

Coronavirus Disease Pandemic: A Public Health Perspective

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ABSTRACT

The new novel coronavirus was discovered by a Scottish virologist in London in 1964. As is usual with new discoveries, it seems the article she wrote about this discovery, was rejected by a peer reviewed journal. Dr Almeida wrote to the prestigious journal Nature (Nature 220, 1968), outlining her findings and proposed the name "coronavirus" for the new family of viruses. The name referred to the "crown like" appearance, she first observed on these viruses by electron microscopy. While SARS CoV-2 infection seems to be in control in China (less than 100,000 for a population of over billion), where it originated, the epidemic has moved briskly to the rest of the world. What seemed to be impossible to achieve, - imposing and enforcing strict quarantine of people, -is now a reality in majority of the countries. Success of preventive efforts is related, to how best the key principles of prevention strategies are followed; testing for infection, contact tracing, social distancing, wearing masks, and containment of the infected individuals. In December of 2019, several people in Wuhan, China, developed pneumonia and respiratory failure, like what happened during SARS epidemic of 2003. This virus is easily transmissible by symptomatic as well as asymptomatic individuals. As early as January 2020, SARS CoV-2 virus was found to spread during workshops, company meetings. Hospitals seem to provide a favorable environment for the propagation of coronavirus disease(Covid-19). Long-term care facilities are high-risk settings for infections of respiratory diseases. In the long-term care facilities, majority of the senior citizens, seem to have pre-existing conditions, such as hypertension, obesity, type-2 diabetes or cardiovascular diseases, which puts them at high-risk associated with Covid-19 severity. Several mass gatherings have been associated with explosive outbreaks of Covid-19, including political rallies, protests, sports and entertainment events. The possible role of children in transmission of the coronavirus is still not clear. Several individuals who had recovered from the COVID-19 have tested positive again at a later date, suggesting that the infection has been reactivated. These observations raise question about immunity in covid-19 patients for future infections, as well as the 'herd immunity' that we all are hoping for. In the absence of an evidence-based cure, the only choice we have of preventing infection is social distancing, wearing masks where needed, hand washing, contact tracing, and containment. SARS CoV-2 virus spreads through a receptor called angiotensin(ACE 2), which is expressed on many cells including the nasopharyngeal epithelial cells, by attaching to these receptors via its spike like external projections. In view of this observation, there is considerable interest in interventions, that may prevent these interactions including vaccines. The mRNA-1273 Group members have published their preliminary report in NEJM (July 14, 2020) about the successful completion of a phase-1 study of 45 healthy adults, who received two vaccines containing stabilized perfusion of SARS CoV-2 spike protein. The vaccines seem to have induced the SARS CoV-2 immune response in all participants. These preliminary findings, support and encourage the development of such novel vaccines, as well as drugs that interfere with the host receptor and virus interaction.

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Introduction

Coronaviruses are a large family of different viruses, that were discovered and characterized by Scottish Virologist in 1965. They were named after their characteristic spikes, which have a crown like appearance [1]. They are responsible for upper respiratory infections, causing common cold like symptoms. In 2002-2003, a coronavirus from southern China, spread throughout the world with a lightning speed. This novel virus was called, Severe Acute Respiratory Syndrome (SARS) Virus (SARS CoV). SARS infection was reported in 29 countries. All coronaviruses develop in the cytoplasm of infected cells, budding into cytoplasmic vesicles from the endoplasmic reticulum. Respiratory virus infections are the most common and frequent infections of humans. These viruses enter through the respiratory tract, and cause disease that are restricted to the respiratory epithelium. The high rate of reinfection of mucosally restricted viruses reflects the difficulty of maintaining a high level of immunity, at the vast surface of the mucosa [2-14]. Influenza virus is a single-stranded negative

sense RNA genome virus. The well-known viruses of this group, known for causing pandemic deaths are: H_1N_1 , which caused the 1918 pandemic, H_2N_2 , which caused the 1957 pandemic of avian influenza, H_3N_2 , which caused the pandemic in 1968 [15,16]. Two strains of Coronavirus are known to cause disease in humans; Coronavirus 229E (HCoV-229E), and HCoV-OC43. SARS-CoV spreads mainly through a respiratory route and causes a unique form of viral pneumonia. In view of these observations, major prevention strategies include, use of face covering, hand washing, testing for infection, contact tracing of infected persons, and containment of infected individuals.

Coronavirus has claimed half a million lives and infected over 13 million subjects worldwide (<https://coronavirus.jhu.edu/>). These numbers increase by the hour and all models and predictions have failed to forecast, the future of how this pandemic will progress.

Experts believe, that the current administration in the United States,

spectacularly failed in its response, by cutting funds from essential health services and research before the crisis, and later by denying its existence and severity [17]. In addition, politicizing also has played a major role in the surge of virus infection. Prime example for this is the crisis in the State of Georgia and how it is handled. Democratic Mayor of the city of Atlanta, in the state of Georgia, has mandated wearing of the mask in public. Whereas the Republican Governor of the state of Georgia, has sued the Mayor of Atlanta about this mandate. The Coronavirus is the worst intelligence failure in U.S. History wrote, Micah Zenko of Foreignpolicy.com, as early as March 25th, 2020. This Pandemic has caused such a havoc, that there are popular social media comments suggesting; that the governments that are supported by populists and headed by dictatorial regimes (USA, UK, Brazil, Spain, Italy, India and Russia) have the worst-case scenario and those led by women (Denmark, Iceland, Finland, Germany, New Zealand, Norway and Taiwan) have the least Covid-19 infection and death. German Chancellor Angela Merkel, a former scientist turned superb politician, said in the European Parliament recently, "As we are experiencing firsthand, you cannot fight the pandemic with lies and disinformation any more, than you can fight it with hate or incitement to hatred," "The limits of populism and denial of basic truths are being laid bare." Early detection of infection, contact tracing, and containment seems to be the best choice or the only choice, till a cure for this disease is discovered.

According to reports, on January 29, after a 'deny-and-censor' strategy, Chinese scientists published articles in The New England Journal of Medicine about coronavirus disease [18-20]. The articles reported that the infection rate (RO) was greater than 2 and the disease was most dangerous for the elderly or people with underlying conditions (comorbidities). Just at this time, China made the unprecedented move, to shut down all of Wuhan, a metropolis of 10 million people, as well as Hubei province of 50 million people. Having said that, I want to make clear to the readers, that there is a great difference between the 'complete lockdown' and stay home orders.

Nowhere in the globalization scheme you see a clearer, nonlinear dynamics and complex-system failure, as in the case of Covid-19 pandemic, because of tight coupling between various components of the service industry. Just think of how common items like paper products, masks, cleaning and disinfecting materials, disappeared from shelves in early March and have not come back even after three months. Even at the time of this writing, we do not have enough tests to monitor the spread of the disease. It is ironical, that let alone the tests, even the swabs that are used to collect the samples from individuals are in short supply. In view of this mismanagement, there is intense blaming of each other, for the general failure of the system. Every major country now blames China and are trying to punish it in every possible way (New York Times May 3, 2020). In this time of 'Globalization', we all are dependent on one another, and it is very hard to implement restrictions or sanctions on each other, without upsetting the service industry. In a way, to a large extent entire service industry is dependent on the global supply chain.

During any pandemic, the first thing that any government needs is the ability to track and manage the spread of the pathogen. Since SARS CoV-2 was a new novel virus, the new tests had to be developed for testing. China developed its own test. The World Health Organization adapted a test that was developed in Germany. The WHO supplied tests for over 150 countries. The Center for Disease Control (CDC), decided to develop its own test as is the usual case in the USA. Jeremy Konyndyk, a senior policy fellow

at Center for Global Development explained, "That's how we normally do things. A lot of countries don't have the capabilities that we have here. And therefore, the need to rely on WHO, to provide tests to them. We don't have to do that in the United States." According to The New York Times, Health and Human Services (HHS) Secretary, Mr. Alex Azar was 'unable' to get either CDC or the FDA to 'speed up or change course.' "Moreover, he had been at odds for months with the 'White House' over other related issues." Experts put the failure simply: "The reason for the lack of sufficient testing has been such a damaging shortcoming in the U.S. response, it has basically left us blind to the spread of the virus in our country for six or seven weeks." Without sufficient testing, the response will continue to fall short. Shortage of test materials have forced a narrow local testing strategy dedicated, to managing hospitalized patients and preventing the health care workers from transmitting the virus [17]. Even though we have passed the six-month mark since the discovery of first infection, in those States with highest surge of infection, test results are not available even now, for a week or two.

Testing the target populations are calculated daily in the USA, using the methodology developed by the Harvard Global Health Institute, headed by Professor Ashish Jha. At the time of this writing (July 10, 2020), the number of tests conducted is only 39% of the level considered necessary to mitigate the spread of virus. Only twelve out of 50 states in the USA, meet the testing target. Another important indicator of a state's testing performance is the positive test rate (PTR). Positive test rates should be at or below 5 percent for at least 14 days, before a state or country can safely reopen according to the WHO. As the pandemic has spread in waves, it has created its own impression of how this virus spreads. For instance, the New York (NY) State was the epicenter of the pandemic in the first few months and even now has the highest number of infected individuals. At one of the clinics in Queens, NY, more than 68 percent tested positive for antibodies to the new coronavirus. At another clinic in Jackson Heights, NY, 56 percent tested were positive. However, in Cobble Hill, a wealthy suburb of NY, only 13% people tested positive to the antibodies. Even if infection with the COVID virus creates a long-lasting immunity, many people would have to become infected to reach the 'herd immunity.' Experts estimate that in the U.S. 70% of the population – more than 200 million people would have to recover from COVID-19, to halt the epidemic. Epidemiologists and virologists caution, that not enough data exists to conclude, that any geographic areas currently, have herd immunity for this novel virus ("Immunity Passports" in the context of COVID-19: Scientific Brief. WHO April 24, 2020).

Discussion

In a recent blog I wrote, that WHO, CDC, and FDA the major professional institutions, who were the leaders at one time, for developing preventive strategies, failed miserably when it comes to detection, mitigation, and containment of SARS CoV-2 pandemic. The New York Times (2020/06/03), in its lead article on this topic titled, "The C.D.C Waited 'Its Entire Existence for This Moment.'" What Went Wrong? Writes, -The technology was old, the data poor, the bureaucracy slow, the guidance confusing, and the US administration, not in agreement. The coronavirus shook the world's premier health agency, creating a loss of confidence and hampering the U.S. response to the crisis. To some extent, this is true of the other two prestigious public health agencies, FDA and WHO. The CDC designed its own test. The FDA allowed labs to use the new CDC tests. When those tests failed, neither new strategy nor a new test was available for more than two weeks.

The CDC did not tell the country to stop gathering in groups, until March 15, 2020. “The C.D.C is no longer the reliable go-to place,” said Ashish Jha, the director of the Harvard Global Public Health Institute. Only history will tell or judge the role of News Media, and Social Media, in disseminating the information of this pandemic, and the role of global leaders in effectively containing the pandemic or being irresponsible to the loss of precious lives, which were preventable. According to one expert, “The media should be screaming about it,” “They should be saying that the states that don’t have stay-at-home orders are killing people, that politicians who are promoting such behavior for personal gains are killing people.”

No one will disagree, if I write that coronavirus pandemic worldwide is unprecedented and has caused a major economic crisis and loss of precious lives worldwide, -both of which could have been prevented by better public health strategies [21-23]. Beyond that, whatever we all say or write about this pandemic, will have to be taken with a pinch of salt. COVID-19 controversies have even become politicized. White House, these days is trying to discredit and undermine the efforts of Dr Fauci the director of National Institutes of Allergy and Infectious Disease, who has served six different Presidents of the USA. In an unprecedented move, the US administration has bypassed the CDC, and asked a private contract company, to handle the Covid-19 data. Disinformation from the US administration also have created other controversies. One of the medical news agency reports, that COVID-19 quarantine has sent alcohol sales skyrocketing. Online sales of alcohol have been increased by 250%. It is also known to have spawned its own cocktail: ‘Quarantini’. After hearing the “Great News” from the ‘White House’ on disinfectants, including UV light in the usual White House briefings, “Alcohol (at a concentration of 60%) works as a disinfectant on your skin, but it has no such effect with your internal systems when ingested,” the World Health Organization (WHO) stated. “Consumption of alcohol will not kill the virus in the inhaled air; it will not disinfect your mouth and throat; and it will not give you any kind of protection against COVID-19.” If that’s not enough, the WHO also sternly warned: **“under no circumstances should you drink any type of alcoholic product as a means of preventing or treating COVID-19 infection.”**

In an unprecedented effort, hundreds of scientists, clinicians, public health workers as well as laymen/women worldwide, are in a race against time, to answer myriad questions raised by individuals who are under a panic, to develop better diagnostic tools (preservatives, reactants, and characterization technology), novel drugs, interventions (pharmacological and nonpharmacological), and vaccines for SARS CoV-2 virus. According to a search on Google Scholar, there are more than 30,000 writeups (including five of mine) on COVID-19, listed in their databases in such a short period that has elapsed (less than 100 days). The rapidity of discovery is so fast, what I write today, needs revision tomorrow. If one has to get at least a rough estimate of the COVID-19 distribution and destruction worldwide, one has to check into the Johns Hopkins Coronavirus resource website (www.coronavirus.jhu.edu/map.html) or a similar COVID-tracker. At the time of this writing, the US has 3.1 million infected individuals, Barzil-1.8million, India 780,000, Russia 713,000, Peru 316,000, Chile 306,000 and UK 293,000 (China; 85,677). As far as the global deaths, the USA 133,450, Brazil 69,184, UK 44,735, Italy 34, 938, Mexico 35,526, and France 29,982 (China; 4,649).

According to The Atlantic (April 10, 2020), in late March an anonymous doctor in New York hospital told CNN, that he was

working in “Third World” conditions, with patients coming in so fast, and so gravely incapacitated, that he and his colleagues were overwhelmed. The writer of this article, by comparison invites an interesting question? If the richest and the most advanced country, the USA now looks like “Africa”, then What about Africa and rest of the developing world. Luckily, right now the African countries with the most confirmed COVID-19 cases are, South Africa (1934), Algeria (1,666) Egypt (1,560), and Morocco (1,374). The great ‘Mantra’ you keep hearing almost daily by the Greatest Virologist, Dr Anthony Fauci, during the now frequent ‘White House’ briefings is “flatten the curve,”- spread out the infection over a period. Majority of the developed world has been using this strategy; mitigation, tracing the infection, flattening the curve and containment. This strategy seems to have worked well in South East Asian countries. This morning Fareed Zakaria, the host of CNN show Global Public Square(GPS), asked this question to Bill Gates in his interview. He specifically asked about the future of densely populated area like Dharavi in Mumbai (700,000/sq.ml). Both Bill Gates and the Global Health Professor at Harvard Prof. Ashish Jha predict a disaster in such areas, if the COVID-19 should enter such high-density areas. We already have some proof from our observations at New York and New Jersey, which have reported highest number of COVID-19 positive cases. Just New York State alone, has more COVID-19 infected individuals, than any other country in the world. Over a period, the infection rate (RO), positive tests rate (PTR), as well as case fatality rates(CFR) also have been changing. Currently Southwest USA, is the epicenter of the Covid-19 pandemic. On the other hand, with good leadership and best public health practices, the state of New York has flattened the curve and brought down the death rate due to Covid-19 to single digit.

Flattening the curve means slowing the spread of virus, so that the peak number of people requiring care at a time is reduced, and the health care system does not exceed its capacity, -according to the PublicHealth experts. With few exceptions, in most countries, domestic surge capacity is nonexistent. Just consider the scenario of a major city in the most advanced country, -the USA, at the peak of the COVID-19 pandemic, the Governor of New York, had his own daily briefings in which he kept repeating, how this pandemic will cause a major crisis in New York city. He predicted that at its peak they may need over 100,000 ventilators. Epidemiologists worldwide, rushed to develop prediction models. Experts at the Imperial College, London, based on their models predicted, that with no preventive action, USA might face 2.2 million deaths. American Hospital Association predicted, that 96 million people in the US will eventually get COVID-19. Should it occur, it would mean that 960,000 people would need mechanical ventilation. These predictions from well-known and reputable sources prompted President Trump to use Defense Production Act and force General Motors to produce Ventilators. The team at Queensland University of Technology (QUT), led by physician, mathematician and Future Fellow Dan Nicolau, has developed what they believe to be a more accurate model to predict the trajectory of the virus and its mortality, based on reliable, country-independent data. The predictions updated daily, are available at COVIDwave.org. According to these researchers the world is currently in the middle of a second global wave of COVID-19, likely to last for some more weeks.

When compared to the analysis of COVID-19 infection rate and mortality worldwide, what is happening to Global Economic Health is much more confusing and unpredictable. The US has borrowed close to three trillion dollars as economic stimulus package. In just three weeks, there are more than 40 million

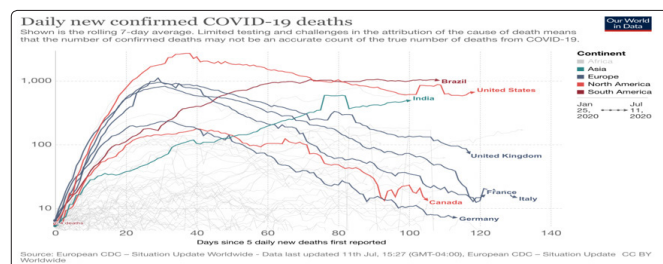
applicants for unemployment compensation. It is heart breaking to see the people standing in long lines (cars standing in line) for food. Majority of these individuals had never faced such a humbling and humiliating experience in their lifetime. The UK and the EU have borrowed over 500 billion for economic stimulus. What exactly happens when countries borrow these funds. Many of them already have huge loans to service. The US is no exception to this economic situation. Of course, the countries with stable currency like the Dollar, Pounds, or Euros can print their own money. How about the countries with currencies with no real value in the international financial markets? India has 120 million unemployed individuals, with no pay protection plan. CNN host of Global Public Square (GPS), Fareed Zakaria asked Mr. Bill Gates about the Wall Street and how it is responding to the Pandemic and the resulting economic crisis. Bill Gates humbly accepted his inability to provide an accurate assessment of the Wall Street response. Despite his humble response, it is quite evident that the share values really do not represent the real economy of the countries. For instance, although Wall Street suffered a significant loss, Microsoft share value remains the same, as that in December of 2019, before the Covid-19 pandemic.

COVID-19 is a public health official's 'worst nightmare' says Dr. Anthony Fauci, who has stayed firmly on the side of science and resisted to go along with political persuasions. Speaking at the AIDS 2020 virtual meeting on July 9th, he said, "We've never seen a virus" that affects in such variable ways, from being asymptomatic, to exhibiting mild to more lingering symptoms, to requiring hospitalization and possibly ventilation and finally ending up with organ failure. Dr. Fauci highlighted the draconian measures, the world has taken to combat the disease, adding that public health measures have had various levels of success in the 200 countries affected by the virus. The infection won't "burn itself out with mere public health measures," he said. "We are going to need a vaccine that works for the entire world, billions and billions of doses." Moderna Inc.'s (Boston, MS) final-stage trial of mRNA vaccines are expected in July (a preliminary report of the early results was published in NEJM), followed by a test of Oxford University and AstraZeneca PLC's in August. Johnson & Johnson has accelerated its clinical trials and now it is set to begin in July. Thirteen COVID-19 vaccines are in human clinical trials, including the one at the prestigious National Institutes of Health, USA. Moderna Inc., has started its phase 11 human studies. More than 130 vaccines are in development against the novel coronavirus, according to WHO and even if the vaccines work well in trials, the big challenge will be producing and distributing enough to meet the demand from around the world and convincing everyone to take these new novel vaccines.

According to Harvard Global Health Institute (HGHI), "Robust tracing, testing and supported isolation (TTSI) across the nation, will provide pandemic safety and get the United states economy back to track." How to get it done, and how to pay for it is the question? - A policy framework (<https://bit.ly/2OampKs>). In brief, TTSI program uses testing (T), contact tracing (T) and supported isolation (SI), to suppress or mitigate highly infectious and dangerous diseases, where the diseases have both a long incubation period and relatively short disease course. A TTSI program, builds on a foundation of viral testing, and uses antibody testing, to support surveillance to increase the effectiveness of the core viral testing programs. According to HGHI, the goal of TTSI is to break all the chains of transmission of the virus. Whereas mitigation seeks to flatten the curve, suppression seeks to break the chain. Looking at the COVID-19 pandemic in the USA, currently the U. S has failed to implement all these strategies. Indeed, even

if they wanted, it will not be possible, as they are not in a position to do the rapid testing needed to accomplish these goals. In the South western part of the USA (California and Arizona), which is the current epicenter of the covid-19, test results are not available for 6 to 7 days post sampling of the individuals.

We have crossed the six month's mark, since the first report appeared on SARS CoV-2 infection in Wuhan China. There is a great rush to reopen business as well as schools. Some of the states which opened early without following the CDC guidelines for phased opening, - have been noticing extraordinary, unprecedented surge in the number of infections. Just the otherday, there was over 70,000 new infections detected in a single day in the USA, - a record for one day increase anywhere in the world. Currently, there is a great rush to start schools and colleges. No nation has tried to send children back to school, with the virus raging at levels like in America, and the scientific research about transmission in classrooms is limited. The WHO has now concluded, that the virus is airborne in crowded spaces with poor ventilation, a description that fits many schools worldwide. Earlier data around the world shows, that children are far less likely to become seriously ill from the coronavirus than adults. Having said that, we need to caution that there are several reports of cases, where children with Covid-19 infection develop severe multisystem inflammatory syndrome [24]. Furthermore, there seems to be an increase in the infection of school going age children in recent months. Minnesota reported increase in Covid-19 infection among school growing children by 80% last month. Experts from Bruno Kessler Foundation in Trento, Italy, in collaboration with collaborators from ATS Laboratory in Lombardy Task Force, conducted study of 5,484 SARS CoV-2 infected individuals. Looking at the data on age, the researchers calculated, that among people aged 20 years and under, a probable 81.9% would present no symptoms following infection of the coronavirus [25]. This finding may have serious implications for virus transmission from asymptomatic individuals.



Graphic Representation of Covid-19 deaths in the USA compared to the European Countries. (Internet Public Source: European CDC (Our World Data).

Professor Ezekiel J Emanuel (Zeke Emanuel), vice provost for Global Initiatives at the University of Pennsylvania, has written a book, "Which Country Has the World's Best Health Care? The book tops the list of best sellers in Health Policy. In a recent Tweet, he wrote, "I've known Tony Fauci for years. He is a consummate professional, whose advice has been sought out and respected by Presidents of both political parties. These attacks on him, are disgusting and say more about those leveling them, than about Dr Fauci." He also has appreciated the way Taiwan has managed the unprecedented Covid-19 pandemic. Taiwan situated next door to China, where this pandemic took its origin, has seen far few cases of the coronavirus, with much lower rate of infection and death. Taiwan did not believe the reports from China, therefore, took quick and decisive action to lockdown. Implemented strict best public health practices at hospitals, to curb the virus and protect the

patients and medics. Combined with stricter regulation for cleaning and disinfecting hospital areas, Taiwan's hospitals have been able to effectively lockdown the virus treatment environment. Within the country's nationalized healthcare system, every citizen and residents are assigned a health card, embedded with a computer chip, -reflecting their identity and medical history. This has enabled the public health authorities the needed 'data base' to monitor every single individual's health status, as well as for contact tracing of the spread of infection.

Prevention is better than cure, especially in this kind of viral infection, where there is no promising cure yet. How did Taiwan manage this? Following the announcement of the first COVID-19 case in China, the Taiwanese government swiftly put together a four-pronged approach to combat the spread of the virus. The strategy was as follows: A) Early border control. B) Proactive case finding and containment, C) Resource allocation, D) Reassurance and education of the public. The national health insurance database was integrated with its immigration database, allowing hospitals/clinics/pharmacies, to easily access the travel data of their patients. Taiwan's effective utilization of digital health technology also played a huge role, in preventing spread of the virus within the country. With the use of smartphone technology, the government was also able to effectively trace the quarantine compliance of citizens, who were returning from high-risk areas. When thinking of global health strategies for the prevention of unprecedented pandemics, there are some lessons that one can learn from the Taiwan's success. First of all, they had the previous experience of a SARS pandemic from 2003. They tried to understand the mode of transmission from the early work of Chinese clinicians [18-21]. They introduced mandatory use of face masks to prevent the spread of virus. Compare this with the attitude of many leaders in the USA, UK and Brazil, who refuse to mandate the use of facial masks. The current status in Taiwan is 440 infections, of them 80percent are imported. In a short overview like this, it is difficult cover all aspects of this complex pandemic, which has raised more controversies than any other pandemic, we urge the readers to refer to the original source, on this topic of great public health interest [26- 52]. In the latest review on, "Pathophysiology, Transmission, Diagnosis, and Treatment of Coronavirus Disease", a multicenter research team concluded, "As of July 1, 2020, more than 10 million people worldwide had been infected with SARS CoV-2. Many aspects of transmission, infection, and treatment remain unclear. Advances in prevention and effective management of COVID-19 will require basic and clinical investigation and public health and clinical interventions [51].

Conclusions

In December 2019, several patients from Wuhan, China, developed pneumonia and respiratory failure. In early January of 2020, a new and novel virus was isolated from bronchoalveolar lavage fluid. Within three weeks of the identification of a new virus, the government ordered lockdown of more than 50 million in Wuhan and the surrounding province. This astonishing first in human history achieved, what even specialists didn't dare dream: curbing an epidemic caused by a highly contagious virus [21]. China was the first country to implement, on 23rd January, a strict and total lockdown in Wuhan (WHO called this "unprecedented in public health history). The joint mission of WHO, consisting of 25 national and international experts from China, Japan, Korea, Nigeria, the United States and the WHO was organized as early as in February (16 to 24th) of 2020, headed by Dr. Bruce Aylward of WHO and Wannian Liang of China (The report is quite extensive and covers all aspect of coronavirus disease). On January 12th WHO publicly shared the genetic sequence of SARS CoV-2. On

March 11, 2020, WHO declared the novel coronavirus outbreak a global pandemic. Italy was the first country to implement national wide lockdown (March 9), Denmark (March 11). Ireland and Norway (March 12), and most of the European countries. By March 26th 1.7 billion people were under lockdown and by early April, 3.9 billion people, -more than half of the world's population was under lockdown (An unprecedented historical public health achievement). The US Centers for Disease Control and Prevention (CDC), the flagship agency of the nation's public health, has seen its role minimized and become an ineffective and nominal adviser in the response to contain the spread of the virus. The Lancet editorial concludes, "The CDC needs a director, who can provide leadership without the threat of being silenced, and who has the technical capacity to lead today's complicated public health efforts (Reviving the US CDC. Lancet May 16, 2020). In our opinion, this is true of the US/FDA as well as World Health Organization.

CIVID-19 pandemic is a public health specialist's 'worst nightmare' says, Dr Anthony Fauci. This is true for the essential workers, front-line workers, caregivers, nurses as well as clinicians. Despite the 30, 000 or more articles written on this topic, there are still innumerable controversies. As such even the White House is blaming Dr Fauci for false statements, he has made over the period of the pandemic. It will take some time, to digest all aspects of this unprecedented pandemic, and trace the origin, impact, prevention, and management of this infectious disease. Similarly, time will tell about the role of the news media, social media, and politics of the country, in the management or mismanagement of the coronavirus disease. The experience gained during this pandemic, also will help each country, to develop their own public health management capabilities. The pandemic has caused so much disruption in the day to day life, we need to rethink and reconstruct the future activities. The way of life will not be the same, and will have its own toll, for the future of our society. Taiwan with the experience from SARS epidemic, was able to build a public health policy, which came very handy in fighting the Covid-19 pandemic. Other countries that had minimum SARS CoV-2 infection are Vietnam, Montenegro, Iceland, and New Zealand.

When the leaders tell the truth about even in near desperate situations, when they lay out a clear and understanding vision, -based on scientific evidence, the public might remain frightened, but will act rationally and actively participate in the preservation of its safety and security. As German Chancellor Angela Merkel told the European Parliament. "We have seen lies and disinformation, and that is no way to fight the pandemic." The limits of "fact denying populism, and denial of basic truths are being laid bare." "There is no time to lose. Only the weakest will suffer." Dr Redfield, the director of US-CDC said, "If we all wore face coverings for the next four, six, eight weeks across the nation, this virus transmission would stop. Four Ex-CDC directors wrote in an Op-Ed in The Washington Post (2020/07/14), "We cannot recall in our collective tenure a single time, when political pressure led to a change in the interpretation of scientific evidence." That is a strong statement, coming from four ex-directors of the prestigious Centers for Disease Control and Prevention. If the virus cannot find you, you will not contact the disease. The CDC's summary report of the 2009 H1N1 pandemic is the best example for efficiency. The virus was first detected in the US on April 1st, 2009. The CDC informed WHO on the April 18th and a test to detect this strain was developed by the CDC for use in 10 days and the CDC began shipping tests across the US and around the world on May 1st. Within the next four months, more than 1 million tests were shipped to 120 domestic locations and 250 international laboratories in 14 countries. Where did the CDC go wrong this

time, when we needed these tests?

Joshua Lederberg, the Nobel laureate in his seminal article in Science, gives us a wake-up call and writes, -Our Wits Versus Their Genes (Science: 288 (5464):287-93, 2000). He continues, “As our awareness of the microbial environment has intensified, important questions have emerged. What puts us at risk? What precautions can and should we be taking? Are we more or less vulnerable to infectious agents today than in the past? What are the origins of pathogenesis? And how can we use deeper knowledge, to develop better medical and public health strategies” Conversely, how much more can the natural history of disease teach us, about fundamental biological evolutionary mechanisms? The human race evidently has withstood the pathogenic challenges encountered so far, albeit with episodes of incalculable tragedy. But the rules of encounter and engagement have been changing; the same record of survival may not necessarily hold for the future. If our collective immune response system fails (as is evident from recent findings that the immunity for the SARS Cov-2 may not last for longer times or indefinitely), to keep pace with microbial innovations in the altered contexts we have created, we will have to rely still more on our wits.”

Researchers for Armed force Institute of Pathology published a report in the Journal of Emerging Infections Diseases, in which they made the following forecast of future pandemic, “Even with modern antiviral and antimicrobial drugs, vaccines, and prevention knowledge, the return of a pandemic virus equivalent in pathogenicity to the virus of 1918, would likely kill > 100 million people worldwide (1918 Influenza: The Mother of all the Pandemics: www.cdc.gov/eld Vol.12(1):16-22, 2006). They also noted that. “Whether because of viral, host or environmental factors, the 1918 virus causing the first or ‘spring’ wave, was not associated with the exceptional pathogenicity of the second (fall) and third (winter) waves. We sincerely hope, that the history will not repeat itself this time again. Finally, I would like to close this essay, with a statement by the director of WHO, at the 73rd World Assembly on May 18, 2020, “COVID-19 is not just a global health emergency, it is a vivid demonstration of the fact, that there is no health security without resilient health systems, or without addressing the social, economic, and environmental determinants.”

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