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Anaesthesia & Critical Care Medicine Journal
ISSN: 2577-4301

Can we Stem the Covid-19 Pandemic: Shaping the Future?

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Review Article

Volume 5 Issue 3

Received Date: July 30, 2020

Published Date: August 19, 2020

DOI: 10.23880/accmj-16000181

Abstract

The COVID-19 (SARS-CoV-2) pandemic is the defining global health crisis of our time and the greatest challenge we are facing. The virus has spread to all countries except Antarctica. As of 17 August 2020 2020, more than 22,113,000 people have been infected, and over 778,530 people have lost their lives. The global spread of the virus has overwhelmed health systems, and caused widespread social and economic disruption. Putting societies and economies on hold (lockdown) has helped to limit some of the short-term impacts of the virus. The faster all cases are found, tested and isolated, the harder we make it for this virus to spread. This strategy will save lives and mitigate the economic impact of the pandemic. This pandemic requires a whole-of-government and whole-of-society response. This virus may become just another endemic virus in our communities, and may never go away. Even if a vaccine was found, coping with the disease would require a massive effort. Countries are racing to slow the spread of the virus by testing and treating patients, carrying out contact tracing, limiting travel, quarantining citizens, and cancelling large gatherings. Educational institutions are closed. COVID-19 has the potential to create devastating social, economic and political crises that will leave deep scars. Every day, people are losing jobs and income, with no way of knowing when normality will return. The financial crisis is already having a severe impact on poverty and inequality. The informal sector, a large employer in many EMs, has been highly vulnerable to the lockdowns and demand drops caused by the pandemic. Millions of workers who have abruptly lost jobs and incomes need urgent attention. Currently, there is no vaccine available and there are few specific antiviral strategies. Several potent candidates of antivirals and repurposed drugs are under urgent investigation. There is an urgent need to increase pooled sample testing and also start undertaking anti-body testing. Life and livelihood are crucial. The lockdown must be rolled back in a phased and staggered manner while ensuring that high risk groups are encouraged to stay home. Strict social distancing norms, use of face masks and hyperlocalization to contain hotspots and areas of high risk should be the way forward.

Keywords: COVID-19; Pandemic; Vaccines; Antibody tests; Preparedness; Clinical trials; COVID-19 pandemic

Abbreviations: AI: Artificial Intelligence; IMT: Internet of Medical Things; RPA: Robotic Process Automation; IVD: In vitro diagnostic; NIAID: National Institute of Allergy and Infectious Diseases; BIB: Beijing Institute of Biotechnology; VSV: vesicular stomatitis virus; HHS: Health and Human Services; IND: Investigational New Drug.

Introduction

The COVID-19 (SARS-CoV-2) pandemic is unprecedented. It has been taking its toll on the world for months now, but researchers have not been sparing any time or resources in looking for ways to defeat the new coronavirus that causes this disease. Scientists around the world are working on a number of vaccines and treatments for COVID 19. Several companies are working on antiviral drugs, some of which are already in use against other illnesses, to treat people who already have COVID-19. The COVID-19, a dangerous and unpredictable virus is affecting 216 countries and territories around the world and two international conveyances. New cases and fatalities are on rise. Most affected countries are the USA, Brazil, India, Russia, South Africa, Mexico, and Peru. The attack rate or transmissibility of a virus is indicated by its reproductive number (Ro, pronounced R-nought or r-zero), which represents the average number of people to which a single infected person will transmit the virus. SARS-CoV-2 has Ro between 2.24 to 3.58. An outbreak with a reproductive number of below 1 will gradually disappear. However, the Ro for the common flu is 1.3 and for SARS it was 2.0 [1-5]. Scientists and Researchers are racing against time ti find an effective and safe vaccine and develop antiviral drug for SARS-CoV-2. Harvard Medical School in Boston, USA and other collaborating institutions report that they obtained promising results with a DNA vaccine that they trailed in rhesus macaques. DNA vaccines are relative newcomers in the field of vaccine research. They work by introducing DNA molecules into the body, meaning to stimulate an immune response to markers of a specific virus. The research team developed six different DNA vaccines with the role of eliciting an immune response against the spike protein of SARS-CoV-2, the protein that allows this virus to infect healthy cells.

Researchers affiliated with Vir Biotechnology, have found a new lead for vaccines. An antibody present in the blood of someone who had recovered from SARS — the disease caused by the coronavirus SARS-CoV — could also be effective against SARS-CoV-2. The researchers pitted the antibody they call “S309” against both SARS-CoV and SARS-CoV-2. They found that it was able to neutralize both. Accelerated development of [monoclonal antibodies] in a pandemic setting could be reduced to 5–6 months compared to the traditional timeline of 10–12 months. We have to watch whether existing antivirals might work or whether new drugs could be developed to try to tackle the virus.

Pandemics Change History

Pandemics have afflicted civilizations throughout human history, with the earliest known outbreak occurring in 430 BC during the Peloponnesian War. Many of these pandemics have had significant impacts on human society, from killing large percentages of the global population to causing humans to ponder larger questions about life. Eleven pandemics that changed the course of human history include:

- Plague of Justinian (541 - 750 AD)
- Black Death (1347 - 1351)
- Smallpox (15th - 17th centuries)
- Cholera (1817 - 1823)
- Spanish Flu, or H1N1 (1918 - 1919)
- Hong Kong Flu, or H3N2 (1968 - 1970)
- HIV/AIDS (1981 - present)
- SARS (2002 - 2003)
- Swine Flu, or H1N1 (2009 - 2010)
- Ebola (2014 - 2016)
- Coronavirus, or COVID-19 (2019 - present)

Epidemics like the coronavirus outbreak are a mirror for humanity, reflecting the moral relationships that people have toward one other. During the last two decades, there have been six significant threats - SARS, MERS, Ebola, avian influenza and swine flu. We dodged five bullets but the sixth got us.

Impact and Implications

The pandemic has resulted in mass unemployment, depleted social safety nets, starvation, increase in gender-based violence, homelessness, alcoholism, and millions slipping into poverty. This will lead to an increase in chronic stress, anxiety, depression, and overall rise in morbidity, suicides and the number of disability-adjusted life years linked to mental health. For developing nations this is the perfect storm. Workers around the world will want to be able to feel safe in their workplaces, reassured that they are not exposed to undue risks of the virus, and more. The general public will insist on new technologies that don’t force them to visit hospitals or clinics. Telemedicine will surge [1-5].

Digital platforms are amplifying consumer actions. The Internet of Medical Things (IoMT), on which the patient’s vital signs are monitored and stored, will help doctors to access the health statistics and vital data of a patient, over time. Artificial Intelligence (AI) and Machine Learning will allow agglomeration of patient data, its comparison, its benchmarking and its rapid deployment in situations like the current pandemic, based on the learnings from thousands of like-profiled patients. Implantables will become a common reality. AI has emerged as a powerful tool in the time to fight against pandemic. These applications can be effective to diagnose, envision, and treat Covid-19 disease. Robotic Process Automation (RPA) is the future. The cost of healthcare is set to increase quite substantially. The beauty and wellness industry will experience a tectonic transformation [1-3].

Race against Time

As the number of confirmed COVID-19 cases continues to skyrocket, healthcare researchers around the world are working tirelessly to discover new life-saving medical innovations. Three distinct areas of activity going on include: Diagnostics, Treatments and Vaccine development for quickly and effectively detecting the disease in the first place, alleviating symptoms so people who have disease experience milder symptoms, and lowering the overall mortality rate and preventing transmission by making the population immune to COVID-19. Rapid and accurate detection of COVID-19 is essential to initiate the appropriate treatment rapidly, to limit further spread of the virus and to ultimately eliminate the virus from circulation. Accurate and rapid diagnosis has evolved as a tool for detecting COVID 19. Molecular-based approaches are the first-line methods to confirm suspected cases. Nucleic acid testing is the main technique for laboratory diagnosis. The development of methods to detect antibodies and viral antigens began after identification of the viral genome [6]. It is argued that, without widespread testing, it is tough to accurately track the spread of the virus, as well as pin down important metrics like morbidity and mortality rates. There have been advances in in vitro diagnostic (IVD) assays. The main IVD assays used for COVID-19 employ real-time reverse transcriptase polymerase chain reaction that takes a few hours. But the assay duration has been shortened to 45 min. An important development is the point-of-care molecular assay that decreased the assay duration to just 5 min. A wide range of serology immunoassays (IAs) have also been developed that complement the molecular assays for the diagnosis of COVID-19. The most prominent IAs are automated chemiluminescent IA, manual ELISA, and rapid lateral flow IA, which detect the immunoglobulin M and immunoglobulin G produced in persons in response to COVID 19 infection. they are employed for the clinical diagnosis of COVID-19A wide range of players are in the race to develop treatments. Creating an effective and safe vaccine is no easy feat. Rapid progress is being made for a variety of reasons. Groups of researchers around the world are likely to come up with solutions that will incrementally help stop the spread of the virus, mitigate symptoms for those infected, and help lower the overall death toll. The testing is critical to getting the disease under control and beginning to re-open the economy. Our knowledge of the disease will help us with tools and policies [7-12].

The World is in Transition

The world is enveloped in a global health emergency that is exacting enormous medical and economic tolls upon humanity. The SARS-CoV-2 that has caused the current COVID-19 pandemic is thought to have originated in bats and, via an intermediary such as the pangolin, to have found its way from a “wet market” where live wildlife species were being sold for human consumption in Wuhan, China, to one or more humans at that location. Within months, this highly infectious virus spread throughout China and around the world, currently involving at least 216 countries and territories, with a trail of incredible damage in its wake.

The crude mortality rate varies substantially by country depending on the populations affected. The crude clinical case fatality is currently over 3%, increasing with age and rising to approximately 15% or higher in patients over 80 years of age. Morbidity associated with COVID-19 is also very high. Underlying health conditions that affect the cardiovascular, respiratory, and immune systems confer an increased risk of severe illness and death. Countries are at different stages of national and subnational outbreaks. Where there has been early action and implementation of comprehensive public health measures (rapid case identification, rapid testing and isolation of cases, comprehensive contact tracing and quarantine of contacts) countries and subnational regions have suppressed the spread of COVID-19 below the threshold at which health systems become unable to prevent excess mortality. Countries that have been able to reduce transmission and bring outbreaks under control have maintained the ability to deliver quality clinical care, and minimize secondary mortality due to other causes through the continued safe delivery of essential health services [1-5]. In many countries where community transmission has led to outbreaks with near exponential growth, governments have introduced widespread population-level physical distancing measures and movement restrictions in order to slow transmission and set in place other control measures. Physical distancing measures and movement restrictions (“shut downs” and “lock downs,”) can slow COVID-19 spread by limiting contact between people. Nevertheless, these measures can have a profound negative impact on individuals, communities, and societies by bringing social and economic life to a near stop. Such measures disproportionately affect disadvantaged groups, including people in poverty, migrants, internally displaced people and refugees, who most often live in overcrowded and under resourced settings, and depend on daily labour for subsistence. Without careful planning, and in the absence of scaled up public health and clinical care capacities, the premature lifting of physical distancing measures is likely to lead to an uncontrolled resurgence in COVID-19 transmission and an amplified second wave of cases.

Many countries have flattened the curve of COVID 19 infections and started work of resuming economic activity. Different public-sector approaches to defeat the pandemic and restarting the economy are: crush and contain, flatten and fight, and sustain and support. Some effective strategies for fighting the coronavirus and restarting the economy have evolved. Countries like Singapore, Hong Kong, Taiwan, South Korea and New Zealand, moved quickly to contain the transmission of COVID-19. Most countries were unable to contain the initial outbreak and moved to flatten and fight.

The COVID-19 pandemic is straining healthcare systems (infrastructure, human, materials and financial resources). It has exposed the weak public health systems and lack of preparedness. There have been successes as well as failures. The leaders who have opted timely the toughest strategies have been able to decline the highest wave of Pandemic and have pulled out their countries much faster from the pandemic. Leadership and political will make a difference. Leadership is also about sowing harmony, creating alignment, and forming partnerships, even with adversaries. Breaking the resistance of a challenger without fighting remains crucial. We must balance quick wins with long-term planning. Balanced realism with optimism is the attitude all global leaders need to adopt. With proper focus on short term wins with long term goals we can win the battle against COVID 19. In the absence of vaccine or drugs, most countries are having to either try or mitigate the spread of infection or suppress it altogether, with a variety of approaches to infection control.

Mitigation refers to quarantine of suspected cases and people in their household, and isolating those most at risk. Suppression refers to reducing the growth of the epidemic and reducing cases to very low numbers, and sustaining this situation for as long as necessary.

The World Is Not Ready for the Pandemics

The consequences of a major pandemic would be world-changing. The 1918 flu pandemic killed 50 million to 100 million people–at the top end, more than the combined total casualties of World Wars I and II–and for a slew of reasons, humans are arguably more vulnerable today than they were 100 years ago. First of all, there are simply more of us. The number of people on the planet has doubled in the past 50 years, which means more humans to get infected and to infect others, especially in densely populated cities. Because people no longer stay in one place–nearly 4 billion trips were taken by air last year–neither do diseases. An infection in all but the most remote corner of the world can make its way to a major city in a day or less. In the case of a new pandemic, modern medicine should provide some protection [4,5].

Future pandemics are likely to happen more frequently, spread more rapidly, have greater economic impact and kill more people if we are not extremely careful about the possible impacts of the choices we make today. There is a need to halt destruction of nature or suffer even worse pandemics. The COVID 19 pandemic is likely to be followed by even more deadly and destructive disease outbreaks unless their root cause is rapidly halted. Microbes evolve about 40 million times as fast as humans do. Of all the things that can kill millions of people in very short order, the one that is most likely to occur over the next 10 years is a pandemic. Covid-19 seems a long way from such hopeful assessments. The public health measures save more lives than they may jeopardize in the long run. Epidemics like the coronavirus outbreak are a mirror for humanity, reflecting the moral relationships that people have toward one another. Scientists in race to protect humanity from future pandemics. Epidemics have also altered the societies they have spread through, affecting personal relationships, the work of artists and intellectuals, and the man-made and natural environments. Every society produces its own specific vulnerabilities.

The main part of preparedness to face these events is that we need as human beings to realize that we are all in this together, that what affects one person anywhere affects everyone everywhere, that we are therefore inevitably part of a species, and we need to think in that way rather than about divisions of race and ethnicity, economic status, and all the rest of it. Epidemics have shaped history in part because they have led human beings inevitably to think about those big questions. Epidemics have tremendous effects on social and political stability.

Indian Scenario

India has 0.9 hospital beds/1000 population as compared to 13.4 in Japan and 13.2 of South Korea and 3.9 in UK and 301 in Sri Lanka. India has 2.3ICU beds/100000 population as compared to 34.2 in USA, 29.2 in Germany, and 306 in China. India has 0.8 physicians/1000 populations as compared to 4.1 in Italy, 2.3 in Singapore and 2.8 in UK. Similarly, India has 2.1 Nurses/1000 populations as compared to 7.2 in Singapore, 3 in Thailand and 3.4 Global averages. A rough estimate of India having 30,000 ventilators is highly inadequate for a huge population of 1.38 billion.

Even the best health systems like that of Italy have crumbled when they faced a run and got overwhelmed due to community transmission leading to a deluge of cases requiring hospitalisation. The best strategy is proactive containment and prevention of community spread.

There is no immunity against it and the entire population is at risk of contracting it if exposed. COVID 9 has an Ro of 2.2 (one infected person shall, on an average infect another 2.2 if not isolated). The doubling time of cases is 7-10 days. If containment is not done, it might infect 30-40% of the population, out of which 5% shall require hospitalisations, and 1% ICU care. In worst scenarios, India will have 152 million people requiring medical care, 41.4 million hospitalisations with 12 million in ICU.

Investigational Treatments

Currently, there are no FDA approved treatments for COVID-19. Some drugs that are being used by some countries include: Bevacizumab, Chloroquine phosphate, Colchicine, Dexamethasone, EIDD-2801, Favipiravir, Fingolimod, Hydroxychloroquine and Azithromycin, Hydroxychloroquine sulfate, Ivermectin, Leronlimab, Lopinavir and ritonavir, Methylprednisolone, Remdesivir, Sarilumab, STC3141, Tocilizumab, Umifenovir, avipiravir, Remdesivir, Hydroxychloroquine and chloroquine Baricitinib Phase 3 studies are in progress to determine the effectiveness of a Janus kinase (JAK) inhibitor called baricitinib in the treatment of COVID-19 patients. Bemcentinib is an AXL kinase inhibitor has been fast-tracked in a UK Phase II clinical trial to study its effectiveness in the treatment of hospitalized patients with COVID-19. It has also been reported to exhibit potent antiviral activity in preclinical models against several enveloped viruses, including Ebola and Zika virus, and recent data have expanded this to include SARS-CoV-2 [13]. Interferon beta showing promising results and should be used as inhalation early in the disease to prevent complications in covid-19. The use of masks and face coverings has been the most effective way to reduce person-to-person spread of coronavirus. Face coverings have been the most effective way to reduce person-to-person spread of coronavirus.

Antibody Tests

Antibody tests are an important public health tool to identify individuals with previous COVID-19 disease. This enables assessment of the spread of infection and the need for public health interventions. Antigen Identification is followed by Antigen Production. New Cochrane review shows that antibody tests could have a useful role in detecting if someone has had COVID-19, but that timing is important. The tests were better at detecting COVID-19 in people two or more weeks after their symptoms started, but we do not know how well they work more than five weeks after symptoms started. The immune system of people who have COVID-19 responds by developing proteins in the blood called antibodies that attack the virus. Detecting antibodies in people's blood may indicate whether they currently have COVID-19 or have had it previously. Whilst detecting current infection is usually done using swab tests within the first 5 days of illness, they may miss infection and are not available to all. The researchers found that the sensitivity (the proportion of the people who have had COVID-19 that the test can detect) of antibody testing is very closely related to when the test is performed. Tests of the IgG and IgM antibodies at 8 to 14 days after onset of symptoms correctly identified only 70% of people who had COVID-19. However, when the researchers looked at data reported at between 15 and 35 days after symptoms first began, antibody tests accurately detected over 90% of people with COVID-19 [14].

Researchers identified a target-a 'main protease' that is essential for viral replication. Using X-ray crystallography to examine the structure of the proteases, the researchers designed a series of α-ketoamide compounds that would bind and block the enzymes active site. The compounds they made were then tested in vitro in human cells. Researchers found one versatile inhibitor of protease activity, which showed the ability to block the enzymes function in multiple coronaviruses and enteroviruses, including COVID-19. Researchers suggest T-cell epitopes that could be targeted by coronavirus vaccines. Since the protein has been expressed stably in our baculovirus system, researchers aim to identify the optimal candidate and scale up production of sufficient vaccine for preliminary clinical trials [14].

Investigational Vaccines

Developing a vaccine amid devastation and deaths is a challenge of mammoth proportions. It is also race against time. For developing an effective and safe vaccine, platform technology has been exploited to develop candidate vaccines. Many innovative methods are in practice for a fast track. These include parallel phase I-II trials and obtaining efficacy data from phase IIb trials. Human 'challenge experiments' to confirm efficacy in humans is under serious consideration. The availability of the COVID-19 vaccine has become a race against time in the middle of death and devastation. Applying 'Quick fix' and 'short cuts' can lead to errors with disastrous consequences. Nearly dozen experimental vaccines are in early stages of testing or poised to start, mostly in China, the US and Europe for Covid-19.

Several pharmaceutical companies and research organizations worldwide are involved in the development of potential vaccines. MRNA-1273 Moderna, Inc. announced positive interim Phase 1 data for an mRNA vaccine called mRNA-1273 from a study led by the National Institute of Allergy and Infectious Diseases (NIAID) on May 18, 2020. Interim results from the Phase 1 study were published in The New England Journal of Medicine on July 14, 2020. Phase 3 study will begin in late July 2020. AZD1222 (formerly ChAdOx1 nCoV-19) AZD1222 was developed by Oxford University's Jenner Institute, with AstraZeneca responsible for development and worldwide manufacturing and distribution.

INO-4800 Inovio Pharmaceuticals, Inc. has announced FDA acceptance of the Investigational New Drug (IND) application for its DNA vaccine candidate INO-4800, paving the way for a Phase 1 clinical trial.

Ad5-nCoV CanSino Biologics Inc. has announced that its recombinant novel coronavirus vaccine (Adenovirus Type 5 Vector) candidate (Ad5-nCoV), co-developed with Beijing Institute of Biotechnology (BIB), has been approved to enter into a Phase 1 clinical trial in China. On June 29, 2020, the company announced the vaccine had received Military Specially-Needed Drug Approval in China.

NVX-CoV2373 On July 7, 2020, Novavax, Inc. announced that it had been selected to participate in Operation Warp Speed, with funding from the federal government to complete late-stage clinical development, including a pivotal Phase 3 clinical trial and the delivery of 100 million doses of NVX CoV2373 as early as late 2020.

Corona Vac Sinovac Biotech Ltd. announced the Brazilian National Regulatory Agency, Anvisa, had granted approval to conduct a phase III clinical trial of CoronaVac in Brazil. BNT162 Pfizer Inc. and BioNTech SE announced that preliminary data from the Phase 1/2 trial for BNT162b1 demonstrated that the vaccine could be administered in a dose that was well tolerated and generated dose dependent immunogenicity. Pfizer announced that BNT162b1 and BNT162b2 had received U.S. FDA Fast Track designation. Ad26.COV2-S Johnson & Johnson announced it has accelerated the initiation of the Phase 1/2a first-in-human clinical trial of its investigational SARS-CoV-2 vaccine, Ad26. COV2-S, recombinant.

Merck has announced collaboration with IAVI (International AIDS Vaccine Initiative) to develop an investigational vaccine against SARS-CoV-2, using the recombinant vesicular stomatitis virus (rVSV) technology that is the basis for its Ebola Zaire virus vaccine (Ervebo). SCB-2019 Clover Pharmaceuticals announced that the first participants have been dosed in the Phase 1 first-in-human study evaluating the company's COVID-19 S-Trimer subunit vaccine candidate (SCB-2019) which is based on its proprietary Trimer-Tag© vaccine technology platform.

COVAC1 Imperial College London announced that it has dosed the first healthy volunteer with its COVAC1 coronavirus vaccine candidate, which has been developed using the new self-amplifying RNA (saRNA) technology. GX-19 Genexine announced the approval of a clinical phase 1/2a trial of DNA vaccine GX-19 in Korea. CVnCoV CureVac AG announced the approval of a Phase 1 clinical trial for its mRNA vaccine to be conducted in Germany and Belgium. An oral COVID-19 vaccine candidate from Vaxart, Inc. has been selected to participate in a non-human primate (NHP) challenge study, organized and funded by Operation Warp Speed. An inactivated COVID-19 vaccine that is effective across against all detected strains of the virus so far is being developed by the Wuhan Institute of Biological Products under the China National Pharmaceutical Group (Sinopharm) and the Wuhan Institute of Virology under the Chinese Academy of Sciences. Positive results from the Phase 1 and Phase 2 clinical studies were reported in June 2020, and the commencement of Phase 3 trial to be conducted in Abu Dhabi, UAE was announced in July 2020. In May 2020, the USA government announced the framework and leadership for Operation Warp Speed, a public-private partnership to facilitate, at an unprecedented pace, the development, manufacturing, and distribution of COVID-19 countermeasures, between components of the Department of Health and Human Services (HHS), including CDC, FDA, NIH, and BARDA.

The development of a vaccine is a complex and time-consuming process. Normally, the period of development of a vaccine is 12-15 years. A major challenge of manufacturing is the construction and validation of production platforms capable of making the vaccine on a large scale. Hundreds of millions of doses are needed. This production process takes at least six months, if the production lines already exist. Any new vaccine involves a new production process, which involves several quality control steps.

Drugs Used to Treat COVID-19

Many of the drugs being developed or tested for COVID-19 are antivirals. These would target the virus in people who already have an infection. Antivirals work better if you administer them sooner, before the virus has a chance to multiply significantly or cause damage to the lungs or other tissues. An antiviral drug must be able to target the specific part of a virus's life cycle that is necessary for it to reproduce. Moreover, an antiviral drug must be able to kill a virus without killing the human cell it occupies. Viruses are highly adaptive. Because they reproduce so rapidly, they have plenty of opportunity to mutate with each new generation, potentially developing resistance to whatever drugs or vaccines we develop. Currently there is no specific antiviral treatment for COVID-19. The following list of medications are in some way related to, or used in the treatment of this condition.

The corticosteroid drug dexamethasone decreased the risk of dying in very ill hospitalized COVID-19 patients. Dexamethasone and other corticosteroids (prednisone, methylprednisolone) are potent anti-inflammatory drugs. What might make the most biological sense is to give dexamethasone when laboratory studies suggest an immune system in overdrive after the amount of virus in the body has started to decrease. The drug's effectiveness needs to be confirmed through further research. Vitamin D may protect against COVID-19 in two ways. First, it may help boost our bodies' natural defense against viruses and bacteria. Second, it may help prevent an exaggerated inflammatory response, which has been shown to contribute to severe illness in some people with COVID-19. Vaccines and treatment options for COVID-19 are currently being investigated around the world. There's some evidence that certain medications may have the potential to be effective with regard to preventing illness or treating the symptoms of COVID-19.

How can we defeat COVID 19?

COVID-19 can be contained by effective measures like interrupting human-to-human transmission including reducing secondary infections among close contacts and health care workers, preventing transmission amplification events, identifying, isolating and caring for patients early, including providing optimised care for infected patients, focusing on treatment options, and accelerating the development of diagnostics, therapeutics and vaccines and communicating critical risk and event information to all communities and counter misinformation. Moreover, minimise social and economic impact through multisectoral partnerships that requires mitigation and suppression reducing case number to levels.

Convalescent plasma (plasma from recovered patients) has been used by some countries. It involves transferring the plasma of a person who developed antibodies to a specific virus to an individual who has the same infection. There have been reports of success from China, but no randomized, controlled studies have been done. Experts also don't yet know the best time during the course of the illness to give plasma. In order to donate plasma, a person must meet several criteria. They have to have tested positive for COVID-19, recovered, have no symptoms for 14 days, currently test negative for COVID-19, and have high enough antibody levels in their plasma. A donor and patient must also have compatible blood types. Once plasma is donated, it is screened for other infectious diseases, such as HIV.

The strategy for stopping the transmission includes: travel restrictions, social distancing, test, track, treat, isolate: surveillance and response, map and engage health infrastructure, personnel, stock PPE, other essential supplies, risk communication, community engagement, research & development. Prolonged stays at home are inevitable. While disrupting the work and educational engagements of millions, it might induce affective and psychological distress if younger and active people are not gainfully engaged. People are going to rely heavily on visual media and social media platform for news and entertainment. This is the high time to provide some cash in the hands of public who are not only facing immense uncertainty on the health front but are directly glaring at a widespread loss of livelihoods. Recovery from the COVID-19 pandemic presents an opportunity to improve future healthcare. Services that are responsive and adaptive to current needs must be developed. Looking back and evaluating what has happened is important and what we have started that we should consider improving or amplifying.

Change is new, and there has not been time for detailed planning and because the environment has continued to change. Recovery should be done with the community articulation. We need to create a global learning system based on shared data standards and rapid information sharing to identify what works, share best practices, and develop a coordinated global effort to defeat the coronavirus and restart the world economy. Global solidarity is crucial to achieve success.

The longer we go without a vaccine, the more likely focus will shift toward treatments, such as the experimental antiviral drug remdesivir, which has reportedly shown promising results. With effective therapeutic treatments, many viruses that used to be fatal are no longer death sentences. Without a coronavirus vaccine, the road back to normal life may be harder and longer, but not necessarily impossible. Coronavirus testing, including antibody testing, and contact-tracing efforts would need to intensify, experts say.

The Pace of Vaccine Development

More than 150 potential coronavirus vaccines are in various stages of development around the world, with 23 candidates already being tested in people. Global efforts to develop a vaccine against the coronavirus disease (Covid-19) have progressed at an unprecedented pace aiming to stop the spread of the pandemic. Vaccine development, on average, takes 10.71 years from the preclinical phase, and has a market entry probability of 6%. The development includes at least three human trials to test their safety, dosage and the strength and duration of the protection they offer, followed by production, licensure, deployment of vaccines and plans for post-marketing surveillance. With COVID-19, the goal is to develop, test and manufacture a vaccine on a scale of hundreds of millions of doses within 12 to 18 months. Since the vaccine will be needed very quickly, an unprecedented approach has been taken by the companies. Scientists tracking the coronavirus genome report that, unlike other viruses such as the flu, this coronavirus doesn't change quickly, which means mutations are unlikely to slow the development of a vaccine. The vaccine - called ChAdOx1 nCoV-19 - is being developed at unprecedented speed. It is made from a genetically engineered virus that causes the common cold in chimpanzees.

It has been heavily modified, first so it cannot cause infections in people and also to make it "look" more like coronavirus. Scientists did this by transferring the genetic instructions for the coronavirus's "spike protein"-the crucial tool it uses to invade our cells - to the vaccine they were developing. Scientists are trying to produce L nanoantibodies against COVID protein in the lab which will prevent spikes on the virus getting attached to human cells and I pray that they succeed because this deadly virus is there to stay.

Vaccines to prevent COVID-19 are being developed at a record pace. Operation Warp Speed is a sort of coronavirus vaccine task force that has identified to focus on fast-tracking. The Warp Speed project has a stated goal of readying 300 million doses of vaccine to be available by January 2021, which coincides with Fauci's estimation. Operation Warp Speed is financially backing efforts to start manufacturing doses while clinical trials are still ongoing. That means, if and when those vaccines do get approved, there will already be a store of doses ready to distribute nationally.

Pune-based Serum Institute of India (SII) started work on manufacturing in parallel to the human safety trials, the Oxford experimental vaccine, ChAdOx1 nCoV-19, at its own risk. SII plans to begin manufacturing the ChAdOx1 vaccine in anticipation of the clinical trials in the UK succeeding by September/October. SII will initiate the manufacture at its own risk to jump-start manufacturing and have enough doses available, if the clinical trials work. The manufacturing capacity that exists in the region is of the quality and scale required to produce and roll out a Covid-19 vaccine globally. A global epidemiological problem of COVID 19 pandemic will require establishment of large-scale production of the vaccine (to develop a vaccine production platform, providing the scalability, technological flexibility, and versatility). High efficacy, safety, and tolerability of vaccine are crucial.

A Never-Ending Story

Types of vaccines for COVID 19 include: the mRNA vaccine. Membrane fusion (viral and cellular) is an essential step when encapsulated viruses enter cells. The technique transforms the human body into a 'living laboratory', because the whole process is no longer carried out in the laboratory, but directly in the body that received the vaccine. DNA vaccines represent the latest direction of development in the manufacture of vaccines. Vaccines obtained by recombinant DNA technology are produced by genetic modification. An advantage of this type of vaccine is that it stimulates both humoral and cellular immunity. Subunit vaccines contain only certain antigenic determinants of pathogenic microorganisms, and are obtained either starting from conventional cultivation processes, or by recombinant DNA technology. Viral vectors are widely used, in which genome of one virus is used to deliver the antigen of another virus, thus allowing development of a platform technology of virus production. Inactivated virus vaccine has the advantage of higher stability; however, effectiveness is lower and requires reminders of immune system. Live attenuated vaccines were the first vaccines utilized. Anything to be tested on humans should first be checked for purity, and then sterile production lines provided. It is time consuming. Vaccines never generate immunity to all vaccinated people. The causes are complex and vary from genetic and immunological factors, to the quality of the vaccines themselves and how they are administered.

DNA and RNA vaccines are based on the principle of insertion of these nucleic acids in some cells of the vaccinated ones, forcing them to make immunogenic viral proteins. Although some recent data seem encouraging, these concepts have questionable efficiency in humans. An important feature in the landscape of vaccine research and development for COVID 19 is represented by the varied range of evaluated technological platforms, including nucleic acids (DNA and RNA), virus-like particles, peptides, viral vector, recombinant proteins, live attenuated viruses and inactivated viruses. The development of an effective vaccine, along with efforts to implement immune-enhancing strategic treatments and shorter-term efforts to identify tactical repurposed treatments, should be considered major public health priorities [15].

Impact and Implications

All countries are now preparing to safely transition towards a new normal in which social and economic life can function amid low or no Covid-19 transmission. Innovations like geofencing, tracking, biometric attendance and inactivity violations traced on network systems helped to identify the violators of quarantine facilities and not following the health advisories. The contact tracing was done via GPS in order to trace down people who had met the positive cases retrospectively as per incubation period.

The coronavirus pandemic catapulted the many countries into one of the deepest recessions in history, leaving millions of people without jobs or health insurance. There is a lot of evidence that economic hardship is associated with poor health and can increase the risk of cardiovascular disease, mental health problems, cognitive dysfunction and early death. It is estimated that by the end of 2020, public health measures to mitigate COVID-19, including shelter-in-place orders, school and business closures, social distancing and face mask recommendations, would save between 900,000 and 2.7 million lives in the U.S. The economic downturn and loss of income from shelter-in-place measures and other restrictions on economic activity could contribute to between 50,400 and 323,000 deaths, based on an economic decline of 8%-14%. Saving the life of a COVID-19 patient could come at a price of up to US$6.7 million per year of life saved in terms of economic losses. There are troubling economic implications as well. The 2003 SARS epidemic, which killed fewer than 800 people, cost the global economy $54 billion, much of it in lost trade, transportation disruption and health care costs. The World Bank estimates that the toll from a severe flu pandemic could hit $4 trillion [1-5].

What is at Stake?

Diseases are ordered events, because microbes selectively expand and diffuse themselves to explore ecological niches that human beings have created. The first thing is the strong-arm methods introduced by the Chinese on January 23rd, when they introduced cordon sanitaire, which is a wholesale quarantine by cordoning off with soldiers and policemen whole geographical areas and communities. In this case, in Wuhan, a city of some eleven million, and then the Hubei Province, which has almost sixty million people, they decided to impose a lockdown. Rampant deforestation, uncontrolled expansion of agriculture, intensive farming, mining and infrastructure development, as well as the exploitation of wild species has created a 'perfect storm' for the spill-over of diseases. Such activities cause pandemics by bringing more people into contact and conflict with animals, from which 70% of emerging human diseases originate, they said. Combined with urbanisation and the explosive growth of global air travel, this enabled a harmless virus in Asian bats to bring "untold human suffering and halt economies and societies around the world. This is the human hand in pandemic emergence.

Human behaviour is helping diseases to spread from animals into humans more frequently. Biodiversity loss can create landscapes that increase risky human-wildlife contact and increase the chances of certain viruses, bacteria and parasites spilling over into people. We have created almost a perfect storm here for the emergence of pandemics. Global innovation is the key to limiting the damage. This includes innovations in testing, treatments, vaccines, and policies to limit the spread while minimizing the damage to economies and well-being.

The economic cost that has been paid to reduce the infection rate is unprecedented. The drop in employment is faster than anything we have ever experienced. Entire sectors of the economy are shut down. When people hear that an infectious disease is spreading widely, they change their behavior.

The pandemic has not affected all countries equally. China was where the first infection took place. They were able to use stringent isolation and extensive testing to stop most of the spread. The countries that reacted quickly to do lots of testing and isolation avoided large-scale infection. The benefits of early action also meant that these countries didn't have to shut down their economies as much as others. There are success stories on limiting the transmission of COVID 19. New Zealand, South Korea, Thailand, Hong Kong, Indian State of Kerala and few more have done enough to protect the lives of people by robust methods, effective strategies and political will.

Fear and lockdown restrictions are seriously changing child behaviours. School memories, isolation from friends, loss of adopted entertainment, absence of kiss and hug, shift to unusual engagements at home, closeness to irritable family issues- all this is causing fatigue, loss of sleep and appetite, aggression, reactive temperament, abnormalities hinging on depression and other complex psychological problems. Not many are conscious about responses and absence of awareness at family level is bound to lead to metamorphosis of serious impact in children which will hinder their overall personality growth. People wish current scenario cuts short and society rises to fall out before it is too late.

Conclusion

We are living through an unprecedented health and economic crisis. The human cost of COVID pandemic could be extraordinary. It endangers millions of lives. The pandemic has catalysed the development of novel coronavirus vaccines across the biotech industry. Most, if not all, Health Care Systems are in chaos and on the verge of collapse. A failure of preparedness, policies, and health systems. The pandemic demands action on many fronts, from prevention to testing to treatment. Scientists and researchers across the globe are racing against the time to develop a vaccine and drugs for the SARS-CoV-2 virus.

Future pandemics are likely to happen more frequently, spread more rapidly, have greater economic impact and kill more people if we are not extremely careful about the possible impacts of the choices we make today. Science must save humanity from this pandemic. To end this pandemic, we must act in solidarity. Nations will have endemic SARS-CoV-2 infection for the foreseeable future. A structured and well-coordinated approach is critical for success. Global crisis needs global action. Nations have to build a healthier world by focusing on the shared good health of human and nature.

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