

Effects of COVID-19 disinfectants on the environment Los efectos de los desinfectantes contra la COVID-19 en el ambiente

Enerijiofi ^{1,2*}, K. E., Enaigbe ^{2,3}, A., Erhabor ⁴, J. O., Odozi, P. I. ², Ikhajagbe, B. ^{2,5} and Ekhaise, F. O. ²

1- Dept. of Biological Sciences, Samuel Adegboyega University, Km 1 Ogwa-Ehor Road, PMB001, Ogwa Edo State, Nigeria

2- Applied Environmental Bioscience and Public Health Research Group, Dept. of Microbiology, University of Benin, Nigeria

3- Dept. of Biological Sciences, Igbinedion University, Okada, Edo State

4- Phytomedicine and Drug Discovery Research Group, Dept. of Plant Biology and Biotechnology, University of Benin, Nigeria

5- Environmental Biotechnology and Sustainability Research Group, Dept. of Plant Biology and Biotechnology, University of Benin, Nigeria

*Corresponding author: beckley.ikhajagbe@uniben.edu

ABSTRACT

Nearly all nations in the globe have been impacted by COVID-19, otherwise known as coronavirus infection brought on by new SARS-Cov-2, which has been dubbed a global pandemic. Contact with sick people and handling contaminated surfaces are the main ways that coronavirus is disseminated. However, as of July 2020, it had impacted more than 33 million people worldwide. Aside from the use of personal protective equipment (PPE), alcohol-based sanitizers, and personal cleanliness, the use of disinfectants to successfully decrease or stop the spread is of paramount importance. Since surfaces and people are recognized to be the sources of COVID - 19 transmissions globally, disinfecting these areas is a good way to stop the disease from spreading. Many ideas and models have been developed to manage the novel virus, but these models are always being updated to reflect how well the virus has adapted to various domains and sections of the global community. With little to no scientific support, theories have been spread about the unique virus's ability to survive. The use of disinfectants of various kinds is one general control technique being implemented globally to combat the new Covid-19. The likelihood of infection increases the longer a person who is not infected is in close contact with an infected person. As of now, coughing or sneezing by an infected person continues to be the predominant method of transmission. It looks like a decent idea to use a disinfectant to render droplets on surfaces inactive in order to stop the spread of COVID-19. Chemistry, concentration, contact time, and coverage are particularly significant factors when thinking about disinfection. The disinfectants play a crucial role in stopping the spread of COVID-19 in the environment and ensuring everyone's safety. The global economy has experienced significant economic decline as a result of this epidemic. It is advised to properly dispose of COVID-19 management supplies in order to prevent the spread of other instances or another type of health problem.

Keywords: COVID-19 disinfectants, fomites, novel coronavirus, public health, SARS-CoV-2

RESUMEN

Casi muchas naciones en el mundo han sido afectadas por la COVID-19, también conocida como infección por coronavirus provocada por el nuevo SARS-Cov-2, la cual ha sido denominada una pandemia mundial. El contacto con personas infectadas y la manipulación de superficies contaminadas son las principales causas para que se disemine el coronavirus. Sin embargo, a partir de julio de 2020, más de 33 millones de personas por todo el mundo se habían visto afectadas. Aparte de hacer uso del Equipo de Protección Personal (PPE), los sanitizantes a base de alcohol y el aseo personal, también es de suma importancia el uso de desinfectantes para disminuir o detener la propagación eficazmente. Desde que se reconocen a las superficies y la gente como la causa de las transmisiones de COVID-19 a nivel mundial, el uso de la desinfección para con estos, es una buena forma para

detener la propagación de la enfermedad. Se han desarrollado muchas ideas y modelos para controlar el nuevo virus, pero estos modelos siempre se están actualizando para mostrar que tan bien se ha adaptado el virus en distintos ámbitos y regiones de la comunidad global. Con escaso apoyo científico, se han difundido teorías sobre la capacidad de supervivencia del singular virus. El uso de desinfectantes de distintos tipos es una técnica general de control para combatir la nueva Covid-19, y el cual se está implementando mundialmente. El riesgo de infección aumenta entre mayor sea el tiempo que una persona no infectada tenga contacto estrecho con una que sí lo está. Por el momento, el hecho de que una persona infectada tosa o estornude, sigue siendo la forma de transmisión que predomina. Parece una buena idea emplear desinfectantes para dejar inoperantes a las gotas de Flügge en las superficies inactivas para impedir que la COVID-19 se propague. Cuando se piensa en desinfección, la química, la concentración, el periodo de contacto y la cobertura son factores principalmente significativos. Los desinfectantes juegan un papel fundamental para dejar que la COVID-19 se propague en el ambiente y para garantizar la seguridad de todos. Como resultante de esta pandemia, la economía global ha experimentado un declive económico considerable. Se aconseja eliminar adecuadamente los suministros de control de COVID-19, para evitar la propagación de otros casos o algún otro tipo de problema de salud.

Palabras clave: desinfectantes contra COVID-19, fómites, nuevo coronavirus, salud pública, SARS-CoV-2

INTRODUCTION

Planet earth has suffered several types of pandemic at different times of man's existence but this current one was the first in this century. In the past ten years, individuals has suffered to a reasonable extent due to infections linked to Coronavirus strains (SARS-2003, MERS-2012, and COVID-2019). However, these three strains listed differs genetically from COVID 19. In the past the past outbreaks, the major areas that were affected were Middle East, Saudi Arabia and China. Transmission from animals to man began at the onset, and thereafter humans to humans transmission of the pathogenic microbes were documented in several nations (Lu *et al.*, 2020).

Coronavirus disease 2019 also known as COVID 19 infections caused by severe acute respiratory syndrome novel coronavirus 2 (SARS- Cov-2). It is a novel strain of coronavirus whose wide spread infections worldwide within a very short period of time has continued to attract public attention because of its attendants health implications (Dietz *et al.*, 2020). Coronavirus originated in Wuhan, Hubei province, China in December 2019 with the earliest index case originally linked to seafood in Wuhan city (Wu *et al.*, 2020) which suggested it as a direct means of transmission. However, hosts to humans, and human to human transmission are known to be means of transmission and spread of the coronavirus disease (Dietz *et al.*, 2020; Li *et al.*, 2020). It is also known as Coronavirus. It was declared as a world pandemic by the World Health Organization (WHO) in the year 2020. It is a novel strain of (SARS- Cov-2) which is revenging the entire world (Dietz *et al.*, 2020). On March 11th, 2020, when the virus had spread to 114 countries with over 118,000 cases and more than 4000 deaths, the WHO declared the COVID – 19 as a pandemic status (WHO, 2020). This makes COVID-19 to occupy the 6th position in world pandemic ranking. Others in earlier positions are H1N1 (2009), (Girard *et al.*, 2016) polio (2014), Ebola in West Africa (2014), (Kaaner and Schaack 2016), Zika (2016) (Plourde and Bloch, 2016) and Ebola in the Democratic Republic of Congo (2019) (Gostin *et al.*, 2019).

It has spread to more than 214 countries of the world as at 3rd May, 2020. With 3,267,184 confirmed cases and 229,971 deaths worldwide and in Nigeria with 2,388 confirmed cases and 85 deaths, there is need for a cursory look into this ravaging virus which has been declared a world pandemic by World Health Organisation in February 2020. There are preliminary evidence that contact with abiotic surfaces could also be responsible for spread of coronavirus (Rothan and Byrareddy, 2020). The viral particles settle on abiotic surfaces and also possibly function as pools for the viral transmission (Perlman, 2020; Ong *et al.*, 2020, CDC, 2020). There are indications that fomites are possibly contaminated with SARS- Cov-2 particles from individuals that are infected via secretions from

humans like nasal and saliva fluids, droplets spread through vomiting, sneezing, coughing and talking, contaminated hands, droplets spread via talking, sneezing, coughing, and vomiting (Ong *et al.*, 2020; Doultree *et al.*, 1999).

Coronavirus has been associated with as inflammation of the lungs, rise in body temperature, inhalation and exhalation challenge, pulmonary disease and mortality. Coronavirus disease-19 (COVID-19) has is associated with several types of animals. Some claim has it that few has been pathogenic to humans in time past. The agency that controls global health efforts referred to this current strain as 2019 novel coronavirus. It affects the downward tract that is used for respiration in subjects (Li *et al.*, 2020). The virus is called severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). This virus has been noted in different conventional mass media alongside World Wide Web, that many subjects had pulmonary infection that was connected to sea food bought from a selling point in Huanan, China sometime at the end of 2019 decade. In an attempt to curb the new infectious agent, the infection control unit in China delegated a group of experts to check the origin and extent of infection in the community. The World Health Organization (WHO) independently asserted the pandemic have a definite mode of transmission from human to human. Researchers has been trying to know the mechanism of this virus and how to develop a vaccine. In a span of 30 days, the virus has taken hold in most part of China leading to the cancellation of the Chinese New Year holiday as reported by British Broadcasting Corporation. The limitation of movement was actually meant to stalemate the spread of the virus to most part of Chinese province and to a reasonable extent, it paid off as the Chinese authority enforced a total locked/ban on all lines of transportation to Wuhan. Although, it might be too soon to know the extent in which the public are prone to the virus, some presentations look like severe acute respiratory syndrome (SARS) and Middle East respiratory syndrome (MERS) coronaviruses. The inability of some patients to resist the virus might have some connections with age, biology, gender, and other limitations to general well-being (Fehr *et al.*, 2017). COVID-19 has been tagged as a public health concern and a threat to all nations of the world by WHO. As a result of the widespread capability of this virus and the resultant effect on morbidity and mortality, the scientific world has turned their periscope to it.

In an attempt to initiate a response plan, the Nigerian government harnessed a group of individuals to be part of the COVID-19 presidential committee. Nigerian center for disease control was saddled with the responsibility of testing and announcing cases and fatality. Till date, the authorities saddled with this responsibility had released about 2300 cases with well over 80 deaths. The respective states in Nigeria has followed suite in initiating a certain degree of response plan. The state most hit in the South-Western part of the country (Lagos State) has actually been through a lot. Although there are cases of acclaimed death in Kano state and some other northern states with the death of prominent citizens and some others. At the time of putting this piece together, there is no clear distinction scientifically on the cause of death. The government of the day has initiated some measures in rolling back the numbers of would be infected individuals by COVID-19 testing, personal protective measures such as nose masking, social distancing, stay at home, lockdown, zero night life, washing of hands with flowing water and soap, use of alcohol based hand sanitizers, closure of academic institutions, restriction of social gatherings (burial, marriages, birthday, religious centers etc).

This pandemic took a toll on the entire world. The impact of COVID-19 on the globe has been a daring challenge for this survival of mankind. In the United States of America, the seat of power was threaten as the president enlisted for COVID test. The President was basically running the office alone from the oval office. The same problem affected the other countries. Generally, the outbreak affected most mega companies like Boeing aircraft, general electric, the military network and others. Other countries like Germany, France, United Kingdom, Spain, Italy and some others initiated a total lockdown. This singular act led to food shortages, and others

The distribution of this disease in human populations and the factors determining that distribution is uniquely remarkable. A relevant point in new global incidences is the ability of the organism to cause and cause diseases. Some of the subjects present with moderate signs and gets relief afterward. By February 20 of 2020,

China has recorded 18, 264 (24%) discharged patients. The recoverability and death levels in marked incidences in Guangdong were 26.4% and 13.4%, respectively. The timeframe for symptomatic presentation in mild and severe cases is 2 and 3-6-week period, respectively. In addition, severe oxygen deficiency in different organs started in about seven days. However, the mean time of symptomatic initiation to death varies considerably. Interestingly, the age presence/absence of other infection (e.g., Influenza virus and *Klebsiella*) or chronic conditions range is very important for the onset of signs and subsequent progression to morbidity and mortality (Ng and Hiscox, 2020). On the reverse, work from Singapore indicated that shows no history of morbidity.

The government of many countries and its agencies have increased sensitization and advocacy on the need to wash hands regularly with soap and running water for at least 20seconds, keeping social distancing of at least 6 feet, wearing of masks and mass production of Personal Protective Equipment (PPE) (CDC, 2020; Goldberg, 2017), use of alcohol-based sanitizers with alcohol content of 70% and above for hand sanitizing (Chhikara *et al.*, 2020). Government are stepping up effort at increasing contact tracing, setting up isolation, and testing centers through improvement in health care facilities. There are ban on travels in many countries of the world except those on essential duties, and advocating stay at home policy. However, these mobility restrictions have been confirmed to help contain the spread of COVID-19 as they help in preventing person to person contact as well as fomites based transmission (Ryu *et al.*, 2020). Efforts are on worldwide to produce vaccines against the dreaded coronavirus disease (Chhikara *et al.*, 2020).

Global impact of covid -19

Globally, confirmed corona virus cases had risen to unprecedented level with enormous people consumed by the deadly virus. The United States of America, Brazil Italy, United Kingdom and Spain have witnessed the highest degree of reported fatalities (Johns Hopkins University, 2020). Without a vaccine in sight, the World Health Organization (WHO) and subsidiary governments released guidelines of physical distancing, regular hand washing, use of facemasks, test, trace quarantine and eventual partial to total lock down.

Despite these proactive precautions to combat the ferocious virus, the impacts on the global population are at alarming rate and has resulted in the reduction of oil output and benchmark price, enabling nations cut their budgetary allocations. This has implored economic professionals to advice nations as a case of urgency, expand other frontiers of the economy with derived profits channeled toward other sectors and to eradicate reliance on crude oil products. However, it has been proposed that, the economic fall-out from the Covid-19 could approach trillions of dollars. Therefore, to avoid a re-occurrence of this nature, human health should be considered sacrosanct (Ejoh, 2020).

The scope of the pandemic has led government authorities to institute stay-at-home order, imposed curfews, closed worship places, social event center, festivals, markets and concerts. This trend has however thrown citizens into undeserved hardships, starvation and deprivation and people are hungry because they no longer go work. Based on this premise, millions of workers across the globe have lost their jobs and a lot number of small and medium scale enterprises have been crippled (Komolafe, 2020). Situations will ultimately deteriorate prior to improvements, therefore, it's imperative sustaining the intimate link between public health and the economy.

Additionally, violators of government orders are molested, brutalized, maimed and occasionally shot by overzealous security operatives. Some are imprisoned, vehicles impounded and are made to bail out, thereby thickening their social and financial burdens of citizens. The other offenders for fear of been arrested would abandon their cars and walk home in spite of the horrible experiences associated to night movements.

The pandemic has led to large number of children and maternal deaths everyday from preventable causes, within a short time due to Covid-19 related diseases (CDC, 2020). This has jeopardized normal service delivery and threatened to incapacitate the existing health coverage spectra. Under worst circumstances, the number of children dying globally before attaining the age of six could rise for the first time in twenty years. This scenario would be devastating for families and the entire world.

Similarly, countries with inadequate health facilities, Covid-19 would result to challenges in medical distribution network, reduced monetary and human capacities. This is due to lower number of patients attending health-care center for fear of the horrible infection community transmission of the virus. The lockdown is heinous; leading to prevailed molestation, intrusion of basic fundamental human rights, domestic, sexual abuse and rape have increased. In Lagos, Nigeria, the most populous city and the epicenter of the dreaded Covid-19 virus, the Domestic and Sexual Violence Response Team (DSVRT) reported that, prior to lockdown, 10 cases are recorded daily. However, since the pandemic, an average of 20 new incidents are now being documented (Ejoh, 2020).

The Executive Director (United Nations Women Affairs) Phumzile Mlambo-Ngouka urged governments and all stake-holders to place girls and women at the mainstream of their efforts to put an end to the girl-child and women violence, so as to preserve the safety and well-being of the girls and women around the globe. The home considered an abode, a place of delight and pleasure has turned to an avenue of fear, sorrows and intimidation for the vulnerable at this period of stay at home and opportunity for abusers to continually perpetuate their nefarious activities.

More so, the huge urge to prevent the high death rate (morbidity) originating from Covid-19 pandemic has led to wanton increase in product formation, reconstitution of drug composition and vaccine to curtail Covid-19. Nevertheless, since no vaccine presently exists to stop further spread of the virus, the inadvertently task of obtaining a therapeutic for this novel virus has led to claims and counter claims from health institutions and agencies saddled with the responsibility of providing and regulating health-care services. These health bodies accused each other of conspiracy, sentiment, distrust and unreliability for lack of verified clinical trials for claim supposedly adduced or developed as a panacea to Covid-19 virus.

The awareness and fear of Covid-19 has now become the beginning of wisdom, as sectors, hitherto neglected, would now be accorded proper considerations in the scheme of national growths. In diadem to this fact, professional organizations had advocated for massive developmental strides in the funding and reconstruction of health sectors, aptly abandoned by successive governments, which this pandemic has now revealed the associated dire consequences and failures in the health institutions. The end of the pandemic seems to promise job prospect, creation and preservation, while the training of medical personnel, doctors, microbiologist, nurses and other relevant health related professionals would be emphasized and prioritized.

Covid-19 pandemic would raise social protection system with governments and stake holders collaboration. This partnership would play key role in guiding, stabilizing and enhancing countries' economic growth and robustness. However, inadequate social and health leverage are inimical to the global population. Therefore, bodies such as World Health Organization (WHO), United Nations Children Education Fund (UNICEF), International Monetary Fund (IMF) and others are admonished to provide necessary assistance to optimally increase the capacities of the public health social protection institutions.

The epidemiological effects of this pandemic is the tendency to become a community transmitted infection. This is a situation where the origin of the disease is not known, neither can it be traced nor tracked. Consequently, this constitutes a task to epidemiological studies because, the infection aetiology, distribution, pattern of spread, detection, prevention become non-achievable, as the disease cannot be linked to anyone.

However, the prospect of a large number of persons or the whole community been contaminated is possible as a result of many individuals who are asymptomatic, without knowing that they possess the virus. Eventually, this will lead to exponential rise of the community spread because, someone is having the disease case,

you cannot isolate and detect. Nevertheless, to perform testing on everyone in a community is a huge challenge to epidemiological studies due to large number of persons in the community, religious beliefs and stigmatization.

Environmentally, power plants, construction sectors, factories and industrial activities stopped their productions, vehicular movements drastically minimized, transport system disrupted and aeroplane grounded. These have constituted to vast reduction in the concentration of carbon (iv) oxide (CO₂), nitrogen (iv) oxide (NO₂) and other particulate matters emitted into the atmosphere. This would eventually amount to the greenhouse gas (GHG) emission to fall, thereby affecting the environment. The closure of schools, social gatherings and decline in planned travel had lowered the risks of pollutants escaping into the environment, resulting in reduced air pollution and improved air quality.

The use of energy has been disrupted world-wide by the advent of Covid-19 pandemic, fewer vehicles ply the roads, reduced traffic congestion and the discharge of less carbon monoxide (CO) into the environment. In fact, carbon emission has reduced by an estimated 10 percent of 2019 in global total of gas released, indicating that corona virus pandemic has accelerated the highest yearly drop in carbon related gases in 2020. Reduced public noise in transit engines, generators and high powered vibrations have the tendency to alter the natural conditions of the air ecosystem.

In order to avoid spreading the virus, the routine activity of waste recycling centers have been suspended in some parts of the world. The release of organic (faeces, urine and meals left-over) medical wastes (masks, hand gloves, tissue paper and personal protective equipment) onto water and soil ecosystem could be altered through microbial transformations. In addition, the application of disinfectants such as chlorine and ozone as we wash our hands and in waste-water treatment facilities to combat the distribution of the virus and other prevailing microorganisms used in excess, could constitute a threat to the public health system.

The common practice of regular hand washing at this pandemic era by detergents and soaps to arrest the pathogenic action of the virus, could drain or deposit other organisms into the soil and water habitats, which could change their compositions, cause reduction in biological oxygen demand (BOD) chemical oxygen demand (COD) and coliform levels in water bodies.

The lockdown has prevented tourists from visiting beaches, thereby making beaches and water channels clean, devoid of accumulated particles and sediments. This would eventually stimulate much water flow, healthier and visibility of fish. Subsequently, fish biomass will increase due to reduction in fishing activity, resulting in the prices of fish to crash. Covid-19 pandemic has heightened wild-life conservation globally, since the vector of the virus transmission to humans has been linked to animals (bats and pangolin).

Control measures

One overarching control measure across the board around the world is the use of disinfectants of all sorts to fight the novel Covid-19. Coronavirus, also known as COVID-19, is a new disease (WHO, 2020a). The virus reported to be responsible is still being understood and continues to evolve. Available reports show that Covid-19, a new strain of coronavirus, was first identified and detected in Wuhan, Hubei, China (WHO, 2020b). Today, Covid-19 has been reported in over 100 countries around the world. The disease is believed to have originally occurred from animal-to-person contact and then spreads from person-to-person. Like other coronaviruses, the transmission of COVID-19 is most likely to happen when there is close contact (2 metres or less) with an infected person (WHO, 2020a). It is most probable that the risk of infection increases the longer an uninfected person has close contact with an infected person. The main route of transmission to date remains the release of viral droplets when an infected person coughs or sneezes (Palmer, 2020; UNC Health, 2020; CDC, 2020).

Governments all over the world have churned out a lot of regulations to control the novel COVID-19 since it was detected and declared a pandemic by WHO (WHO, 2020b). Policymakers, health care practitioners,

researchers and non-specialists in the business of health have all had concerted efforts in spilling out several measures. Some of the control measures are highlighted below.

1. Declaring partial/total lockdown. This measure to date remains the most utilized by several nations across the world to curtail the spread of the virus so far. This measure was targeted at stopping international, national, sub-national and community transmission of the disease. The implication of a partial/total lockdown is partially or totally closing all borders. Like in other regions of the world, 15 sub-Saharan countries closed their airports, ports and land borders partially or fully (Fletcher and Rouget, 2020).
2. Social distancing. This is also referred to as physical distancing. It entails merely keeping a distance of not less than 2 m away from a person who is not of your immediate home.
3. Improved Personal Hygiene. A frequently advocated measure is the regular washing of hands at all times. There is also the need to avoid touching your nose, mouth and eyes or surfaces within and outside the home
4. Massive Screening and Testing. The effective screening and testing of suspected person is a vital measure in tracking the trend of transmission and how reliable the rules in place have been.
5. Compulsory use of facemask and Hand Sanitizers in Public. The use of face masks and alcohol-based sanitizers is also one measure that has been advocated.

To date, though a good number of clinical trials are ongoing across the world, no vaccine is yet to be certified or approved for human use against the novel strain of the ravaging coronavirus (Covid-19). Across borders, the most effective preventive measure is to avoid any form of exposure to the virus (Palmer, 2020). Generally, in preventing respiratory infections like Covid-19, most of the health guide include regular washing of hands with soap and water for at least 20 seconds or use of hand sanitizers (at least 60% alcohol), use of facemask to cover both the nose and mouth and coughing or sneezing into your elbow or a tissue to be discarded appropriately. Other preventive measures include resisting the urge to touch your face, nose, eyes and mouth with contaminated or unwashed hands as well as the intermittent cleaning and disinfection of frequently touched surfaces or objects (Palmer, 2020)

Managing the novel virus has thrown up many theories and models which keep changing following the adaptability of the virus to different areas/spheres of the global world. Postulations on the survival of the novel virus have been spilled with little or no scientific validations of these opinions. Generally, according to a report by Palmer (2020) working collaboratively with the European Agency for Safety and Health at Work (EU-OSHA), the survival of any respiratory virus rests on some key factors such as what surface the virus is on, whether it is exposed to sunlight, differences in temperature and humidity and the exposure to cleaning products. In most of these circumstances, the amount of infectious virus on any contaminated surfaces is likely to decrease significantly over 72 hours. A significant management measure explored by many Governments around the world is to slow down the spread of the virus by restricting human and vehicular movements, and gatherings and where impossible, enforce strict regulations. The compulsory wearing of face masks and provisions of sanitizers in public places have also been adopted to manage the rampaging effect of the virus. The provision of readily available isolation centers and strict monitoring of self-isolated cases are other measures that have been applied by the Covid-19 management councils in different countries. The massive and gigantic screening of those entering public space has been advocated and utilized as well as the contact tracing of those suspected to have the symptoms or had contact with a positive case.

Nevertheless, the death toll from the pandemic has been on the increase with a fast track facilitated research by many institutions across the world for a vaccine to arrest the situation. A lot of trials are ongoing, but the success rate of the trials of the possible vaccine in the initial clinical trial phases have not been very encouraging. The untoward side effects and low recovery rates have been dismal and disproportionate.

A first set back in the control measures so far is the time lag in getting the valid results of suspected positive cases. Though efforts are being made to scale up screening, but the testing of suspected Covid-19 patients have generally been low. Contact tracing of suspected Covid-19 persons has been met with a lot of difficulties. The

escape in some instances, and the uncooperative attitude of suspected persons have been an uphill task. The most significant dilemma facing most Governments across the globe is their ability to balance the control of the virus with looming economic activities. Most of the control measures have made nations to choose between saving lives or saving the economy.

Disinfection as a protective measure

The history of man has been linked with the need for good hygiene level but COVID-19 has taken this to a greater height judging from the need for regular hand washing and in the absence of this, the need to use and alcohol based sanitizer. The need for the disinfection of human hands and surfaces has a major role in the prevention of contact transmission as well as community spread. In essence, good hygiene is a major way curtailing this pandemic. There has been a known method of treating hospital items in order to prevent the transfer of infectious agents (Spaulding, 1968). All aspects of infection prevention are crucial in the response against COVID-19: compliance with social distancing, availability of personal protective equipment (PPE), effective hand hygiene, and thorough surface disinfection, and that one is not necessarily more important than the other. While the media has widely reported on social distancing and (unfortunately severe deficiencies of it) PPE and hand sanitizer, the nuances of surface disinfection are not frequently discussed.

It has been reported that COVID-19 can be transmitted through aerosolized droplets and this can remain viable for hours or days depending on the surface material. In the hospital, these aerosols might be deposited on hospital equipment. Most of these equipment are grouped according to the hazard that they harbor in its ability to transfer and initiates infection as seen on different critical cases (Spaulding, 1968). COVID-19 is an enveloped virus, meaning that it's protected by a fatty lipid bilayer. Fatty layers are easily exploited. When hands are washed with soap and water, the individual creates a fat-soluble layer for the fatty layer of the virus to bind to so that it will be washed away with the soap. Unlike more robust pathogens like non-enveloped viruses and bacterial spores that contain layers of tough protein, fatty layers are susceptible to bonding with alcohol which causes the fat to un-bond with each other, opening up the envelope and allowing the alcohol to go in and denature proteins. Stronger oxidizing disinfectants, like bleach and hydrogen peroxide, literally rip electrons off molecules to destroy the structure of the pathogen. Using a disinfectant to inactivate droplets on surfaces seems like a good way to prevent COVID-19 transmission.

In considering the disinfection, the chemistry, concentration, contact time, and coverage are uniquely important. The chemistry, concentration, and contact time basically refer to what, how much and how long it takes to kill a specific pathogen. For example, the active ingredient in Clorox healthcare germicidal bleach wipes is 0.55% sodium hypochlorite and it claims a 3-minute contact time against *Clostridium difficile* spores. The items that could transmit infection are grouped into critical, semi-critical and non-critical equipment (Spaulding, 1968). In order to make it to the shelf, most disinfectants have to submit data to the EPA proving these claims. To be classified as a sanitizer, for instance, the requirement is usually conducting an AOAC- or ASTM-standard test demonstrating a minimum 3-log reduction (e.g. 99.9% reduction, 4-log would be 99.99%, and so on) within 10 minutes on a couple of pathogens. Specifically in the context of COVID-19, a recent paper that compiled data on the efficacy of disinfectants against enveloped viruses. Sodium hypochlorite at a concentration of 0.5% was able to achieve a >3.0-log reduction in human coronavirus after 1 minute, whereas a 0.06% sodium hypochlorite solution was only able to achieve a 0.4-log reduction in transmissible gastroenteritis virus after the same time period, suggesting that a longer Contact Time than 1 minute is needed for a more diluted bleach solution to effectively kill enveloped viruses or that stronger concentrations should be used in practice.

All the disinfectants presented on the EPA's disinfectant list against COVID-19 have varying concentrations of active ingredients that require a different amount of time to be effective. As a case study, Micro-kill bleach wipes have a 30 second contact time, Sani-cloth bleach wipes have a 1-minute contact time, and Cavicide bleach has a 3-minute contact time, even though they are all sodium hypochlorite. Majority of the quaternary ammonium

("quat") disinfectants (which is the active ingredient in household disinfectants like Lysol and what the media means when they say "alcohol" because quats are dissolved in alcohol) tend to have longer contact times at the 10-minute mark. As discussed above, it's generally because alcohol breaks down the membrane by bonding and then the quats permeates and denature proteins whereas bleach is ripping the virus apart more rapidly via oxidation. In the hospital settings, the 3 steps equipment groupings (critical, semi-critical and non-critical equipment) has also found used in aseptic uses (Garner and Favero, 1986). This could also be applied to COVID-19 scenario. One of our gripes with all of the news articles saying that bleach is overkill and that alcohol is sufficient is that they completely neglect the contact time. Alcohol can be effective, but often only if left on the surface undisturbed for 10 minutes, in which time the alcohol could evaporate and one may need to reapply. Finally, there is coverage, which is pretty intuitive and ties everything back to the importance of process – cover every part of the surface and make sure the surface is covered for the correct Contact Time. Of course, this can be difficult when one is dealing with large surface areas and using a transparent disinfectant. It's worth noting that many of the surfaces one tend to disinfect are waterproof, and when a liquid is added on a waterproof surface, it beads up. If beading occurs, one physically unable to achieve the contact time on every part of that surface. The good news is that more disinfectant manufacturers have been addressing this problem by adding surfactants which lower the surface tension of the liquid to allow spreading out.

The importance of disinfection of humans and surfaces as a preventive measure

Humans and surfaces are known to be responsible for the transmission on n COVID – 19 worldwide (Chhikara *et al.*, 2020). Symptomatic patients spread the virus through release of respiratory droplets by sneezing or coughing (Kam *et al.*, 2020) while asymptomatic patients with SARS-CoV-2 virus spread it via handshake as well as surface contamination by hands (Bai *et al.*, 2020). Travellers to and from Wuhan city in China during the peak infection era were mainly responsible for the spread of the infections to other countries of the world. Because of the aforementioned, it is very important to disinfect humans and surfaces. However, the view that environmental disinfection is important has recently begun to gain ground. Disinfection of surfaces has become a component of many topical domestic and global infection control strategies and endorsements. In recognition of this fact, the commission for hospital hygiene in Germany came up with recommendations for cleaning and disinfecting of surfaces in 2004 (Gebel *et al.*, 2014; Otto *et al.*, 2011). This brings to a fall the obvious need to disinfectant surfaces all in attempt to reduce viral load on surfaces thereby creating a clean and hygienic environment for all. Disinfectants are applied on only hard surfaces that are not food contact surfaces to exterminate microbes. This is because they are applied at much higher concentrations and allowed longer contact time. Perfume often make up part of their component (Evans *et al.*, 2002; Sattar, 2007). However, humans are encouraged to continually make use of sanitizers to guarantee good hygienic practices

Gains and challenges met so far

The world health Organization has said that there are currently no effective treatments for COVID-19, though series of researches are on to develop vaccine to combat the public health pandemic. However, there are lots of preventive measures put in place by WHO and CDC as adopted by many Nationals to halt contamination and spread of COVID-19 is to evade contamination with severe acute respiratory syndrome coronavirus (SARS-CoV-2). These measures include advocacy / public awareness, frequent hand washing / sanitizing with alcohol based solutions, frequent hand washing, frequently wiping of surfaces / objects, practicing of good respiratory hygiene, Avoid touching your eyes, nose and mouth, maintaining of social distance, Stay home and self-isolate, wearing personal protective equipment (PPE), and Ban on public travelling and lockdown of nations (Adhikari *et al.*, 2020; Chhikara *et al.*, 2020; Ramoset *al.* 2020; WHO, 2020;).

1. **Advocacy / public health awareness:** There is need for concerted effort by all sectors of the society to engage members of the public (citizens). This should be scientific evidence based findings passed to health care practitioners and the general public so as to alleviate their nervousness and suffering that could result from propaganda. There is need for findings from epidemiological studies to be reported in apt and unbiased routine so as to allow for precise review and understanding. Distorted information can lead to fear among members of the public and it is not helpful in putting into practice endemic control procedures (Lili, 2020).
2. **Frequent hand washing:** There is need to wash hand frequently and painstakingly using water and soap for a minimum of 20 seconds, particularly after one has come in contact with members of the public, or immediately after sneezing, coughing or blowing one's nose. However, in the absence of soap and running water, especially in if one is not at home, there is need to make use of hand sanitizers which should contain at minimum of 60% alcohol. Frequent hand washing and sanitizing are one of the best practices to prevent contamination and spread of coronavirus disease (CDC, 2020; Chhikara *et al.*, 2020).
3. **Frequently wiping of surfaces / objects:** surfaces that are commonly touched by members of the public such as like desks and tables as well as objects including telephones, keyboards, handles, and toilets need to be disinfected regularly with the aid of disinfectants containing at least 60% alcohol. However, the readily utilized ones in households are effective. Moreso, the use of too much quantities of alcohols and disinfectants put humans at high risk as they are considered to be potentially harmful, therefore, and should be avoided (National Health Commission of the People's Republic of China, WHO, 2020).
4. **Practicing of good respiratory hygiene:** This involves members of the public putting up acceptable respiratory hygiene practices. This include covering of nose and mouth with bent elbow or the use of tissue paper especially when one sneezes. These used tissue papers should be thereafter disposed immediately in the waste bin (CDC, 2020, WHO, 2020; Wang *et al.*, 2020).
5. **Avoid touching your eyes, nose and mouth:** The human hands are always in contact with surfaces and objects which serves as host to coronavirus and other viruses making them to be contaminated with these viruses. Once contaminated, the human hands can transfer the virus to the mouth, nose or eyes and finally into the body and subsequent spread into tissues (Chhikara *et al.*, 2020).
6. **Maintaining of social distance:** This is one of the precautionary methods which recommended for preventing being contaminated especially when in close contact with an infected person (s) or spreading the virus. This also reduces secondary infections form close association as well as health care providers thereby avoiding the spread of the virus. The recommended distance is a minimum of six feet or two meters between yourself and anyone who is sneezing or coughing (Gennaro *et al.*, 2020).
7. **Stay home and self-isolate:** When someone is not feeling good and experience increase temperature, cough and breathing difficulties, it is advisable to immediately reach out for medical attention by informing a professional health care giver. Also, it is advisable to practice self- isolation in one's home as much as possible. This is to reduce the possibility of being exposed to the virus. When someone is having symptoms of coronavirus, there is need to practice self -isolation for at least 14days, the estimated maximum incubation period (Gennaro *et al.*, 2020; Lili, 2020).
8. **Putting on Personal protective equipment:** These include clothing including masks and googles which should be worn by medical personnel that are actively involved with the management of COVID -19 patients. These

protective materials are important as they prevent getting infected, however, there is need to make a distinction the various risk factor, take on diverse ways of preventing epidemic, as well as reduction in the leftover of personal protective equipment. This is due to the short supply of these equipment. The use of surgical masks and non - surgical masks worldwide by the general populace to prevent the spread and acquisition of COVID-19, there is however no scientific evidence supporting its use, it however, slightly reduce spread from infected persons. Health care practitioners are advised to make use of particulate respirators like the ones certified by N95 or Filtering Face Piece 2 (FFP2) during aerosol-generating procedures and to use medical masks when taking care of suspected or confirmed cases (Chan *et al.*, 2020; Hopman *et al.*, 2020; WHO, 2020; National Health Commission of the People's Republic of China, 2020).

9. Ban on public travelling and lockdown of nations: These are considered of no value in preventing and controlling COVID-19. Since the onset of coronavirus, most countries have put on hold travels to and from China, also, Chinese nationals have also been prevented from travelling into other nations of the world. It is known that these actions contravene the International Health Regulations as recommended by the world health organization (Habibi *et al.*, 2020). Also, the sealing of road networks between towns and cities have been reported to be of no value in alleviating the prevention and control of community spread of the diseases such precautions could lead to disorder in the community and decrease counsel relating to the prevention and control advice of the virus (Chhikara *et al.*, 2020; Ruyi, 2020).

Disposal of covid-19 related wares

The Texas Department of State Health Services (DSHS) and the Texas Commission on Environmental Quality (TCEQ) generally defined medical waste as special waste from health care-related and includes treated and untreated animal waste, bulk human blood and body fluids, microbiological waste, pathological waste and sharps. Approved methods for treatment of medical waste include steam sterilization (autoclave), incineration, chemical treatments and shredding. After treatment, medical waste may be managed as routine municipal solid waste and disposed off in a municipal solid waste landfill. It is established that some microbes linked to hospital acquired infections resists baseline cleaning and also live for extending periods on wet and dry surfaces thereby permitting transmissibility through hands and movement of air (Weber and Rutala, 1997). Some agencies regulates entities that manage medical waste, including transportation, storage, transfer and treatment facilities. These rules include requirements for labeling and packaging, transportation, storage times, and handling procedures. WHO recommend that the management of waste materials related to COVID-19 from healthcare facilities should be performed in accordance with routine handling procedures for medical waste (for example laboratory specimens, sharps, cleaning cloths, wipes, single-use microfiber cloths, etc.). For double-bag contaminated wastes all used gloves, facemasks, and other disposable items should be place in a bag that can be tied closed before placing in another bag with other wastes. There is need for proper cleaning of hospital related wares to ensure safety of life (Weber and Rutala, 1997). Bags should be dropped in a rigid trash container, like a trash can with a lid or dumpster. Hands should be washed with soap and water for at least 20 seconds or an alcohol-based hand sanitizer should be used immediately after removing gloves or handling trash bags. Hypochlorite has been documented to be a more superior cleaning and disinfecting agents than the to the quaternary ammonium solutions (Fawley *et al.*, 2007). This superior potency might be helpful in curbing the spread of COVID-19 in the community because it could ensure effective cleaning and disinfection of medical wares.

In conclusion, it has been observed that COVID-19 disinfectants has effect on the environment, nature and ecology as seen from leaching of these chemicals into the ecosystem. The pandemic might have taken a toll on the life of humans as observed from the monumental death and shrinking of the global economy alongside the social distancing of the entire global.

CONCLUSION

The disinfectants are important in combating the spread of COVID -19 in the environment, thereby ensuring safety for us all. This world pandemic has caused a lot of downturn in nations' economies worldwide. The safe disposal of COVID -19 management wares is advised so as not to expose the world to increased cases or another form of health challenge. This brings to the over-riding importance the need to improve the world health care delivery system and most importantly personal hygiene.

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