that the aquatic life is thriving and recovering. Animals have been spotted moving freely where once they would not dare to go. Vegetation is growing better because of clearer air and water. The global reduction in modern human activity poses positive impacts on the environment. Reports from all over the world indicated the Post-Covidimproved environmental conditions of air & water (Zambrano-Monserrate *et al.*, 2020; Saadat *et al.*, 2020). Eroglu (2020) reported reduced air pollution such as nitrogendioxide and carbondioxide emission in many regions.

Singh *et al.*, (2007) compared between the major air-pollutants and analysed the impact of industrialization, transportation and other anthropogenic activities. An attempt to study the improvement in the air quality using tools like satellite images of Indian atmosphere undertaken by Lokhandwala and Gautam (Sept 2020) revealed the results of onsite real-time monitoring at specific locations (Ghaziabad-highest polluting city of India) and Air quality index (AQI) calculated by central pollution control board of India and found a remarkable reduction of 85.1% in PM<sub>2.5</sub> concentration in one of the India's most polluted city (Ghaziabad), as compared to the concentration just three months back. Wang *et al.*, (2020) estimated the reduced concentration of different pollutants with the help of community multi-scale air quality model.

According to a report by India-based television news channel, NDTV, the closure of industrial units in the National Capital Region during the lockdown led to an improvement in water quality of the river. The amount of toxic waste being dumped into the river has greatly decreased, said vice-chairman of Delhi Jal Board Raghav Chadha. The Jal Board is an Indian government agency responsible for the supply of drinkable water to the most of the National Capital Territory region of Delhi. Many industries and offices are closed due to the lockdown and therefore the Yamuna is looking cleaner these days. The stoppage of industrial pollutants and industrial waste has definitely had a positive effect on water quality. Mohammad Arif *et al.*, (2020) studied five major locations of the river Yamuna and measured the concentrations of pH,

EC, DO, BOD and COD. The results showed a reduction by 1-10%, 33-66%, 51%, 45-90%, and 33-82% respectively during the lockdown phase in comparison to the pre-lockdown phase.

Positive impact of Covid-19 lockdown has been seen in wildlife. Vehicle movements will be reduced dramatically this year, which decreased the number of wildlife species killed on the streets (Rupani *et al.*, 2020). Sightings of Pumas in downtown Santiago, Chile, of Dolphins in untypically calm waters in the harbour of Trieste, Italy, and of Jackals in broad daylight in urban parks in Tel Aviv, Israel were reported by Rutzet *et al.*, (2020)

### **b. Negative impacts of Covid-19**

There is a huge rise in Medical waste during Covid-19. Hospitals in Wuhan, China produced an average of 240 metric tonnes of medical waste per day as compared to their previous average of fewer than 50 tons. Single-use face mask production in China increased to 116 million per day in February, about 12 times the usual quantity (Calma, 2020).

Dente and Hashimoto (2020) reported the extensive use and production of sanitizers and disinfectant during pandemic has led to an increased amount of sanitization/hygiene bottles and packaging that is mostly made up of non-biodegradable plastics. There is a high demand of Personal Protective Equipment (PPE Kit) among the general public health care workers and service workers. Throwing or dumping these waste endanger the lives of health workers involving in waste management process.

Many people have suffered from losing their jobs, some don't have skills to work from home found themselves away from social circle feel distressed about the crisis which impacted their mental health. (Yanget *et al.*, 2020). There will be a huge rise in teleconferencing which poses a negative effect on travel. The widespread lockdown has caused a substantial increase in the domestic waste. These large amounts of waste require collection and recycling which has become a huge challenge for waste management industry. Developing countries are at the risk as proper waste management system is absent which results in the spread of virus (Datta *et al.*, 2018).

The negative impact of Covid-19 at the local, regional and global contexts based on the situation in early April 2020 was discussed by Karunathilake (Sept 2020). In addition, a future action plan or a Covid-19 recovery action plan for Sri Lanka as a South Asian Country

which is in a Covid-19 affected stage which gradually progresses into a non-affecting stage was also proposed for a period of five years.

### **Post-Covid Maintenance of sustainability of the environment**

The influential Post-Covid-19 changes in the global environment, in a short time, would not be possible without the pandemic and its consequences (Nilashiet *al.*, 2019; Diffenbaugh *et al.*, 2020) Attention must be paid to develop efficient strategies to boost global nature. Supporting National new green strategies to lower carbon emission, Open issues must be revised, analyzed, and managed by governments to adopt the suitable approaches for nature recovery as well as retaining the economical development. According to a study by Adyel (2020) if the global population adheres to a standard of one disposable face mask per day then after the end of lockdown, the pandemic could result in a monthly global consumption and waste of 129 billion face masks and 65 billion gloves. So there is an urgent and committed need to develop policies regarding recycling and to reduce single-use plastics. According to Ashkin, (2020) sustainability is “meeting the needs of present without compromising the ability of future generations to meet their own needs”. The operations and maintenance of sustainability plan should include the Purchase of products and supplies that are resource-efficient, bio-degradable and as safe as possible.

### **Conclusion**

This paper highlighted the changed scenario after the Covid-19 pandemic including positive and negative effects on the environment. The importance of proper training and cleaning personnel processes is highlighted during pandemic which helps to keep safe from pathogens. The downfall of many small businesses has turned to on-line retailers. These changes helped in economical recovery, sustainable development, growing and adjusting to new reality. With proper management and recycling facilities, the adverse effects of the pandemic can be avoided.

Covid-19 poses a new challenge to some developing countries including India regarding online learning for the welfare of students. Online teaching-learning methods should be promoted. Teachers should be trained for real online platform. They should not only engage students but learning outcomes would be achieved. While using video-teleconferencing during

the COVID-19 pandemic, guidance on the confidentiality of certain information released by the Substance Abuse and Mental Health Services Administration (SAMHSA) should be followed.

Post-Covid we witnessed clean air, water, liveable cities which people expected for so long but Covid-19 associated lockdown has given the opportunity to step back and commit to install the principles of sustainable development to make our environment clean and sustainable.

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