COVID 19 Environmental Health Response

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COVID-19 crisis

The Challenge

Corona virus disease is caused by a novel coronavirus known as SARS-CoV- 2 (Severe Acute Respiratory Syndrome Coronavirus 2) (LV et.al., 2020). WHO (2021) has named SARS-CoV-2 to COVID-19 where CO stands for Corona, VI stands for virus, D stands for disease and 19 stands for the year 2019 when the first case was discovered (LV et.al., 2020). WHO in Jan 2020 declared COVID-19 as Public Health Emergency of International Concern and in March 2020 WHO declared it as a global pandemic disease (Kontoangelos et.al., 2002).

SARS-CoV- 2 is a positive sense RNA virus which is non segmented, enveloped and belongs to subfamily sarbecovirus, ortho corona virinae (Huang et.al., 2020). Many investigations on COVID-19 research have documented that the bats are the main reservoirs of the virus with genome sequencing of SARS-CoV-2 and bat CoV RaTG13 are 96.2% identical (Guo et.al., 2020). To control the spread of Covid 19 disease countries globally have imposed a lock down in the year 2020 when WHO declared it as a pandemic disease (Onyeaka t.al., 2021).

A person infected with SARS-Co V-2, either symptomatic or asymptomatic, during his/her infectious period will emit aerosols when they sneeze, breathe, cough, or talk. WHO (2020) concedes Covid 19 as a droplet and airborne transmission which occurs during medical "aerosol generating procedures". When the surface tension of the mucus lining the mucus membranes of the respiratory tract is exceeded by force, aerosols are generated (Wilson et.al., 2020). Force is explained in terms of rapidity of the airflow through the airways which are controlled by respiratory activity such as sneezing, heavy breathing, talking, coughing, etc., will generate aerosols of different sizes containing the virus materials (Wilson et.al., 2020).

Corona virus is transmitted from bats and coronavirus infected humans. Into the human body the virus enters through attaching its S glycoprotein to ACE2 receptors which are located on organs such as lungs, heart, kidneys, and GIT (Astuti & Ysrafil 2020). When a person is affected with covid 19, the body immune system responds by 38% increase in neutrophils, 52% increase if interleukins, 86% increase in C-reactive protein and 35% decrease in lymphocytes (Astuti & Ysrafil 2020). The cytokines storm in the body is associated with severity of the disease (Huang et.al., 2020).

Persons suffering with covid 19 exhibit symptoms such as fever, chills, fatigue, cough, headache, congestion or runny nose, shortness of breath (CDC, 2021). Postmortem biopsies of covid 19 patients indicated that the pattern of covid 19 disease is geographically heterogeneous affecting primarily central parts of lungs and preserving peripheral parts (Aguiar et.al., 2020). SARS-CoV-2 causes acute respiratory distress syndrome and extreme severity of the virus results in death as it damages the alveoli of lungs and causes respiratory failure (Xu.Z et.al., 2020).

SARS-CoV-2 is detected by two types of lab tests: a viral test and an antibody test (CDC, 2021). Viral tests are of two types: NAAT (Nucleic Acid Amplification Test) and antigen test

(CDC, 2021). For viral tests, samples from respiratory system such as nasal swabs are collected to detect the presence of SARS-CoV-2 in the body (CDC, 2021). Viral tests are used to detect acute covid infection. CDC (2021) recommends every individual not to test more than once in 24 hrs. Antibody test is the test for past infection. Antibody tests help to detect the presence of SARS-CoV-2 antibodies which are produced in the body post covid infection (CDC, 2021).

The first case of COVID 19 was documented in Wuhan, China in late 2019 and has spread from China to the entire world. Epidemiologists after a detailed investigation found that the virus has spread from the animal sold at Wuhan market (CDC, 2020). The outbreak was first classified as epidemic disease of Wuhan, China and later as it spread throughout the countries crossing the borders it was declared as pandemic disease (CDC, 2020). Over 31,000 cases and 636 fatalities have been reported by China on 6th Feb 2020 (NHC PRC, 2020). On Jan 14, 2020, there were only 3 confirmed cases of COVID 19 in the U.S which has reached to 52,000 cases in mid-April 2020 and 2,632,656 as of June 28 with New York being epicenter of COVID 19 in the United States. As of Aug 24, 2020, in the United States alone 38M positive covid cases and 630K deaths were reported (New York times, 2021). Globally as of August 23, 2021, 211,730,035 confirmed cases of COVID-19, including 4,430,697 deaths, were reported to WHO (WHO, 2021).

Intensity of Covid 19 disease is directly proportional to age i.e., older adults are at the highest risk of developing covid 19 (CDC, 2021). In research studies it was found that more than 80% of deaths due to COVID 19 were reported in people over 65 years of age and more than 95% of deaths due to COVID 19 were reported in people older than 45 years of age (CDC, 2021). Populations with compromised immune systems and preexisting chronic diseases such as diabetes, cardiovascular diseases, lung diseases, cancers, kidney diseases are more susceptible to COVID 19 disease (CDC, 2021). In the United States many racial and ethnic minority groups and people with disabilities are more prone to COVID 19 and are dying as a result of social inequities (CDC, 2021).

COVID 19 affected the global Macroeconomy in three ways: it affected the production (supply) due to lockdown, decrease in supply resulted in market disruption, which further had an impact on financial firms of the market (demand) (Shlomo, 2020). Decrease in supply resulted in stagflation (lower output, higher prices) (Shlomo, 2020). The US Department of Labor reported that the Unemployment insurance claims have more than doubled during the pandemic when compared to previous year (Gharehgozli et.al., 2020). As of April 04, 2020, The US Department of Labor reported that Weekly Unemployment Insurance Claims have reached a high of more than 6.2 million Seasonally Adjusted Initial Claims. In the year 2019 there were 203,000 Seasonally Adjusted Initial Claims (Gharehgozli et.al., 2020).

COVID 19 pandemic and the economic recession caused due to the pandemic has adversely affected the mental health of people (Nirmitha, et.al., 2021). In Jan-June 2019, 1 in 10 adults in the United States reported anxiety or depression, but during the pandemic 4 in 10 adults in the United States reported anxiety or depression (Nirmitha, et.al., 2021). A survey conducted by KFF health tracking poll reported negative impacts of pandemic on the mental health of the United State population such as sleeping difficulties increased by 36%, eating disorders

increased by 32% and alcohol consumption increased by 12% in the United States (Nirmitha, et.al., 2021).

Environmental Health Response

Coronavirus is a zoonotic virus, belongs to the Coronaviridae family and it causes respiratory infection among mammals (bats, camels, and civets) and avian species (Sharma et.al., 2021). A vigorous environmental health system accompanied with the best monitoring (surveillance) system plays a significant role to minimize and prevent the spread of COVID 19.

Air Quality

SARS-CoV-2 RNA was found on aerosols in Wuhan hospital (Lui et.al., 2020) and outside in northern Italy (Setti et.al., 2020), indicating the possibility of indoor and outdoor reduction in air quality and airborne transmission of COVID 19. Virus bearing aerosols from human atomization rapidly accumulate in confined environments and elevated levels of virus in the air will decrease air quality and promote transmission from person to person (Zhang et.al., 2020). Although viral transmission in open air is subjected to dilution, accumulation of virus still occurs owing to stagnation in polluted metropolitan environments (Zhang et.al., 2020).

Face coverings and social distancing (6 feet apart) inhibit the airborne transmission by preventing virus-bearing aerosols from being atomized and inhaled, as well as contact transmission by preventing viral shedding of droplets (Zhang et.al., 2020). In COVID 19 investigations it was found that air borne transmission is the only feasible route for transmitting the disease when mandatory face coverings were not implemented (Zhang et.al., 2020). Moreover, it is supported by the evidence that before implementing mandatory face coverings and social distancing in Italy and New York, airborne transmission played a significant role in linear growth of the infection (Zhang et.al., 2020).

Individuals with preexisting respiratory diseases such as COPD, interstitial lung disease (ILD) (Gallay et.al., 2021), asthma are at threefold higher risk of developing severe COVID 19 infection and death due to COVID 19 when exposed to aerosols containing coronavirus (Rabbani et.al., 2021). Research studies indicate that high mortality rates due to COVID 19 are seen among patients with preexisting ILD (Gallay ET.AL., 2021).

The Possibility of being a vector borne disease and governmental response to that

Fomites are any inanimate objects which when exposed or contaminated with infectious agents such as bacteria, virus, fungi, can transfer the disease to the new host (Institute of Medicine (US) Forum on Microbial Threats, 2008). Fomites are known as passive vectors and diseases that are transmitted by any agent, fomite, or arthropod to humans, plants, or animals are known as vector borne diseases (Institute of Medicine (US) Forum on Microbial Threats, 2008). Results of case reports suggest that SARS-CoV-2 can be transmitted between individuals through touching surfaces (fomite) that an infected person has recently sneezed or coughed on and then touching eyes, nose, or mouth directly (CDC, 2021). Federal government recommends that the risk of fomite transmission of COVID 19 can be decreased by regularly and appropriately

wearing masks, practicing regular hand hygiene, and taking other efforts to maintain healthy facilities (CDC, 2021).

Surveillance

The aim of COVID 19 surveillance is to minimize spread of infection, enabling public health professionals to manage the risk of the disease (WHO, 2021). COVID 19 surveillance objectives include: testing and detection of cases, isolation and quarantine of cases and contacts, detect and control outbreaks among vulnerable populations, access the influence of pandemic on health care systems and society (WHO, 2021). Multipronged surveillance and containment strategy implemented by Singapore helped to enhance case detection and limit the spread of outbreak (CDC, 2020). To monitor COVID 19 disease in the United States, CDC is running multiple surveillance systems in collaboration with state, local and territorial health departments, public health, commercial and clinical laboratories, vital statistics offices, health care providers, emergency (CDC, 2021).

Traceability (Case investigation and Contact tracing)

Case investigation and Contact tracing are the critical measures to minimize the spread of COVID 19 (CDC, 2021). For many decades contact tracing has been used by public health agencies to control or prevent the spread of infectious diseases such as STD'S, Tb, etc. (CDC, 2021). Case investigation and Contact tracing can control the spread of COVID 19 by informing people who has been diagnosed with COVID 19 (Cases) that they should isolate to avoid infecting others and assisting them notifying their close contacts so that the contacts can be tested and quarantined if required and provides resources to cases and contacts about isolation, quarantine and vaccinations (CDC, 2021). CDC helps State, tribal, local, and territorial health departments to create and execute effective contact tracing programs by providing guidance, resources, training, and assistance (CDC, 2021). In certain states such as Massachusetts and New York contact tracing programs yielded encouraging results, i.e., those jurisdictions were able to control the spread of the outbreak through case detection and contact tracing (Brown, 2020).

Vulnerable populations

COVID 19 has disproportionately impacted vulnerable population and exposed inequalities by sex, age, race, income, and geographic location (WHO, 2021). Older people aged between 45 years and above, and people with preexisting chronic diseases such as lung diseases, endocrine diseases (diabetes) and heart diseases are at the highest risk of developing COVID 19 (Maragakis, 2020). It was found that people with disabilities and LTSS (Long term services and support) population live in congregate settings, experience greater barriers to health care and tend to have preexisting chronic diseases, all of which makes them more susceptible to COVID 19 (CDC, 2019). Recent federal statute offers high federal payments for state Medicaid programs and more funding for nursing facility inspection to control the spread of COVID 19 among elederly and LTSS population (Mary & Priya, 2020). Research studies indicate that racial ethnic minority groups such as Black African American population and Black Hispanic are at the higher risk of developing COVID 19 and hospitalization due to COVID 19 (Mackey et.al., 2021). The lower the person's socioeconomic status, the greater is the poverty and higher are the chances for

individuals to suffer from chronic diseases and are at higher risk to develop COVID 19 (Emily & Lindsey, 2020). Federal government under the FPUC Act is providing additional $300/week compensation to everyone qualified for unemployment benefits (usa.gov, 2021) to reduce health disparities due to poverty.

Vaccinations

Vaccines have reduced the devastating impacts of infectious diseases and considerably improved life expectancy over the past 100 years, radically reshaping the economy and community (Chung, 2021). Vaccination is the safest and most effective approach to prevent COVID 19 diseases and decrease deaths due to COVID 19, as well as vaccinations are the greatest choice for combatting future versions of coronavirus (Chung, 2021). COVID 19 authorized vaccines in the United States are Pfizer-BioNTech, Moderna, Johnson & Johnson's Janssen (CDC, 2021). COVID 19 vaccinations are effective and safe, CDC estimates that approximately 370M doses of vaccines were administered and 174M people i.e., 53.0% of the US population has been fully vaccinated as of August 29, 2021 (CDC,2021). Evidence from the research studies suggest that after implementing vaccinations in the United States, there has been a significant decrease in the number of COVID 19 cases and deaths (Holtgrave et.al., 2021).

Opportunities for Action

1. Increase digital technology surveillance methods and enhance digital technology collaboration with medical organizations to identify more cases and contacts which will aid in increased detection and prevention of COVID 19.
2. Allow leading health agencies (NIH, CDC, HRSA, SAMHSA, AHRQ) to conduct committee meetings in a public setting and provide the public with an opportunity to observe statistical data on decline in the cases after following COVID 19 guidelines and prioritize public comments to build confidence in public.
3. Environmental health workforce with the help of leading health agencies should evaluate the potential risk of environmental health issues (COVID 19) and later develop and implement risk management strategies.
4. Create a robust training plan (which includes clear understanding of the environmental health issue, preventive measures, actions to be implemented, and work as an assistant under senior environmental health expert), provide resources (funding), technical support, identify potential environmental health experts and monitor regular results to ensure a vigorous environmental health workforce.
5. Develop and implement effective compensation programs and policies to help vulnerable populations financially to improve their daily living during the pandemic times.

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