World Pandemics and the War Against CoVID-19

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Abstract

Microbes ('germs' in lay terms) have always been a constant threat to human existence. Hence, an endless war between microbes and humans is taking place at all times. This has been a phenomenon since antiquity and throughout human history. Out of the many major pandemics, it was only Smallpox that was eradicated from the world through a well-coordinated immunization programme. There are many examples in the past where pandemics have threatened the existence of civilizations and caused the shifting of well-established kingdoms. The virus that has caused the current pandemic was named SARS- CoV-2 (Novel Coronavirus) as it is genetically related to the SARS virus pandemic that took place in 2003. The disease or outcome of this infection is called CoVID-19. Based on secondary sources and author's own reflection, the author views that CoVID-19 is a naturally born virus, not a laboratory construct and it shares symptoms and signs with other respiratory virus infections. Control measures operate at many levels from Individual to global aiming at achieving a CoVID-19-free world. In this endeavour, the World Health Organization (WHO) has a crucial advocacy role. It has to coordinate between states and formulate guidelines periodically. Hence, stronger disease surveillance systems should be established in the future with a view to identify early and prevent future pandemics. In general, the investment on Public Health is the key for success.

Keywords: *Pandemics, Viruses, Severe Adult Respiratory Syndrome, Corona Virus Disease 2019, World Health Organization, Polymerase Chain Reaction.*

Introduction

Microbes ('germs' in lay terms) have always been a constant threat to human existence. Hence, an endless war between microbes and humans is always taking place at all times. This has been a phenomenon since antiquity and throughout human history. There have been many devastating past

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pandemics in the world since the Plague of Athens in Greece (429-426 BCE) (Littman, 2009). The Black Death in Europe (1347 -1353 AD) (Wade, 2010) and the Great Plague of London (1665AD) (Haensch, 2010) have caused major havoc and deaths in well over a thousand million, at a time when the world population was less than one billion. Therefore, the world population was almost constant over many millennia. With advancements made in science, the world population rose steadily and then exponentially after mid-19th century AD. This was mainly due to the emergence of the field of public health and improvements in the medical sciences.

The world population as of 2019 stands approximate at 7.8 billion (7800 million) (United Nations, 2019). The world took many millennia for it to have the first one billion habitants (1804 AD); it took another 123 years (1927 AD) for the second billion. Thereafter, it gradually took shorter periods to add one billion people to the world. It took only 12 years for the last one billion to be added (from 1999 to 2011). When the population was rising and general conditions were improving, people were very happy and this was, indeed, considered man's major achievement. However in 1798, Thomas Robert Malthus, an English economist, voiced a different view "Malthusian trap/theory" (Tisdell, 2015) against the then popular belief. In his book, *An Essay on the Principle of Population*, he presented that humans will face a catastrophe in the future as there would be an imbalance between population and available supplies. It meant that the available resources would not be able to meet the demands due to the rising world population.

An epidemic due to an infection ,particularly, of virus origin of another country cannot or should not be considered a problem of that particular country only, in the context of current globalization. In the past, over a century or two ago, it took several weeks or months or even years for an epidemic to spread and become a pandemic. This was due to the mode of transport of travellers. At the time, it was by sea (by ships) or land which took months to reach their destination.

However, with the advancement of technology (air routes, rapid trains, etc.), the time taken to reach the destination has gradually become shorter. Now it takes less than 24 hours to travel across the globe. Hence, the spread of an

infection is likely to be super-fast, beating all human preventive strategies. As a result, there can be an exponential rise in affected individuals in a very short period of time. Further, the pandemics of Cholera, Smallpox, Malaria, HIV/AIDS etc. have also caused much human suffering and deaths in many millions. Just over a century ago, after World War 1, the Spanish Flu pandemic (1918/1919) caused an estimated 50 – 70 million human deaths (Spreeuwenberg, Kroneman and Paget, 2018).

Hence, the world has suffered immensely in the past due to such numerous pandemics caused by microbes. Considering past human suffering, in fact, the world is now a much safer and better place to live in, mainly due to vast improvements in Public Health services. However, an epidemic, particularly one with a virus origin, should not be underestimated. Unlike bacterial infections, for which a wide range of antibiotics is available, in general, virus infections have no specific drugs; this makes prevention the only rational method.

Viruses

Medical terminology has its roots from Latin and Greek languages. Therefore, such terms sound non-English and are unfamiliar to most lay people. Microbes (micro-organisms, as opposed to macro-organisms) are of many types. There are four main types of germs (microbes) causing infections.

1. Virus (plural – viruses)
2. Bacterium –singular form, (plural – bacteria)
3. Fungus (e.g. Yeast), plural - fungi
4. Protozoan (e.g. Malaria)

The smallest of all, are of basically two types – RNA viruses and DNA viruses, depending on the type of genetic material found inside the virus. RNA viruses are the smallest and most primitive. (RNA – **R**ibo-**N**ucleic **A**cid, DNA – **D**eoxyribo-**N**ucleic **A**cid). The current pandemic is caused by

the new CoVID-19[2] (**Co**rona **Vi**rus **D**isease **19**) or 2019 novel coronavirus or '2019-nCoV' (World Health Organization, 2019). Viruses have their preferences in residing in the human body when it comes to their site of infections. Some viruses mainly cause respiratory illness (Influenza virus – causing common cold/flu). CoVID-19 broadly falls in to this type and mainly causes respiratory symptoms, e.g. cough, sore throat etc. Pneumonia is a serious complication. Another group of viruses mainly attacks the intestines (medically called Gastro-Intestinal Tract infections) causing loose stools (Diarrhoea). Similarly, some viruses cause brain infections, leading to Meningitis or Encephalitis. All types of viruses can affect any system in the human body and share common features, but they have their primary sites of infection; e.g. CoVID-19 infection can affect any system namely intestine, brain or even kidney, though the main site of infection is the respiratory system (ear, nose, throat or lungs).

Spread of Virus Disease (transmission)

It occurs in many ways. It can be transmitted to a person from an affected individual (patient) through air/droplets (in which case the disease is called air-borne), e.g. Influenza virus, CoVID-19 etc. Another method of transmission would be through water or food (called water-borne or food-borne diseases), generally affecting the gut (intestines) resulting in loose stools. Also, some virus infections are transmitted by animals. For instance those caused by mosquitoes are called mosquito-borne virus diseases e.g. Dengue Fever is also broadly called vector-borne disease; here the vector is the mosquito (another well-known example is malaria, but here the microbe is not a virus, but it is a protozoan).

Various types of antibiotics are available for bacterial infections. Generally, there is no specific treatment for viral infections, and antibiotics are not effective against viruses. Anti-viral drugs are seldom available and not as

[2] The subject of CoVID 19 is gaining new knowledge on a daily basis. This article was submitted in mid- December 2020. Hence, some facts may easily be out-dated at the time of publication.

effective as antibiotics in bacterial infections. Hence, so far there is no anti-viral drug available to treat the CoVID-19 infection.

Basic knowledge on certain terms is required to understand the situations of medical importance, such as the CoVID-19 pandemic.

- **Endemic disease** - a disease or a condition, regularly found in a certain population or in a particular area. It may not be an infection; e.g. thyroid disease can be endemic in Sri Lanka. Dengue Fever is now endemic in Sri Lanka (Malaria was endemic in Sri Lanka some time back).
- **Epidemic** - the appearance of a particular disease/condition in an unusually large number of people (or patients) during a short period of time. When Dengue Fever is endemic in an area/country, and if suddenly, a large number is reported in a short time, it can be called a Dengue Fever epidemic during an endemic situation.
- **Pandemic** (Pan-epidemic) **-** When the condition is prevalent across the globe/world.
- **Zoonotic Disease -** any disease or infection that is naturally transmissible from vertebrate animals to humans.
- **Incubation period -** The period between exposure (entry to the body) to an infection and the appearance of the first symptom.
- **Antigen –** an external agent that enters the body (any form of microbe – e.g. virus, bacterium etc.)
- **Antibody –** what is produced by the body in response to an antigen that has entered the body. This is a protein produced in the blood to neutralize the antigen.
- **Symptoms –** Apparent to the patient, usually described by patients. E.g. cough, fever, pain etc.
- **Sign -** A feature that can be recognized by the physician, nurse, or someone else (patient may not be aware).
- **PCR Test – P**olymerase **C**hain **R**eaction test. It is a time consuming test done through a machine; Samples are taken from nose and throat. It detects the genetic material (RNA particle in case of Corona virus), PCR test is not only for Corona virus, but it can be done to detect

other germs also e.g. Tuberculosis (TB) bacterium. The test has been in use for the past 36 years. This test has a high specificity. (Once a positive result is yielded, the chance of actual disease is very high).

- **False positive result** – Test is positive, but the patient has no disease (it means that the test incorrectly gives a positive result)
- **False negative result** – Test is negative, but the patient has the disease (it means that the test misses out a certain number of actual patients, incorrectly gives a negative result).
- **Sensitivity of a test** – the ability of a test to detect true positive patients.
- **Specificity of a test** – measures the proportion of true negatives, (measures a test's ability to correctly generate a negative result for people who don't have the condition that's being tested for). Once detected as positive, the ability to be certain of the result or the chance of actual disease.
- **Rapid Antigen test -** Rapid antigen tests require respiratory specimens (nasal swab etc.) from the patient. Rapid antigen tests will indicate if a patient is actively infected with SARS-CoV-2. They detect the presence of virus-specific proteins (antigens), from patients' specimens.

Interpretation - Example

A test with high sensitivity (95% is generally considered to be very good) means it will detect 95% as positives. It also means the test will miss out 5% of patients who have the disease (false negative).

The current PCR test is said to have 70% sensitivity. It means, out of 100 actual patients it can detect only 70 patients. It also means when 100 actual patients are tested, the test can miss out 30 actual patients. This is a dangerous situation where this 30% will be viewed by lay people as 'all cleared' and will move freely in the community and have the ability of infecting others.

This is the reason why the control measures do not tend to give us desired results. (But it is said to have a high specificity, it means once identified as positive, it is highly likely that the patient has the condition.

SARS-Cov-2 (Severe Acute Respiratory Syndrome Corona Virus 2)
The virus was named SARS- CoV-2(Novel Coronavirus) by the WHO on 11th February 2020 as it is genetically related to the SARS virus pandemic that took place in 2003.

CoVID-19
It is the outcome or disease condition that has emerged as the result of the virus. It was named by the WHO on the same date as above. For general use, the term CoVID-19 may be used to identify the virus or disease.

Important
Since the SARS-Cov-2 (or simply CoVID-19 virus) is a new virus, scientists, medical experts/academics are going through a learning process. New knowledge is being added to medical literature on a daily basis. The WHO is the apex body of health related matters in the world and sets guidelines on currently available knowledge. The guidelines/opinions that were expressed in the early stage of the pandemic (in Jan/Feb/March of 2020) may well have been different or replaced now due to new learning. Therefore, this phenomenon has to be considered at all times.

As it was mentioned above, it is an RNA virus, belonging to the corona virus family, spread by droplets. The entry of the virus is mainly through the nose, mouth and eyes. These droplets are released to the environment when a patient coughs or sneezes. It is said to be a heavy RNA virus; hence when a patient coughs out, it tends to fall 1 – 1.5 metres away from the patient. It can be on a surface, surviving for some time. The length of this period is not yet fully known, but it depends on the type of surface (metal, plastic, wood, human skin, etc.) It may take from a few hours to days. It is also known to be heat sensitive and is expected to become inactive after 50 – 70 Centigrade and be destroyed over 70 centigrade. It has an incubation period of 2 to 14 days, average 5 – 7 days (World Health Organization, 2020). It mainly affects the respiratory system, causing symptoms such as fever, cough,

tiredness, sore throat, headache, loss of smell and taste etc. Serious symptoms are difficulty in breathing or shortness of breath, chest pain, and loss of speech or movement.

Most patients do not show any symptoms (asymptomatic), and up to 80% exhibit only mild symptoms. Severe manifestations occur only in less than 5 % (McNamara, 2020). The case fatality rate/ratio (proportion of deaths from a certain disease, is simply the percentage of deaths from a particular disease which is generally around 2-3%. However, the case fatality depends on several factors such as age, association with other long term illnesses (pre-morbid/co-morbid/ underlying medical problems like cardiovascular disease (heart disease), diabetes, chronic respiratory disease and cancer, are more likely to develop serious illness). Smoking is an important behaviour pattern which creates a high risk situation. As such, patients can die of respiratory failure (due to pneumonia), heart failure (cardiac ischemia- heart attacks) or multi-system failure (failure of many organs simultaneously).

Origin of CoVID-19

There is some speculation about the origin of CoVID-19 infection; whether it was a naturally occurring or a human created virus in a laboratory setting. It is very difficult to subscribe to the theory of a human created virus without substantial evidence, as the virus has caused an extremely dangerous and sinister situation. It can easily go beyond the control of the instigator due to subsequent mutations (changes at molecular level of the virus). This could well and truly lead to disastrous consequences to the creators themselves. Therefore, the author's view is that CoVID-19 was a naturally born virus, not a laboratory construct.

Control / Preventive Measures

We must be mindful of the fact that complacency in our preventive strategies can well be our biggest enemy. We are up against an invisible, yet a very powerful, enemy.

Individual Level

It is observed that many people have still not truly understood the serious nature of the problem. Once the basic knowledge is known, it is common

sense that ought to prevail. Since it is spread by droplets, the following preventive measures should be adopted.

1. Wearing effective masks in all outings
2. Maintenance of a fair distance between people; 1 – 2 metres
3. Frequent hand washing with soap and running water after exposure
4. Avoidance of touching the face or mask
5. Bathing after coming home from work or all outings
6. Using a standard hand sanitizer when hand washing is not possible or not practical
7. Stopping all forms of intimate greeting gestures e.g. kissing/hugging, hand shaking etc.
8. Avoidance of places that are closed, crowded or involve close contact
9. Postponement of all non-essential travelling
10. Being mindful of safe public transport
11. Cleaning and disinfecting surfaces frequently especially those which are regularly touched, such as door handles, and phone screens.

Community Level

Health education and community screening – the WHO has recommended all possible screening tests as much as possible, such as PCR tests, Rapid Antigen tests etc. on selected and random samples. Restriction of non-essential public gatherings of various types, and contact tracing of all close contacts are recommended.

Political Commitment and Leadership

- Appointing appropriate specialized teams to investigate and manage the situation.
- Releasing adequate funds to various relevant authorities.
- Strengthening of the community and hospital capacities in order to cope up with exponential and unexpected health needs.
- Implementation of quarantine laws etc., empowering law enforcing authorities appropriately.
- Having emergency and alternative plans/strategies for unforeseen circumstances.

Global Commitment

All states, working towards one objective / goal would be an essential step towards achieving a CoVID-19-free world. In this endeavour, the world's governing body in health – World Health Organization (WHO) has a very crucial advocacy role. It has to coordinate between states and formulate guidelines periodically.

Lessons from the Past

The first smallpox vaccine was given in 1796 by Edward Jenner. However, the last naturally occurring smallpox patient was detected in October 1977. It means the world took 181 years to eradicate smallpox which was once a dreadful disease. However, in the present context, we can be more optimistic due to advancements made in other fields e.g. transport, knowledge of medical science, social science, literacy of the general public, etc. The BCG vaccine (to prevent Tuberculosis) was developed over a period of 13 years, from 1908. The first vaccination was carried out in 1921, almost 100 years ago (Hansen-Flaschen, 2020). Since then, the BCG vaccination has been given worldwide. Despite its administration, the world still loses over two million people due to Tuberculosis. However, it has a much less infectivity (in spite of being air-borne) than CoVID-19. There are many success stories in controlling infectious diseases due to vaccination (e.g. Poliomyelitis – generally known as Polio, Tetanus, Diphtheria, Measles, Rabies, etc.). They are as a group called vaccine preventable diseases.

It is believed that the Plague of Athens in Greece (429-426 BCE) indeed resulted in the weakening of Greek military dominance in the world (Smith, 1996-1997). There are many examples in the past where pandemics have threatened the existence of civilizations and caused shifting of well-established kingdoms.

Production of a Vaccine

With the above example, one has to realize that the production or discovery of a vaccine is no easy task for scientists. A vaccine has to be safe, reliable and effective (high efficacy), producing long lasting immunity. Other features would be: easy administration, public acceptability relatively low cost (important in mass vaccination), thermal/temperature stability, etc.

Safety of a vaccine

This is the most important aspect of any drug or vaccine. Once a new drug or vaccine is produced, it will go through a time consuming process. It has to be tested under many different settings before its use on humans. One example would be to have it free of serious side effects. The most important and dangerous problem would be the immediate allergic reaction called anaphylaxis. It comes within seconds or minutes commonly after an injectable vaccine is given. It is very rare and can come with no prior warnings at all, leading to a potentially fatal outcome. Although it is rare, in a mass vaccination (in millions of vaccine), this figure can be numerically a large one. This immediate reaction of a drug or vaccine is unpredictable due to the complexity and diversity of the human body.

Matters of Concern

- One must be mindful of the quality of certain items in the market. The poor quality of masks, hand sanitizers, disinfectants, soap, various equipment etc., in the market is a possibility. Adulteration of such items could be done by unscrupulous parties when commercially produced in large quantities by those who are only interested in money-making at the expense of public safety.
- It was reported that Denmark, the United States, Italy, the Netherlands, Sweden, and Spain, have reported coronavirus cases cropping up among farmed minks (a small mammal) (World Health Organization, 2020).
- Hence, there is always a possibility that CoVID-19 would have originated from an animal source (a zoonotic infection). Also, CoVID-19 can affect animals (particularly mammals) and transmission can take place between man and animal. In this situation, the control measures can become exceedingly difficult.
- Since CoVID -19 is a new disease, its late complications are not yet known. The patients after recovery ought to live a sufficiently long period of time to discover such complications. Hence, only time will teach us.

- Longevity of immunity (protection) after recovery of CoVID-19 infection. Some infections e.g. Measles, Chickenpox, Smallpox (in the past) usually confer lifelong immunity once recovered. There are occasional reports where the same individual develops CoVID twice (Bonifácio, et al., 2020). As this is a new infection, this needs more time for scientists to decide on the longevity of immunity.

Conclusion and Future Directions

When one studies the distribution, infectivity, mortality etc. (epidemiology of the infection), it gives the impression that temperate countries are at a higher risk of transmission and mortality than the tropical countries. Hence one can expect higher transmission and mortality rates during winter. In the post-CoVID-19 world, people of all nations must be vigilant of the emergence of any new disease/infection with higher transmissibility and mortality.

During the pre-CoVID-19 situation, people were travelling between territories and continents very freely. It takes less than a day for a traveller to go across the globe due to superfast aircraft. This invariably facilitates the spread of an infection from one end to another in no time. Although restriction of human movement is difficult under the current context, nevertheless, it is an immensely important area to be discussed for the wider interest of all habitants of the world.

Hence, stronger disease surveillance systems should be established. In general, the investment on Public Health is the key to success. Many do not perceive spending on the preventive sector as a popular and wise decision. This is due to the attraction that the policy makers/politicians have towards curative (hospital) sector. The future survival of humans depends on making preventive medicine much stronger. Therefore, it is very important for all states to increase the budgetary allocations for public health by adopting public health friendly health policies. This needs bold political leadership and decision making. In this respect, in matters concerning health, in order to improve the health sector, countries with weaker economies must be adequately supported by countries with stronger economies at least for their own interest

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