COVID-19

PANDEMIC UPDATE

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COVID-19

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Disclaimer: Please note to all readers, the number of infected patients mentioned in the book might increase as there are rapid increase in the mortality and morbidity rates. The data mentioned in the present book is related to the data reflected from the date of the submission of chapters from the authors.

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PREFACE

This book compiles scientific reports pertaining to COVID-19. The book elucidates the pandemic update of 2020 which has catastrophically impacted the whole of mankind. The chapter starts with the basic introduction of COVID-19 and its mode of transmission and its spread across various borders. This book is of great interest to readers who are looking for updates on the current happenings of COVID -19 and its influence on the society. The contributors of the book have precisely drafted their chapters to envision their concerned topics. The book covers almost every aspect, for instance the history of corona viruses followed by their influence on human health and the role of immune response towards combating the virus. The initial symptoms, management strategies to prevent infection along with the morbidity and mortality reported across the globe. The book is unique owing to its content which addresses the impact and roles of COVID-19 on health care system, role of health care professionals, transformation of schools and colleges into digital portals owing to lock down of academic institutions. The book provides an update on the current research on therapeutic drugs and also about the ongoing search for best vaccine to combat COVID-19. The editors of the book are of myriad backgrounds who have worked towards gathering information from many different fields, to name a few - role of information science during this pandemic, impact on business models across the globe due to the lock down and its influence on global economy. The content of the book serves as a catalyst for the readers who are yet to find the best possible preventive measures and onsite treatment for COVID-19, by illustrating the best possible ways to curb any severe situations. This book is designed as per the scientific reports available. An entire chapter has been designed to report the role of WHO during the pandemic situation, country wise statistics on COVID-19. The editors have put in their best possible efforts to report mental health and fitness of individuals which plays pivotal roles during this crisis, the book further elucidates the role of physical exercise and psychological influence to stay positive. There is also an update on the current medication and emergency approved drugs employed to treat the infected patients worldwide. Finally, this book has highlighted the role of Ayurveda and Indian medicine which is under trail to examine its effects against COVID-19. This book is an exceptional resource to get an update on the current situation - 2020. The contributors of the book come from various expertise ranging from students, research scholars, professors and scientists working on related areas of science.

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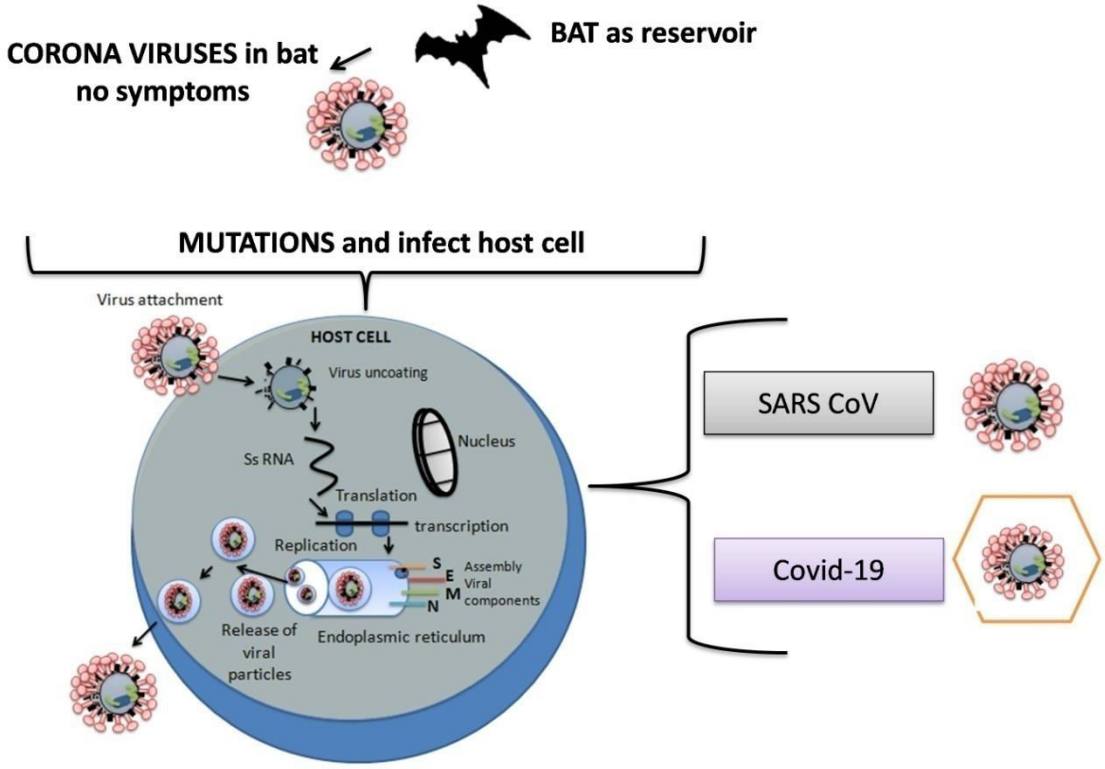
CONTENT

CHAPTER 1

GRAPHICAL ABSTRACT



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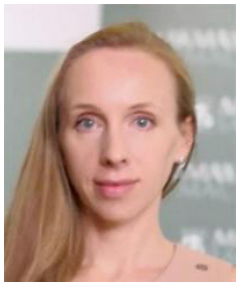

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CHAPTER-1

COVID-19: THE SIEGE OF HUMANS WITH THE INVISIBLE MICROBIAL WORLD

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ABSTRACT

The outbreak of novel coronavirus has paralyzed global activities. The zoonotic virus COVID-19 has transmitted to humans from wild species causing severe rampant on global health and economy. Currently, it has been one of the top priority research among the scientific fraternity with different scientific platforms working to develop strategies on combating COVID-19. The infection is spreading at an alarming rate and WHO has announced a global emergency and declared as pandemic situation. Undoubtedly, the emergence of the novel coronavirus is a wake-up call to control the conflict between humans and wildlife species which has led to the spillover of microbiomes causing serious implications. Surprisingly the magnitude of the infection blow was way beyond boundaries

Keywords

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claiming the lives of thousands across the globe. The present review emphasis the scientific literature on coronavirus and the emergence of COVID-19 with facts and influence of virus spread and transmission. The review highlights the factors promoting viral infections and preventive measures. Hence the present scenario can be easily correlated with manifestation of antimicrobial resistance which has siege emergency across the globe.

1. Introduction

Viral infections of zoonotic origin are often recognized as an acute and fatal illness with high morbidity and mortality rates during its outbreaks [1,2]. These illnesses have posed a potential risk to all sectors of the world with its severe impact on global health and the economy [3]. Although the scientific fraternity is working hard to develop novel strategies to control the major impacts still the repeated occurrence of these pandemic outbreaks are clear warnings to the globe [4]. Presently, the world has witnessed yet another outbreak of the zoonotic virus which has created a pandemic situation in the form of COVID-19 [5]. The end of 2019 gave rise to a global crisis in the health care sector with the spread of the corona virus-19 which was first witnessed in Wuhan city of China [6]. Surprisingly the magnitude of the infection blow was way beyond boundaries claiming the lives of thousands across the globe [7]. There is no surprise to see such life-threatening viral infections spreading from animal to human beings as the world has witnessed in the past, for instance, SARS-Cov, MERS Cov, HIV to name a few [8]. Intuitively the emergence of novel viral infection has created pathetic conditions with no or limited choice of drugs [9]. Though these infections are causing serious health implications, the scientific community is struggling to combat such a situation [10]. There have been various factors influencing the outbreaks due to the conflicts of humans with wildlife species which are being traded and marketed as commercial commodities [11]. Apart from these, there has been a cultural shift of modern lifestyle with extensive human traveling and trekking into the wild niches which was once considered to be the zone of wild species [12]. According to the WHO database, the recent outbreaks of novel

coronaviruses are termed as life-threatening viruses for mankind [13]. Hence to overcome these situations in the near future, one must not only rely on developing novel drugs and vaccines but also concentrate on the prevention of spillover of the microbiome from animals to humans. Further, the serving of wild scrummy food can often end up in an intensive care unit owing to the consumption of undercooked food leading to such an alarming situation. There have been ignorance of early warnings from WHO which has stated that by the year 2050, antimicrobial resistance would claim the highest mortality rates compared to other diseases [14]. The present situation can be easily correlated with the manifestation of antimicrobial resistance which has siege emergency across the globe. Based on these scientific facts, the present review is drafted to highlight the importance of life-threatening microbial outbreaks as a warning for the devastation of nature eventually. The review envisages on different aspects of the coronavirus with historical importance and its brief classification coupled with preventive modes to combat such outbreaks in the near future.

2. The historical rampant spread of Coronavirus across the globe

The term corona is derived from Latin meaning crown which was designated to a group of viruses whose morphological characteristics resembled that of crown owing to their protein spikes [15]. The first coronavirus infection was witnessed in 1931 affecting avian chicken [16]. The first human infecting coronavirus (HCoV-229E) was isolated in 1965 from the nasal cavity [17]. Later, in 2003, coronaviruses gained importance due to their frequent outbreaks causing infections in the lower respiratory tract [18]. It was then the coronavirus was recognized as an etiological agent causing infections in humans in the form of a severe acute respiratory syndrome (SARS) [19]. These coronaviruses are reported to infect unciliated bronchial cells and pneumocytes [20]. Insights revealed that myriad novel coronaviruses inhabiting bats which are a potential reservoir of this virus [21]. This led to the identification of SARS coronavirus (SARS-CoV), during this outbreak, nearly 8096 SARS infection cases were reported with a staggering mortality rate of 9.6% with 774 deaths [22]. Subsequently, WHO recognized it as an epidemic that originated from China's Guangdong province and started to disseminate to other countries like Vietnam, Hong Kong, etc [23]. This outbreak indicated the evolution of the coronavirus

saga in human beings. The evolution process was also confirmed with the detection of SARS related coronaviruses from bats and other animals from the samples isolated from wild commercial markets [24].

Studies have also suggested that, in their natural reservoir, they are asymptomatic and have become virulent only when they enter different host systems [25]. The investigation highlighted that other animal-like pangolins, wild dogs, civets acts as carrier host from bats to human beings [26]. These facts commemorate the interspecies transmission and circulation of coronaviruses among various animal species has led to genetic modification causing more virulent viruses which becomes life-threatening ailment once it reaches the human beings [19,24]. As it reaches the human body, it replicates and causes infection in the super host further disseminate the disease to other individuals in numerous ways. In 2012, the emergence of the coronavirus was reported from the Middle East region which expressed the similar respiratory syndrome of previously reported SARS-CoV, the host being identified as camel [27]. The middle east respiratory syndrome coronavirus (MERS-CoV) reported to cause infection with 145 deaths and the majority of cases were reported from Saudi Arabia [28]. In the current scenario, the world has witnessed yet another infectious agent of coronavirus which is said to be novel and was identified in the city of Wuhan in late 2019. The symptoms are almost similar to the siblings of the previous coronavirus but the infection rate is rapid and elevating [29]. By the start of 2020, there was a severe outbreak of this novel coronavirus (COVID-19) which was spread to almost every country [30]. The world is reported to have been engulfed with the sign of this deadly outbreak COVID-19. However, the mortality rates of COVID-19 are reported to be lesser than the previous outbreaks but the infected numbers are on the much higher side.

3. Different strains of coronavirus reported

Coronaviruses are single-stranded RNA, enveloped, positive sense viruses that reside inside different animal cells and cause infections and they are reported to become an infectious agent as they encounter human beings [31]. These viruses belong to order Nidovirales with the family of Coronaviridae. There are nearly 26 different species that have been reported to date [32]. Broadly, the coronaviruses can be grouped into four

genera based on their host specificity and genetic composition. The alphacoronavirus: CoVs 229E and NL63. Betacorona virus includes CoVs-MERS, SARS, HKU1, OC43. Gamma coronaviruses include whale CoV and Dolphin CoV and delta coronaviruses induces white eye CoV, porcine CoV, etc [20]. The conflict between coronaviruses and human beings can be traced to 500 years as per the reports [33]. Ever since then these zoonotic pathogens are capable of causing enteric diseases. The vast genetic diversity coupled with interspecies transmission from avians to animals and to humans causing genetic recombination making them one of the world life-threatening zoonotic agents [20].

4. Structure elucidation of Coronavirus

Coronaviruses have the largest genome among the RNA viruses with size ranging from 26 to 32 kilobase pairs in length [34]. The genome codes for five important proteins such as nucleocapsid (N), envelope (E), spike (S), membrane (M) and Hemagglutinin Esterase (HE) [35]. The HE proteins are only found in beta coronaviruses (Figure.1). All these proteins encapsid and play an important role and participate to form a viral particle. These proteins huddled with each other to form interaction which forms an important virulent factor. The S-protein is found outside which gives the morphology of crown-like structure [36]. The S proteins interact with M proteins via the C-terminal membrane and the N-terminus part of the protein involves binding to the host cell [34]. The membrane protein plays an important role in the diffusion of viral particle into the host cell and also participate in generating antigenic proteins [37]. The E proteins participate in the assembly of the virus within the host cell and attachment of the viruses [38]. The N proteins aids in replication and transcription of the viruses. The N protein also helps in binding to the helix in the viral genome to form nucleocapsid [39]. Recent studies have also highlighted that the coronaviruses encode for additional proteins depending upon their host of transmission [31]. The results of early sequencing displayed the about 89% similarity of COVID-19 to its previously reported member SARS-CoVZXC21 inhabiting bat and also showed 82% similarity to human SARS coronavirus [40]. The mode of entry of the novel coronavirus is reported to have a similar route to enter the host cell as shown in figure 2. Whenever a virus enters into host its mainly by recognizing and attaching to the

receptors. COVID 19 is no exception, as per some of the recent studies ACE2 is considered as a potential portal for entry of this deadly pathogen [41]. The C terminal domain of COVID spike protein in complex binding with human ACE2 protein. This spike protein is responsible for the displayed cell tropism and hence plays a pivotal role in interspecies transmission [42]. As stated before in the paper the virus is documented to be originated from the meat market of Wuhan city of China and is now spreading across more than 200 countries as a wildfire through the human transmission.

The spike proteins C terminal domain is responsible for binding to that of the ACE2 host receptor. Further COVID -19 has shown in various structural analyses that, they are capable of using diverse receptors, thereby chaining their binding specificity multiple times making them very potent novel viruses. Once the viral spike through S protein bind to the targeted receptor, it also assists the fusion of viral and cell membrane so that the nucleic acids are routed to the cytosol of the host. Before this process priming of S protein takes place encashing a plethora of host proteases like trypsin and furin. The important components of viruses are assembled with the host cell endoplasmic reticulum coupled with Golgi complex compartments (Figure 2).

5. COVID-19 as infectious diseases and its complication

As mentioned earlier the conflict of coronaviruses with human beings are often led to an outbreak. The practices of trading wild animals and marketing for the flesh have posed risk which costs the pandemic outbreak of the novel coronavirus in November 2019 [20, 12]. The first case of COVID-19 was reported from Wuhan city of China which was stemmed from the animal and seafood market [20]. The early symptoms of this infection were similar to the previous outbreaks of zoonotic diseases like SARS coronavirus [5]. This infection gained momentum and spreading like a wildfire across different parts of China and extending to disseminate to the entire world. The impact is at an alarming rate and WHO has listed COVID-19 as one of the life-threatening diseases of recent times [12,13]. Further, the Center for Disease Control has reported that people with immune-compromised, elder population are at higher risk to acquire severe pneumonia from this virus [5,25]. Concomitantly, the infections in China also broke out targeting the younger population in the closed environment of schools and other institutions making the

situation much worse than expected [20, 12, 13]. The infection became contagious as the infection rates started to mount rapidly which has resulted to have a negative impact on the global economy and has caused huge dent economy and health care facilities across the globe.

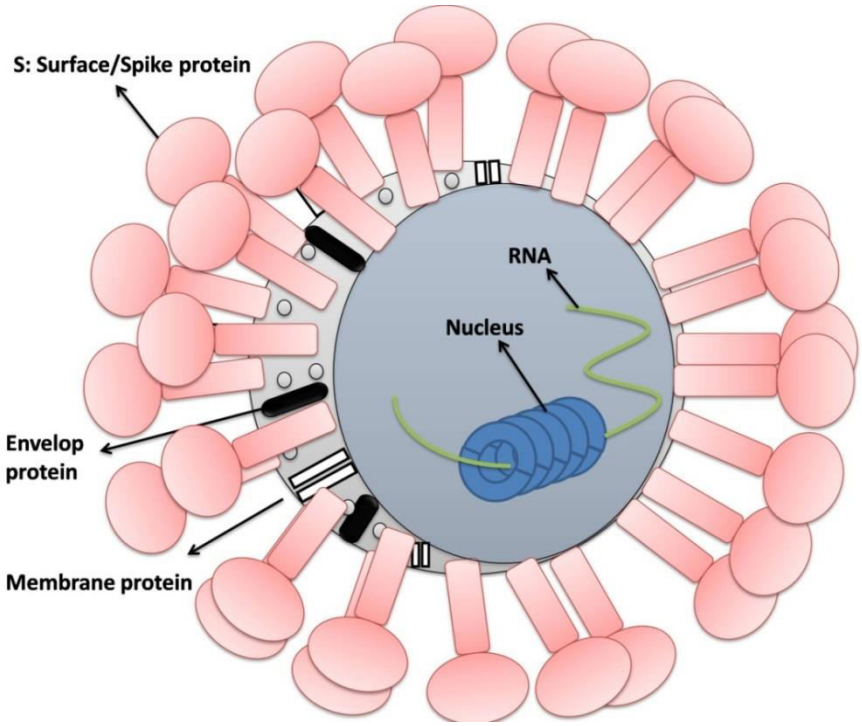

Figure.1. Structure elucidation of corona virus with respect to COVID-19

6. The symptoms and diagnosis of Coronaviruses with available tools for detection

The clinical manifestation and symptoms of coronaviruses are reported to target the respiratory system of the host by damaging the alveolar and macrophages. But studies have also confirmed that the infection is not localized to the pulmonary system [20, 40, 43]. Once the infection is initiated, the initial condition is similar to flu-like symptoms with high fever, chills, cold, body pain, etc. Further, with the increase in the infection rates, the patient may experience shortness of breath and the viral components are reported to have sufficiently replicated inside the host body to affect other parts of the body [44, 45]. This indicates the risk posed during the infection and the condition becomes severe with the individuals already suffering from health-related ailments. The infection can easily be transmitted via coughing, sneezing, and stools [5,45]. The droplets released from the

infected person forms aerosol and can reach healthy individual when comes in contact [12,13,45]. The early diagnosis of coronaviruses is problematic since the virus reaches the pulmonary system and starts replicating in host with an incubation time of 5-10 days depending upon various factors [46]. The radiographic techniques display abnormalities in the lungs only after 10 days of infections the duration varies on the severity and degree of infection [20]. The detection of infection can be done with molecular PCR assays which also depends on the titer value of viral genetic material [20]. In the majority of cases, the highest titer value of viral RNA is found during the second week of infection. Whereas, early detection during the first week is possible with sensitive PCR and sensitive enzyme immunoassay for targeted Nucleocapsid protein [47]. Further increase in the level of enzymes such as lactate dehydrogenase and creatine kinase acts as an indicator of infections which aids in detection [5,45].

7. The biotic and abiotic factors influencing the spread of COVID-19

Any disease or infections are often associated with myriad factors that influence the degree of virulence and transmission. In the case of recent outbreaks of the coronavirus from Wuhan city China, which has spread across nearly 77 countries is reported to have greatly influenced to increase the virus titer values [20]. The initial reports indicate the biotic factors like other living organisms such as reservoir host which is predicted as a bat and the carrier host claimed to be pangolins have played important roles [26, 29]. Any individuals coming in close contact with these animals have witnessed high-risk factors to acquire the infections [26]. Besides the use of wild animal flesh for consumption and the modern lifestyle of traveling has resulted in the spread of COVID-19. Early studies from scientific fraternity have reported the weakened immune response increases the viral particles in the infected hosts [20,26]. The individuals who are immuno-compromised, ailing with other medical implications such as diabetics, cardiovascular dysfunctions, renal failure, and acute respiratory diseases have posed a greater threat from COVID-19 infections [48].

This indicates the role of the immune system to act as a first-line defense towards invading the COVID-19 virus. Future impending investigations on this can lead to concrete evidence of the exact biotic factors promoting the spread of infection. Similarly, initial

claims are being made related to the temperature, humidity, and lifestyle of the populations to spread the infections [49]. As of now, early studies claim that higher the temperature coupled with increased humidity slower the transmission rate compared to the temperature below 20 degrees [49,50]. Adding to this, countries like Scandinavian nations and close to the northern hemisphere have shown the low impact of viral transmission below zero degrees [50]. The healthy lifestyles and use of garlic, ginger, green herb tea can aid in cleaning the body to a greater extent which can help in boosting the immune system to combat any viral disease [51]. The age has also played an important role in the mortality and morbidity rates with higher the age above 40 are at danger zone if encountered with the infection [6,7,51]. To claim these suggestions, further research is highly recommended to study the growth pattern of this disease concerning environmental factors.

8. The current possible drugs and vaccine to combat COVID-19

The search for best-suited drugs to combat any situation is often time-consuming and problematic since initial trails from laboratory scale to surpass the clinical trials and get approval consist of hardship. The advance scientific tools coupled with integrated medical knowledge results in the time gap of nearly 30 years for commercially available drugs. In the case of COVID-19, there have been non-stop searching at different laboratories across the globe [7,52]. There is no evidence of official use of the drug in the treatment of COVID-19 and most of the drugs are under clinical trials. Based on the clinical evidence of antiviral activity, some of the drugs are initially investigated to combat COVID-19 for instance use of Chloroquine has reported expressing in vitro activity against previously reported SARS coronavirus [53]. The use of chloroquine is based on immunomodulating properties [54]. Scientific literature suggests the inhibition of viral enzymes required for replication coupled with acidification of cell membrane and inhibits ACE2 cellular receptor which plays an important role in fusion or attachment of virus [53]. The use of hydroxychloroquine also involve similar mechanisms along with the immunomodulation of cytokine [55]. The use of ritonavir and lopinavir has displayed a vitro anti-viral properties for previously reported coronaviruses like SARS and MERS [56].

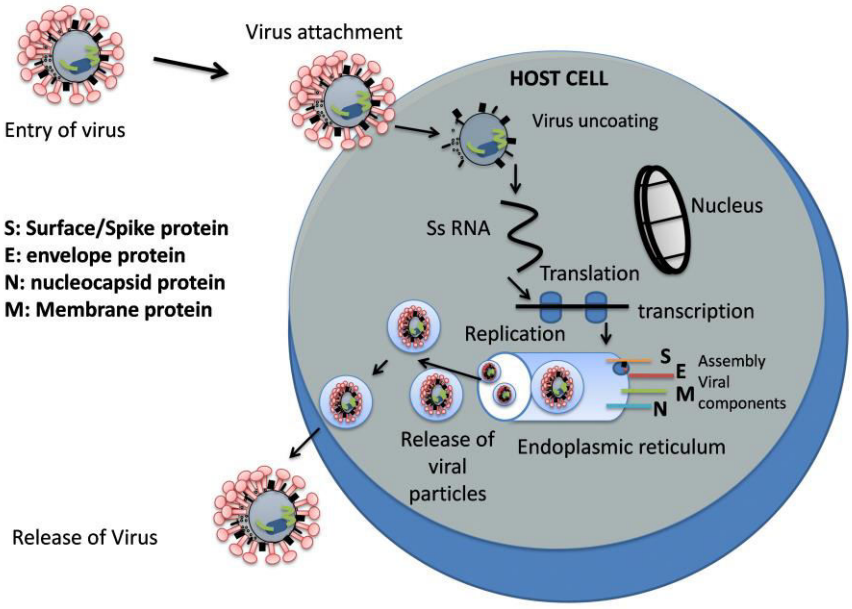

Figure.2. The possible mode of transmission of virus into the host cell

The mode of action is based on the inactivation of vital enzymes required for replication. As a counterpart, azithromycin is also tested owing to their immunomodulatory properties which can down regulate inflammatory responses and prevent the production cytokine [57, 58]. Also, to control the temperature in COVID-19 patients, acetaminophen is administered as per the initial information of the FDA. As of now, exclusive anti-viral therapy to combat COVID-19 is under investigation and further research is essential to elucidate the drug and its mode of action. To develop vaccination to the current novel coronavirus COVID-19, comprehensive knowledge of their molecular and genetic makeup must be available [59]. The complete structure elucidation of the virus and its components can be promising enough to target the virulent factors [60]. As per the initial investigations, types of proteins associated with coronaviruses whose understanding is very important [59]. The knowledge of immunology upon the exposure of the viruses can be handy to understand the first line of defense mechanisms from the host body and the recruitment of myriad cells to combat the infection can reveal the possible targets to develop the vaccine against the novel coronavirus [61]. At the same

time developing novel technologies will be handy to track the infected patients spreading the disease [62].

9. The preventive measures to combat COVID-19

In the current scenario, COVID-19 is recognized as a contagious virus that has created a global international emergency with its magnitude spreading to nearly more than 77 countries across the globe. It is for the 6th time, the global emergency declared by WHO and has designated the current situation as pandemic on January 30th, 2020 (WHO 2020). The CDC and NCIRD released a set of guidelines and measures to prevent the spread of COVID-19 (CDC 2020 and NCIRD 2020). Maintaining the social distance has resulted in controlling the pandemic situation and self-quarantine has shown a significant impact to prevent the transmission. The use of masks might be helpful to prevent the entry of airborne droplets containing viral particles. Most of the countries have sealed their entry and exit border which has prevented the further influx of foreign nationalities which might pose risk to spread the contamination. In this current situation, rapid detection kits are highly recommended to screen as much as the population to extract the number the infected individual. Further, maintaining hygienic conditions like washing hands regularly with soap/ hand wash and usage of hand sanitizer is recommended to prevent the entry of pathogens. Also, washing face and bathing twice flushes the foreign bodies and prevent the entry of invading entities. (CDC 2020, Ashour 2020). The scientific community is working on different strategies to prevent the current outbreak and hoping to combat the situation.

10. The future perspective to control viral outbreaks with COVID-19 as example

The world has to learn the lesson for their ignorance despite the previous outbreaks which created a pathetic situation in most countries especially underdeveloped countries. But this time the world's global leading countries have succumbed to the contagious novel coronavirus. The migration of the coronavirus from the wild animal as their primary host which upon encountering the secondary host becoming virulent and spreading the zoonotic infections to the human being. The rate of mortality and morbidity is without any boundaries causing the spillover of microbiomes from wild to urban niches.

In the near future, to prevent such outbreaks, there should be stringency to control the improper usage of wildlife trading and declaring the species as super host for inhabiting the etiologic agents which can cause severe outbreaks. The WHO should consider antimicrobial resistance as a global emergency and instruct the countries to develop strategies to break down such epidemic and pandemic situations. It should be of national interest to develop high equipped laboratory to diagnose the outbreak within shorter time intervals and develop rapid kits that can reach the masses and remote areas. The utilization of the skilled human resource of life science graduates who are well qualified to tackle the situation in scientific manners. Implementation of integrated scientific knowledge into the medical sector to come up with preventive guidelines will be highly essential in emergencies. No matter how much the technological advances exist, the human should not forget the existence of microbial species which are reported to the early forms of life which have made the world habitable planet and have potential to make reverse the situation upon mishandling its resource. The knowledge of Ayurveda and traditional medicines should be brought down for the commercial development of drugs to make it safer for consumption. The recent advances of nanotechnology can unfold the rapid detection tool and can be employed to develop vaccines coupled with targeted drug delivery systems. Implementing a ban on poaching wild lives for flesh and their niches for human use should be immediately brought under the scanner and should be handled to punish the culprits under international law. Finally, providing funding to the budding researcher to take up challenging tasks will guard the nations against the sudden outbreaks. Exclusive research laboratories should be set up under one roof with expertise from different scientific backgrounds.

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CHAPTER 2

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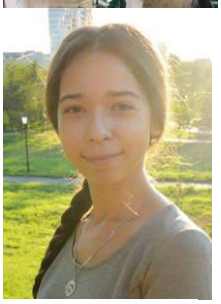

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CHAPTER-2

HISTORY OF CORONAVIRUS

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ABSTRACT

The pandemic COVID-19 has created huge impact across the globe. Perusal of scientific literature reveal the history of corona viruses which have been influencing in past decades, The previous outbreaks were also severe which was combated with different management resources. In case of present COVID-19, which belong to the corona virus family has greatly impacted compared to the previous reported corona viruses. Hence the present chapter deals with the history of corona viruses which becomes one of the important factor to deal with the present and upcoming situations.

1. Introduction

COVID-19 is the new member in the house of coronavirus which started from Wuhan market of China and spreads in all over the globe. USA is having highest number of patients suffering from COVID-19, then Brazil and India is on 3rd number who is suffering from this virus COVID-19. Total number of confirmed patients all over the world is 20,826,701 with mortality reported to be 747,569 updated as on 13th August, 2020. In this chapter, we will highlight and discuss about coronavirus and its history in details. The name of the coronavirus derived from Latin word corona which means crown

or wealth. The name coronavirus is discovered by Almeida and David Tyrrell while studying human coronaviruses. The term was used in Nature journal in 1968 and defined as new member of virus family. Coronavirus is a group of RNA viruses found in birds and mammals and make them sick. If these viruses transferred into human, it makes to suffer from respiratory infections from mild to serious problems. Coronavirus belongs to the family of Ortho coronavirinae. The range of genome size of coronaviruses is approximately 26 to 32 kilobases, one of the largest among RNA viruses. They are rounded with spikes on the surface as revealed by electron micrographs, which create an image similar as solar corona, and since the term Corona is derived. In 1930, coronavirus was discovered when serious respiratory infection was shown and caused infectious bronchitis virus (IBV) in chickens. The infection of new-born chicks was categorized by breathless and slowness and the mortality rate of chicks was 40-90%. The Human coronavirus was first discovered in 1960's and they were quarantined using by two different methods in UK and US. The virus cultivated rhinovirus and many other known viruses related to cold. Tyrrell and By one successfully tested and promoted the novel virus by practicing on human embryonic trachea passing through human organs. COVID-19 is the recent virus found in year 2019 in the family of coronavirus and declared as epidemic. As of now no vaccine is being invented to treat this virus (August,2020) [1-4] and it is challenging to the scientific world in the present scenario.

2. Human infection

Coronavirus is a serious virus infection which is risk factor in human lives. Humans can kill 30 % coronavirus themselves such as MERS-CoV and some virus are relatively harmless like common cold. The Symptoms of coronavirus are fever, cold, throat infection, etc. Coronavirus can also cause pneumonia and bronchitis. In 2003, human coronavirus was discovered and named as SARS-CoV, which can cause severe acute respiratory syndrome that is SARS. It is unique which can cause upper and lower respiratory tract infection [2-4].

Different types of corona viruses infecting humans are

- Human coronavirus OC43
- Human coronavirus HKU1
- Human coronavirus 229E
- Human coronavirus NL63
- Middle East respiratory syndrome-related coronavirus
- Severe acute respiratory syndrome coronavirus
- Severe acute respiratory coronavirus

3. Common cold

There were already many coronaviruses which is already existing before this COVID-19 like HCoV-OC43, hcOv-HKU1, HC0V-229E,HC0v-NL63 in the body humans with the normal symptoms of cold in every day's life. Coronaviruses only cause 15% of common cold while majority are caused by rhinoviruses. Generally,coronaviruses get active more in winter seasons.

4. Severe acute respiratory syndrome (SARS)

It is first found in 2003, and started from Asia and slowly spreads in whole world. World Health Organization (WHO) that time declared it as novel coronavirus which is almost affected by 8000 people worldwide and 10% of people died approx. The official name of this virus is SARS coronavirus that is SARS-CoV [3,5].

5. Middle east respiratory syndrome (MERS)

This virus first found in September 2012, a new type of virus in the family of coronavirus and in 2012 it is also called as Novel Coronavirus and the official name of this virus is Middle east respiratory syndrome that is MERS-CoV. Initially by the world health organization (WHO) it is declared as a virus which is not transmitted through humans but later on France ministry of social affairs and health in May,2013 confirmed it as a case of human to human transmission virus. By the October end in 2013 total number of 124 cases found in Saudi Arabia and 52 deaths found that time. In 2015, it outbreak in Republic of Korea and its found one man travelled to the Middle East to the four hospitals to treat

himself from illness and this then became largest outbreak cases. By December,2019 total number of cases went to 2,468 of MERS-CoV and the mortality rate was 34.5% [5-8].

6. COVID-19

This is the latest virus found in the family of coronavirus. In 2019, first case report in Wuhan, a market of China. World Health Organization give the name of COVID-19 as it traced as a novel trauma of coronavirus. It's now declared as Pandemic. Later it is renamed as SARS-CoV-2 by the International Committee on Taxonomy of Viruses. This virus has 96% similarity with bat coronavirus thus it may be suspected that is came from bat to humans from Wuhan. This virus is human to human transmission virus. The total confirmed cases of COVID-19 are 11,419,529 and approximate death counts touched to 533,780 as of 6th July,2020. This virus shown a tough time to whole nation and everywhere there is Lockdown, restriction in travelling, no vaccine found as such and many more. People who are found ill because of this disease found moderate respiratory problems and not require special treatment for recover. Only who are old and who have some medicals problems like diabetes, cancer, chronic respiratory disease and cardiovascular disease are likely to have serious and special treatment else they will fall into serious illness. To protect yourself and your family from getting affected from this COVID-19 virus then you have to avoid going out as far as possible. The only treatment from COVID-19 is self-protection and taking all preventive measures seriously which is declared by Governments. A number of vaccine development are in process and testing on humans but as such no vaccines is declared positive.

The virus first spread between the close contact of people or a place where positive cases visits. It spread through sneezing or coughing and the droplets then fall on the surface rather than traveling through air. If someone touch that droplet and then touch his own mouth, nose or eyes it hits high and definitely one can suffer too from COVID-19. Later research founds droplet of this virus remain live in the air too for ten minutes. So need to take high precaution every time and everywhere. Usually people touch the contaminated surface and then touch their faces which make them infected. One should take following precautions while moving outside or buy anything wear mask properly, sanitise and wash your hand regularly. When you come home must wash hand

and feet and keep your sleeper outside, properly wash or sanitize the things you bought from market, wash your clothes which you wear during any visit outside and keep social distancing every time. People are not much aware of the fact that how worst the situation is getting and how difficult it is to get protected from this disease especially for the kids and old age people. As Corona reached its third stage which is local transmission it can easily affect the people with a low immune system. Number of cases are increasing as it's in a local transmission stage where the spread is fastest and the virus multiple into twenty times in a second. It takes only few days to spread the cases, so we can guess how bad the situation is. People who have illness like asthma, liver disease, cancer, kidney problems, heart issues and other severe diseases. As it directly attacks the lungs, if you have a weak chest then mind you are at a high risk to get affected by Coronavirus [5-8].

If you want to protect yourself from COVID-19 you need to make your immune strong so you don't affect from such disease. The symptoms are very common like cough, short of breath, fever, fatigue etc. and complications may include pneumonia and respiratory distress. The range of symptoms may occur in five days or range from two to fourteen days. It is the most dangerous among all the coronavirus. It not only hampers the health but whole global social and economic condition also. Because of this we can see global recession. It has cancelled everything from schools to sports, events, political and religious worked, shortage of everything, business loss, global loss and many more. It is found that all age group from new born baby to old age people can suffer from this. Have to take precaution is the only option to save ourselves from this coronavirus COVID-19.

7. Animals infection

Coronavirus is not found in human infection but also recognised in animals too since 1930. The animals like swine, bat, cattle, camels, dogs, horse, birds etc., is also found to be infected by coronavirus too. That's why it is said the latest virus COVID-19 may spread from bat to humans as this virus has similarity of 90% coronavirus found in bats. This virus found in farm animals, Laboratory animals and domestic pets too. In the farm animals, it is found that it effects domesticated birds and IBV that infectious bronchitis virus cause bronchitis infection in them and it affects whole production as it spread in the poultry. It affects both meat and egg production as it targets the respiratory system in

farm animals. In domestic pets like cats and dogs it is found feline coronavirus and canine coronavirus affects the animals by affecting their gastrointestinal disease and cause respiratory disease as well. In laboratory animals are affected by coronaviruses. Mouse hepatitis virus (MHV) roots an epidemic illness which results in high mortality. MHV is the best studies coronavirus before the discovery of SARS-CoV. It was found that this virus affects the individual who comes direct or indirect with the laboratory rats by aerosol [7-9].

Conclusion

Coronavirus is not new, its already existing virus and it's the family of virus. But COVID-19 is most recent, dangerous and serious virus which have no treatment as such. No Vaccine is there to treat COVID-19 as of July,2020. Only precaution and preventive measure is the way to safe from this virus. COVID-19 coronavirus declared as pandemic which is very serious and harmful virus spreading like fire all over the world. Started from Wuhan market of China and spreads everywhere and harmed many lives. People are scared and taking prevention measures. Hospitals and healthcare professionals are in front to fight this virus and save lives. They are our superheroes who are spending their lives to save else live. Media is giving us regular updates on this COVID-19 and it's our duty to understand it and take prevention measures for our safety as well as surroundings. Everyone is aware of this situation and it is very dangerous and have to fight with it. We must follow all safety measure and make sure to make others as well to spread this virus. All instructions and guidelines must be followed to cure yourself and save yourself from this issue. Try to stay at home as much as you and avoid to contacts any outsider. It is the best thing you can easily do and suggest your love ones not to go out for any work until and unless it is not so much important. Make sure that you have all your protection while going out and while buying the things as you have to take all the precautionary measures like washing and sanitizing the things.

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CHAPTER 3

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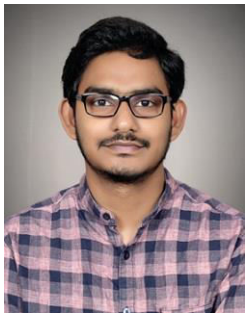

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CHAPTER-3

AN OVERVIEW OF SARS-COV-2: FEATURES, REPLICATION, PATHOPHYSIOLOGY AND THERAPEUTIC APPROACHES

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DRUG, VACCINE

ABSTRACT

This chapter summarized the basic features, pathophysiology, and treatment approaches of the novel coronavirus (COVID-19) that originated from Wuhan, China and since then declared pandemic worldwide by the World Health Organization. It covers an overview of the structural composition of the SARS-CoV-2 virus where the features of the surface proteins are thoroughly explained. The genomic organization of the single-stranded RNA virus is also elucidated in this chapter taking special note on the open reading frames and the associated peptide products. This chapter presents the viral life cycle and replication machinery inside a human host taking an account on the spike protein and receptor binding mechanisms. It also accentuates on the pathophysiological changes in the alveolar tissues of the SARS-CoV-2 infected patient. Proposed therapeutic approaches targeting viral entry mechanism and viral replication to treat COVID-19 and mechanisms of actions of two of the most heavily discussed potential drug candidates, namely Remdesivir and Hydroxychloroquine, are mentioned briefly in this chapter. An overview of the general approaches made to prepare viral vaccines and the progress regarding the research and development of SARS-CoV-19 vaccine till date is provided.

1. Introduction

Over the past few months, we have been getting acquainted with new terminologies, starting with the novel Coronavirus or Covid-19 to the words like quarantine, lockdown or social distancing. The coronaviruses are nothing new to the biological science community as they were responsible for the 2003-SARS and the 2012-MERS outbreaks [1,2]. Moreover, the coronavirus is also capable of causing respiratory diseases in mammals and birds [3]. In December 2019, an outbreak of an unknown type of pneumonia occurred in China's Wuhan province, causing severe damage to the nation [4]. It soon became a global scourge, and today there are almost 12 million people in the world with the disease, of which about 550,000 are dead as on 11 July 2020 [5]. The Chinese Center for Disease Control and Prevention (CCDC) was the first to identify a new beta coronavirus, 2019 n-COV belonging to the β-coronavirus family, as the causative agent behind this disease [6].On 11 February 2020, the International Committee on Taxonomy of Viruses (ICTV) named the novel virus as 'severe acute respiratory syndrome coronavirus 2' (SARS-CoV-2) due to its significant resemblance to the SARS coronavirus outbreak of 2003 [7].

The World Health Organization (WHO) named the disease caused by the virus as Coronavirus disease-19 or COVID-19 and later declared the outbreak as a pandemic on 11 March 2020 [8,9]. The novel COVID-19 is the third coronavirus to provoke such a large-scale epidemic in the past twenty years after the Severe Acute Respiratory Syndrome Coronavirus (SARS-CoV) in 2003 (began in China) and the Middle East Respiratory Syndrome Coronavirus (MERS-CoV) in 2012 (began in Saudi Arabia) [10]. In the case of SARS and MERS infections, the viruses were transmitted from bats to human via an intermediate mammalian host [11]. Currently, two animals, bats and pangolins, are thought to be potentially responsible for originating the disease [12]. As scientists discover that the coronavirus found in these animals show more than 90% resemblance to the SARS-CoV-2 at the genomic level, but no accurate and conclusive information has been found yet regarding its origin [12]. The virus can spread from person to person through droplets, and its transmission rate is much higher than the previous two coronaviruses [13]. This article reviews the key features of SARS-CoV-2 thoroughly, mechanism of its

replication, pathophysiological changes occur in the human host and the potential therapeutic approaches for the development of drugs and vaccines against the disease.

2. Features

The Coronaviruses are classified under family Coronaviridiae (order: Nidovirales) and possess enveloped positive-sense RNA virus with club-like spike proteins on its surface[14]. These spike proteins on the viral membrane make the virus resemble a crown, hence named as 'corona' [15]. The genome size of the coronavirus is quite large for an RNA virus; it ranges between 26 kb to 32 kb nucleotides long [16]. As observed under the cryo-electron microscope, the size of a SARS-CoV-2 virus is about 60-140 nm [6]. Its genome has 14 open reading frames (ORF), which encode a total of 27 proteins[16]. The virus RNA genome encodes for both structural and few non-structural proteins (NSPs) within the 3' end of the genome. Meanwhile, 5' two-third of the viral genome is coded by several non-structural proteins (NSPs)(such as papain-like protease, 3-chymotrypsin-like protease, helicase and RNA-dependent RNA Polymerase) (Figure 2) and are involved in viral replication through RNA-dependent RNA polymerase (RdRP) [17]. In addition to the spike (S) proteins, three other structural proteins are also found on its surface; membrane (M) protein, nucleocapsid (N) protein, and envelope (E) protein [18] (figure 1). The S proteins are distributed across the surface, which allows the virus to bind to the receptor and enter the host cell [19]. M protein is the most abundant protein and is thought to help in the reconstruction of the virus [20]. The N proteins remain attached to the viral genome to form the nucleocapsid [21], and they are commonly involved in the replication, transcription and packaging of the viral genome inside the host [22].The E-protein is a small membrane protein composed 76 to 109 amino-acid residues, and it contributes significantly in membrane permeability of the host cell, virus assembly and virus-host cell interaction [18,23]. They all remain embedded on the capsid of the virus. The two-third of the genome encodes several non-structural proteins (NSPs) [24]. The coronavirus also has six additional proteins that are encoded by ORF3a, ORF6, ORF7a, ORF7b, and ORF8 [25]. However, as there is a lack of scientific information available at the moment for expressions of ORFs, it is hard to say which proteins are encoded by them (Figure 2). Scientists have identified two novel features in SARS-CoV-2,

which was absent in previously known coronaviruses. Firstly, the spike protein being optimized for binding to the human receptor ACE2, and it has a functional polybasic (furin) cleavage site at the boundary of S1 and S2 [12].Spike proteins are type I transmembrane glycoproteins that form a homotrimer to help the virus survive in the host's body [26]. A unique feature of this protein is that it has 22 N-linked glycan sites [26,27]. Spike protein has two subunits, S1 and S2[26]. S1 helps in binding of the virus to the host receptor as it contains the receptor-binding domain (RBD) while S2 is responsible for fusion of viral membrane to the host cell membrane [28,29]. With the help of these two subunits, the SARS-CoV-2 spike protein can enter the human respiratory epithelial cells by forming a complex with the human ACE 2 (angiotensin-converting enzyme 2) receptor [30,31].

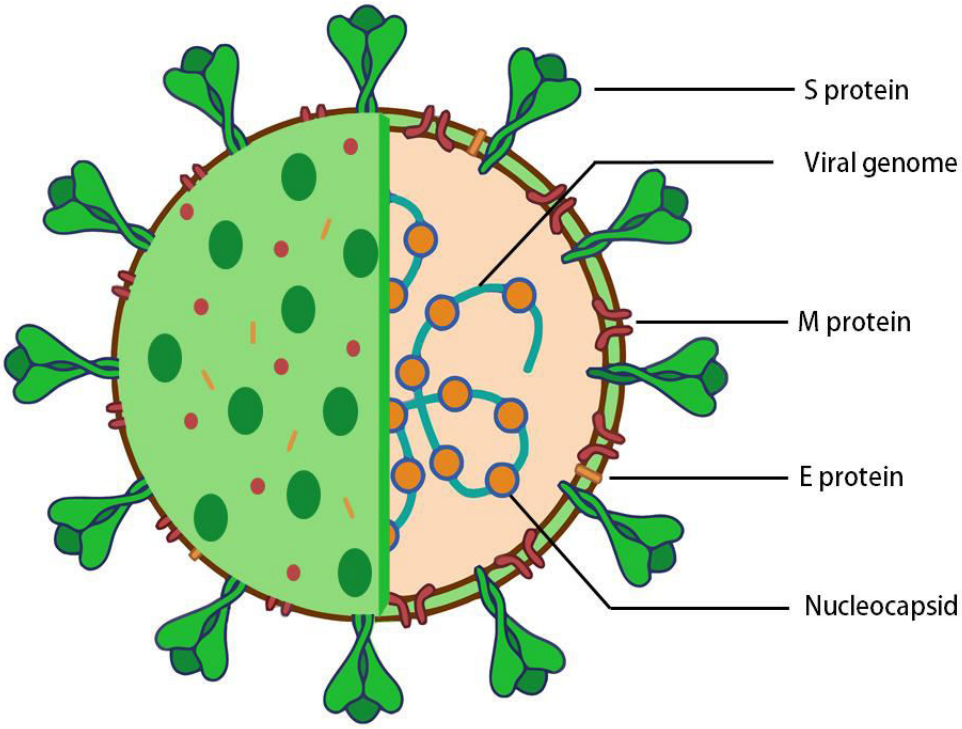

Figure 1: Structure of SARS-CoV-2.

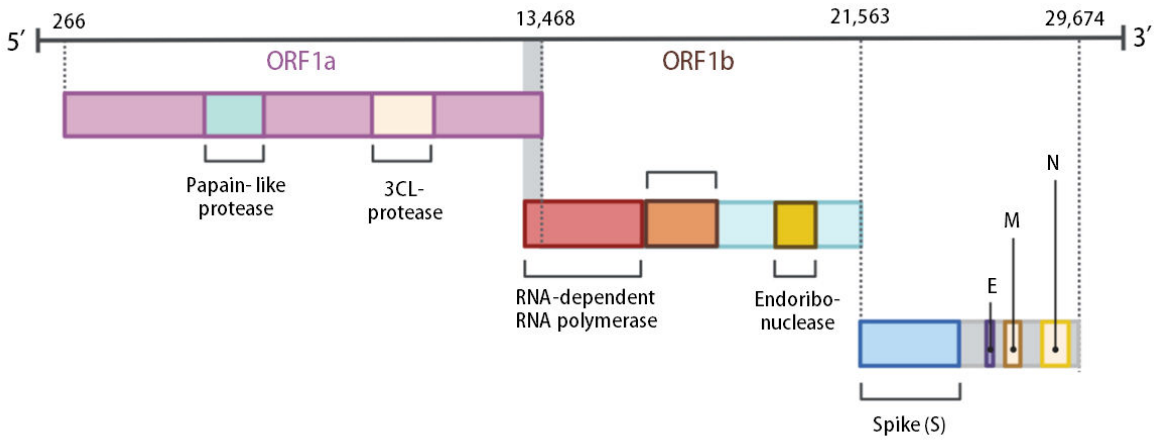

Figure 2: Genomic organization of SARS-CoV-2.

The S1 subunit has two subdomains N terminal and C terminal, and both of them can act as RBD [31](figure 3). Spike proteins are class I viral fusion proteins as the S2 subunit contain two repetitive heptapeptides [32]. Generally, in all coronaviruses, the cleavage site is located at the boundary of S1 and S2 [33]. However, surprisingly in case of SARS-CoV-2 spike proteins, there is a furin cleavage site at the S1- S2 boundary[26,34]. This feature has a moderate effect on the entry of the virus, but it may help in expanding the virus tropism [26]. Recent studies have shown that SARS-CoV-2 binds with ACE2 with 10-20 fold higher binding affinity as compared to previous SARS-CoV. These results show the highly infectious capability of SARS-CoV-2 in humans. Considering the higher binding efficiency of SARS-CoV-2 with ACE2 receptor, soluble ACE2 could be a potential candidate for therapeutic approach [35,36].

3. Replication

The SARS-CoV 2 virus transmits human to human when a person becomes exposed to respiratory droplets from an infected person via coughing, sneezing or by touching any contaminated surface [37]. Those viruses within the droplets can easily travel inside the human body when the person touches his/her mouth, nose or eyes [38]. Asymptomatic carriers can also transmit the virus, therefore, play a crucial role in the spread of COVID-19 [39].

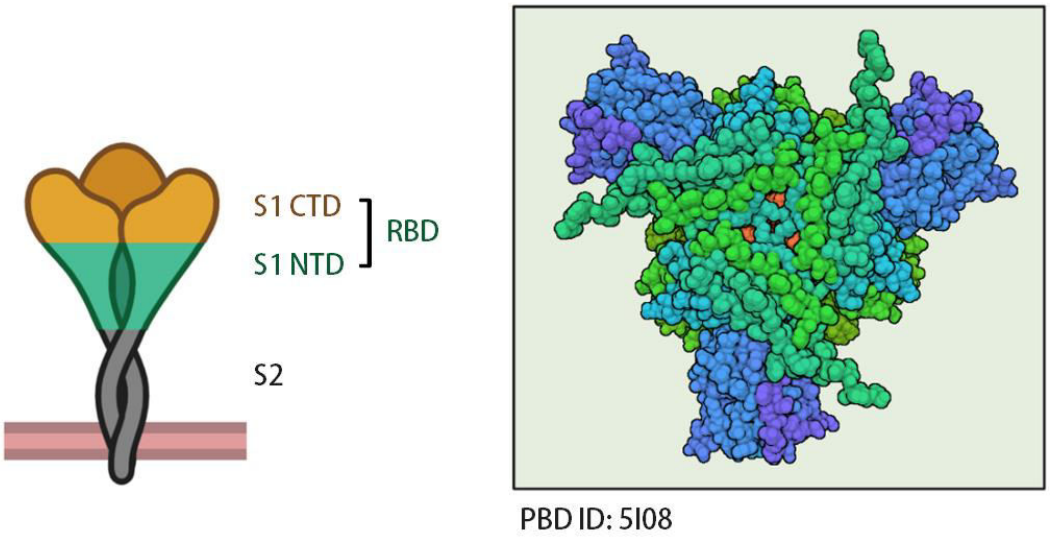

Figure 3: Structure of spike protein

Besides, some researchers have reported SARS-CoV-2 presence in a sample of stool, urine and saliva. This indicates that the virus can replicate in the digestive tract, also [40]. However, vertical transmission from a pregnant woman to newborn baby has yet to be confirmed [41].The SARS-CoV-2 virus enters the host cell through its binding to ACE2 receptor, which is abundant on surfaces of many cells such as heart, kidneys, gastrointestinal tract, and especially in type II pneumocytes of lung alveoli [42]. This binding is strong enough as there are 394 glutamine residues present in the RBD of the spike protein is recognized by the 31 lysine residues present on the ACE2 receptor[30]. Following the binding with the receptor, a conformation change occurs in the S protein structure, and the virus can enter the cell either by fusion of virus and host cell membrane or by endocytosis where virus bounded with the receptors got internalized within the cell [26,43]. The membrane fusion occurs due to the proteolytic cleavage of S protein by host proteases which in turn release the fusion peptide that triggers the activation of the membrane fusion process [44]. After entering the cytoplasm, the virus membrane fuses with the endosome through cathepsin L proteolysis by intercellular proteases [45,46]. The hydrolyzing enzymes within the endosome destroy the viral capsid, and subsequently, the single-stranded RNA comes out in the cytosol [47]. In another suggested mechanism of virus entry, the fusion of viral and host membrane occurs at low ph and the genetic

material directly released in the cytosol [32,46]. After that, the RNA strand translates to produce replicase proteins coded by the ORF1a/b [48,49]. The replicase then mediates the production of negative-stranded genomic RNA as well as positive-stranded subgenomic RNA [50]. Formation of a replication-transcription complex occurs which comprises of non-structural proteins mainly [35,51]. While the genomic RNA continues to replicate, the subgenomic RNA aids the transcription of structural proteins [35,46]. Theses structural viral proteins translocate into the endoplasmic reticulum and eventually get transferred to the endoplasmic reticulum-golgi intermediate compartment (ERGIC) [17]. Concurrently the nucleocapsids formation happens in the cytoplasm, and they get transported to ERGIC for the virion assembly [52]. The newly assembled viruses then translocate to the plasma membrane by vesicular transport and ultimately secrete outside via exocytosis. These newly released viruses then attack nearby cells, and the cycle continues [14,17] (figure 4).

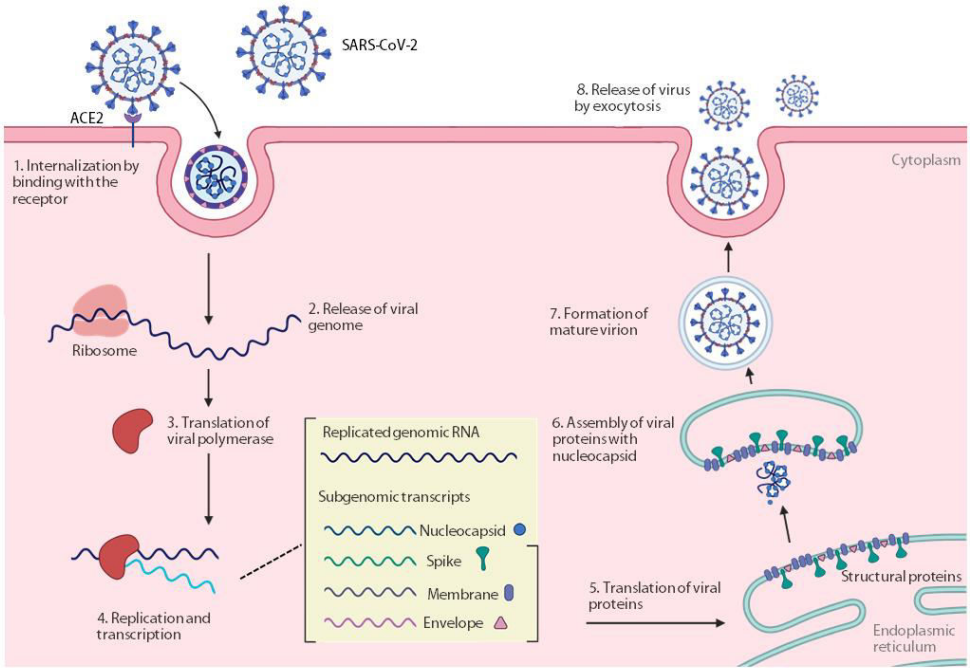

Figure 4: The life cycle of SARS-CoV-2 in a human host.

4. Clinical manifestations and Pathophysiology

The period from the onset of COVID-19 symptoms ranged from 6 to 41 days, with a median of 14 days [53]. However, this period mainly depends on the patient's age and health status. This disease is more vulnerable among patients having age >70 as compared to those who are under 70. Also, the severity of this illness has been found in patients showing comorbidities such as hypertension, diabetes, chronic obstructive pulmonary disease (COPD) and obesity but the still valid scientific explanation is needed [54–56]. According to reports, the typical clinical spectrum of COVID-19 varies from asymptomatic to severe multi-organ failure and sometimes even death [57]. The main symptoms include fever, dry cough, fatigue, dyspnea, rhinorrhoea, sneezing and sore throat [58]. The rare symptoms manifested by some COVID-19 patients are gastrointestinal symptoms, diarrhoea and vomiting [59]. The pathophysiological changes occur in a patient affected with SARS-CoV-2 can be several. The viral infection in patients can be asymptomatic to severe multi-organ failure and death[57]. The organ being most affected in this disease is the lung [58,60]. CT scan reports show pulmonary ground-glass opacification even in asymptomatic patients, probably because of the damaged and destroyed ACE2 receptors on the apical side of lung epithelial cells [61,62]. The dendritic cells and macrophages located in the lung epithelium fight against the virus until the commencement of the adaptive immune response [63,64]. Following the antigen presentation by antigen-presenting cells, the T cell responses initiate [65,66]. Helper and cytotoxic T cells play a highly crucial role here. Helper T cells activate B cells to produce specific antibody against the viral proteins while cytotoxic T cells directly kill the virus-infected cells [67].

The increased level of interleukin 6 (IL6), IL10, granulocyte-colony stimulating factor (G-CSF), monocyte chemo attractant protein 1 (MCP1), macrophage inflammatory protein (MIP)1α, and tumour necrosis factor (TNF)-α were reported in severely infected patients [68]. IL6 sometimes produces in excess, and the condition is called a cytokine storm [69]. Exhausted T cells were also detected in critical cases [70]. The lung epithelial cells produce both IL8 and IL6. IL8 is a chemo attractant which can attract T cells and neutrophils [71]. An abundance of inflammatory cells was noticed in the lungs of the

patients [72]. Amongst the innate immune cells that were reported to be found in clinical samples, the majority were neutrophils [73]; which can damage the lung epithelium itself [74]. Whereas in the case of adaptive immune cells, the preponderant were T cells as a decline in the number of circulating T cells was noted in many cases [63,70]. In some patients, CD4+ pathological cytotoxic T cells sometimes can destroy the virus, but they can contribute to lung injury too [75,76]. ACE2 Receptors were also observed to increase significantly in lymphoid cells ILC2 and ILC3s [76]. All the above-mentioned inflammatory responses can induce severe tissue damage if there is a severe infection. Along with the respiratory symptoms, in some cases, thrombosis and pulmonary embolism were also observed [76–78]. The endothelium plays a very vital role in regulating thrombosis [79,80], and ACE2 receptors are also expressed on it [81,82]. The injury in endothelial cells may result in microvascular permeability which might help the virus to propagate further [76,83] (figure 5).

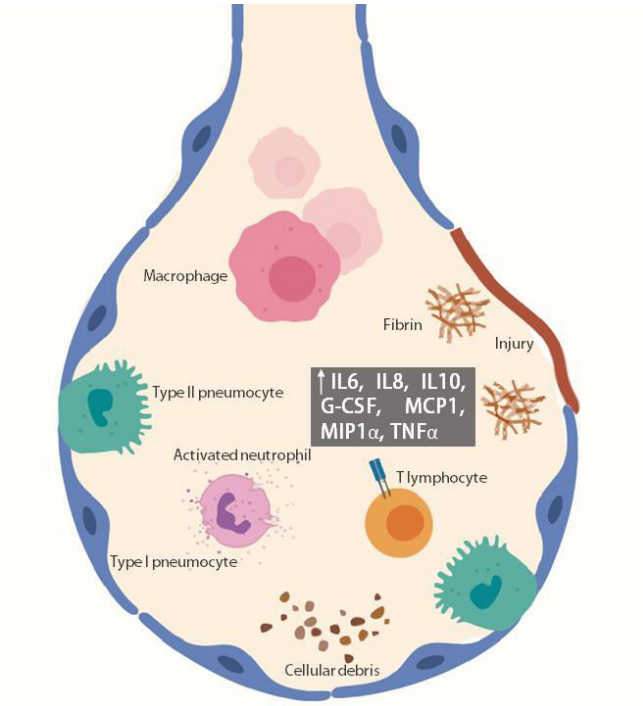

Figure 5: Pathophysiological changes in the alveolar tissues due to COVID-19 infection

5. Therapeutic approaches

Currently, three types of therapeutic strategies are being taken to treat or prevent COVID-19. The first one being the application of repurposed drugs and the development of new drugs. Several existing antiviral drugs are being applied in patients with COVID-19 [84]. Along with antiviral drugs, other drugs and antibiotics are also being practised in combinations [85]. Among them, two drugs exhibited promising effect against the SARS-CoV-2 infection, remdesivir and hydroxychloroquine [86,87]. Remdesivir is a broad-spectrum antiviral medicine [88] whereas hydroxychloroquine is a derived form of chloroquine which is generally used to treat autoimmune diseases like rheumatoid arthritis and lupuserythematosus [89]. It is proposed that the active molecules from remdesivir named GS – 441524 and GS-5734 can prevent viral replication by blocking the viral polymerase protein (RdRp) [88,90,91]. The potential mechanism involved in the protective action of hydroxychloroquine against SARS-CoV-2 is not well understood. It may prevent the formation of endosome during virus entry, it may restrict the viral genome release by interfering with the endosome acidification [89], or it may block the viral transcription by altering the map kinase signalling [92]. Scientists also suggested that it can affect the post-transcriptional modifications of viral proteins and can also interfere with the vacuole formation during viral release from an infected cell [89,93].

Currently, there are 249 drug candidates aimed to treat COVID-19; amongst them, 161 are in various phases of the human trial [37]. Drugs are mainly based on the strategy of preventing virus entry mechanisms [94]. In one approach compounds resemble the structure of RBD of spike proteins are used as drugs, they might eventually outcompete the SARS-CoV-2 viruses to bind with the ACE2 receptor [95]. Another approach is developing drug compounds which can bind to the RBD of spike protein before it enters the cell, and this will block the binding [95]. Secondly, the most crucial type of therapeutic strategy is to develop a vaccine. Currently, there are 139 vaccine candidates proposed, among which 18 are currently in the human trial [96]. Some of the vaccines showed promising results. There are several approaches to viral vaccine development. In some vaccine live attenuated virus, or whole inactive viruses are used, in some circumstances, the genetic material is used as a vaccine, and in some cases, parts of

virus-like proteins are used to develop a vaccine. Currently, each of the following approaches is taken to produce a vaccine as early as possible [97,98] (figure 6). The third therapeutic strategy is convalescent plasma therapy, where the plasma from recovered patients are collected and injected into infected patients. The plasma containing antibodies against the virus act immediately on the patient; this approach is quite successful in many patients in all parts of the world [99].

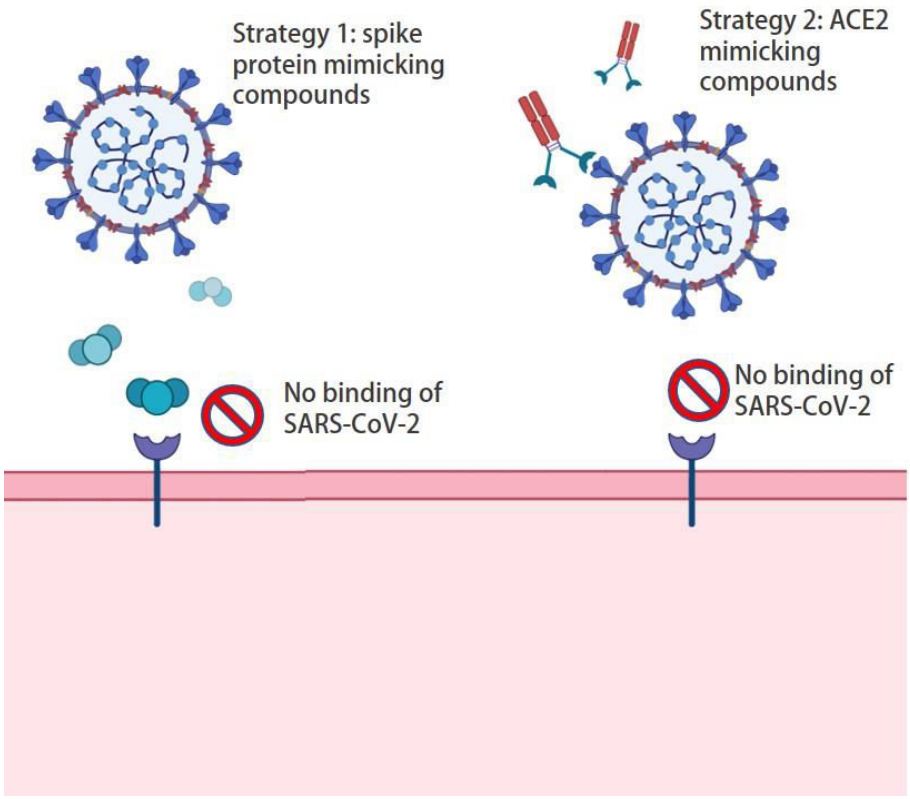

Figure 6: Strategies for developing a drug against COVID-19

6. Future Directions

The SARS-CoV-2 virus has become a significant threat through worldwide. Extensive measures are required to combat person-to-person transmission of SARS-CoV-2 infection and to control the outbreak as soon as possible. Drug testing always requires an established and stable animal model before their clinical use in humans. However, in the current scenario, no promising model has been found to study the pathogenesis and potential treatment for the deadly virus. The development of drugs against COVID-19 is

very challenging due to the repeated emergence of SARS-CoV-2 virus with distinct features. Repurposing the drugs that have been considered as effective drugs against COVID-19 should be screened invitro in order to confirm their activity against this virus. The drugs which will show activity in in-vitro condition should then be investigated in animals and clinical trials. Although many commercial companies are working for the development of effective coronavirus vaccines, still there is a dire need of human and animal-based trials because potential vaccines may take almost 3-10 months for proper commercialization. Along with that, the strategy for accurate and rapid diagnostic kit for COVID-19 detection in the suspected patient is also needed, because no doubt PCR testing kit is not only expensive but also time-consuming.

7. Concluding Remarks

In summary, this review gives insight into the current pandemic situation of COVID-19 and provide a clear-cut picture in terms of epidemiology, key features, transmission, clinical manifestations, pathophysiology and some potential therapeutic approaches. As our current knowledge regarding SARS-CoV-2 virus is limited, hence there is rapidly ongoing research on this topic, and hopefully, this will aid in finding clinical treatment in controlling the outbreak. Therefore, till then, preventive measures should be encouraged, such as social distancing, staying at home and avoiding mass gatherings to prevent the virus spread. Moreover, the research should be focused more on understanding the pathogenicity of SARS-CoV-2 virus as it may help in developing a potential vaccine and effective drugs.

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Declaration of competing interest

The writers claim no conflicting interests.

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CHAPTER-4

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CHAPTER-4

THE EMERGENCE OF COVID-19 AND ITS SPREAD ALONG WITH SYMPTOMS

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ABSTRACT

The recent emergence of the COVID-19 pandemic caused by the novel severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) has put extreme pressure on all sectors of life influencing society, medicine, and the economy around the globe. SARS-CoV-2 is the third zoonotic coronavirus (CoV) identified to cause pronounced disease in the human population, following SARS-CoV of 2003 and MERS-CoV of 2012. Its rate of transmission exceeds than that of SARS-CoV, and its fatality rate varies from 1.2-15.2%. CoV is a large enveloped virus with a linear positive-strand RNA genome. Owing to the fast mutation rate and recombination, CoVs are among the fastest evolving viruses, which might have also helped SARS-CoV-2 to attain novel infectious properties and adaptation to the human host. The genomic and evolutionary studies established so far have suggested that bats and pangolins serve as the natural reservoirs for SARS-CoV-2, eventually spilling over to humans. The transmission of this virus occurs by the inhalation of droplets from the respiratory tract of an infected person and thus strict quarantine measures are needed to prevent its spread. COVID-19 poses major

Keywords

SARSCoV-2
CORONAVIRUS
RNA VIRUS
PANDEMIC
PROTEIN
PNEUMONIA

health risks in the elderly or people with underlying medical problems, while otherwise infecting all age groups. Disease severity may reach to acute respiratory distress syndrome or multi-organ failure. The asymptomatic prevalence is more of a concern. Due to the lack of any drug, vaccine, or existing immunity against this virus, there is an immediate need for the development of drugs and vaccines. Exploring the molecular biology of CoV, it's possible zoonotic mechanisms, and vaccine targets might help control COVID-19. This chapter presents the current understanding of CoVs, with an emphasis on SARS-CoV-2 causing COVID-19, its spread, and its symptoms.

1. Introduction

Viruses surround us, the number of viruses on the Earth are a hundred million times more than the number of stars in the universe [1]. Daily, we breathe in these viruses in large numbers, but most of them are harmless. Viruses not only infect animals and humans, but they are microbial predators as well. Viruses influence global biogeochemical cycles and play an essential role in the ecology of the Earth. Interestingly, human genome retains fragments of past viral infections, indicating that humans have faced several viral attacks and the viral DNA has remained with us. In the last twenty years, the world has seen SARS and MERS outbreaks from coronavirus (CoV), causing severe respiratory infections. The first human respiratory CoV study is from late 1960, when Almeida and Tyrrell published the CoV structure by using electron microscopy [2]. The CoV structure shows spikes or protrusions on the viral envelope, giving a crown-like appearance; hence, the name coronavirus. CoVs are present in birds and mammals (bats, cats, rats, and camels) [3]. Bats serve as the richest source of CoVs [4]. The past two CoV infections, SARS and MERS, revealed the involvement of intermediate hosts for virus transmission from a bat to a human(palm civets in SARS, and camels in MERS). Now a new virus called SARS-CoV-2 has caused the COVID-19 pandemic, leading to social and economic crises globally. The worrisome features are that the virus is extremely contagious and that it causes a severe disease in the elderly and people with

comorbidities. There are more than 8million people infected globally, and more than 440,000 people have died due to a lack of any drug or vaccine to control it (Figure 1). To stop the spread, we need to know the details of the disease emergence, spread and symptoms. This chapter highlights these aspects of SARS-CoV-2.

2. Human pathogenic coronaviruses

The CoVs are a large family of RNA viruses with a size of 60-120 nm in diameter. CoV has a linear positive-strand RNA genome that is 26000-32000 nucleotides long. The RNA is encased inside a lipid-bilayer membrane that is associated with proteins. Figure 2D shows SARS-CoV-2 with transmembrane protein (M), the spike glycoprotein (S), and envelope protein (E). Before2019, six humans pathogenic CoVs existed. Four of them (HCoV 229E, HKU1, NL63, and OC43) induce mild upper respiratory diseases in people with immuno competency. The other two (SARS-CoV and MERS-CoV) cause severe respiratory syndrome in humans. SARS-CoV caused Severe Acute Respiratory Syndrome (SARS), resulting in 8098 cases, with 774 deaths in 26 countries [5]. MERS-CoV caused the Middle East respiratory syndrome outbreak in 2012 infecting 2494 people across 27 countries. The case fatality rate was 34.4% with 858 deaths for MERS;[6]. We are now experiencing the seventh newly discovered CoV, named SARS-CoV-2 [7], which has caused Coronavirus Disease of 2019 (COVID-19), a pandemic.

Our first recorded encounter with any CoV occurred in 1930. In that year an acute respiratory infection occurred in only chickens, caused by a CoV known as avian infectious bronchitis virus (IBV). Phylogenetic dating of CoV RNA genomes (Figure 2A) using the sequence of viral RNA-dependent RNA polymerase (RdRp) estimates the most recent common ancestor (MRCA) of mammalian CoVs occurred ~ 300 million years ago [8]. Contemporary CoVs are well known for human respiratory tract infections and infect many mammalian and avian species [9].

3. Emergence of COVID-19

A disease with characteristics very similar to viral pneumonia appeared in China in December 2019. This disease arose in people who had visited the seafood market in Hunan of Wuhan city (the capital of Hubei province, China). This wet market sells different wildlife live animals, including bats, birds, frogs, hedgehog, marmots, snakes, and

rabbits [10,11] Approximately 50 patients reported the disease at first. The patients reported fever and cough and/or respiratory distress [12]. Experts determined that the pneumonia caused by a novel coronavirus that differed from SARS-CoV and MERS-CoV. The disease was named coronavirus disease 2019 (COVID-19; The World Health Organization (WHO). The International Committee on Taxonomy of Viruses named the causative virus severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The virus belongs to the β-coronavirus family (a naturally prevalent large class of viruses).

- **Geographic distribution**

COVID-19 rapidly spread through human to human contact to all over China and then around the world. According to WHO coronavirus disease (COVID-19) report 149, there are more than 8.38 million confirmed cases, with 449,695 deaths globally. Figure 1 shows the pattern of case comparison by different regions, with 38,99,859 confirmed cases in the Americas, 24,52,247 cases in Europe, 817,458 in Eastern Mediterranean, 503,034 in Asia, and 1,87,625 cases in Africa. The USA alone has reported the highest number of confirmed cases—21,64,497—followed by 955,377 cases in Brazil, 560,279 in Russia,366,946 in India, and 300,717 in the United Kingdom. The total number of deaths are 117,783 in the US, 46,510 in Brazil, 42,238 in the UK, 34,448 in Italy, 29,578 in France and 12,237 in India. The first COVID-19 infection was reported in China in December 2019. China has now 84,462 reported cases with 4638 deaths.

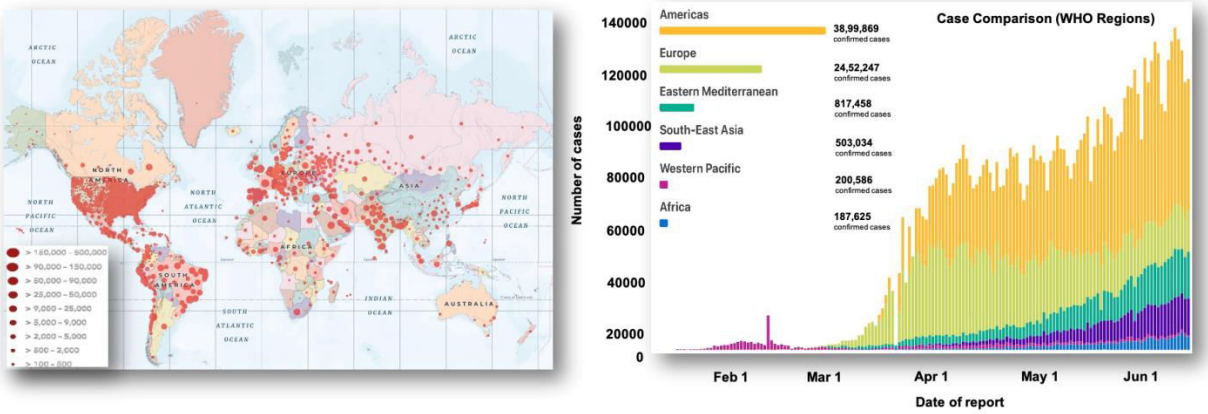

Figure 1. Geographic distribution of COVID-19 cases. (June 17th, 2020). Left: Cumulative confirmed cases globally. Red dots show the number of confirmed cases as per inset (Source: https://coronavirus.jhu.edu/map.html). Right: Number of confirmed COVID-19

cases, by date of report and WHO region, 30 December 2019 through 17 June 2020 (source who.int).

- **Origin of SARS-CoV-2**

COVID-19 is the third CoV attack after SARS and MERS CoVs. SARS-CoV and MERS-CoV cause severe to fatal respiratory tract infections. SARS-CoV-2 is different from SARS-CoV (79.5% identity only) but has a 96.2% identity to a bat CoV RaTG13 genome sequence [13]. Advanced protein amino acid alignment for 27 proteins showed differences in 2019-CoV and SARS-CoV [14]. In total, 380 amino acid substitutions exist in SARS-CoV-2 proteins. Some are in nsp2,nsp3, and spike protein, with 67, 103, and 27 substitutions, respectively. Six relevant mutations are in the receptor binding domain and six in the stalk. The receptor-binding subunit S1 domain has four substitutions in two peptides, and these peptides are antigens for SARS-CoV [15]. The virus uses angiotensin-converting enzyme 2 (ACE2) as its receptor for entry to the human cell, as did SARS-CoV. Although bat is the probable natural host of the SARS- CoV-2,it might rely on transmission from bats via some intermediate hosts to infect humans.

Wuhan is a business hub with elite status, fashionable lifestyle, and the popular game meat. It is a place where one can buy, sell, gift and eat wildlife animals. Game meat has a high possibility of microbiological contamination. The first 27 cases of COVID-19 originated in either the proprietor of shops or with people who had visited this market. It is a crowded market of 50,000 square meters that deals in sales of a wide range of live wild animals of different types, with species caged close for human consumption. SARS-CoV-2 most likely originated here.

Surprisingly after a long tight control over the virus spread in China, a cluster of new COVID-19 patients emerged from another wholesale food market. The Chinese capital reported 36 new cases in a single day, bringing total to 106 on June 12, 2020. These cases are linked to Xinfadi market, which supplies meat, seafood, fruit and vegetables. The outbreak has spread to Liaoning and Hebei provinces. It is still not clear how the virus is spreading. If the spread continues to be same, it may become explosive soon.

- **Source of SARS-CoV-2**

The wholesale wildlife animal market at Hunan was potentially closely linked to the virus source. Usually, viruses undergo recombination and mutation processes and reassortment processes to get equipoise in the final host. SARS-CoV had an in vivo mutation rate for nucleotide substitutions of ~ 5.7×10^{-6} per site per day.It is very similar to RNA viruses [16]. A high rate of mutations in these RNA viruses permits quick adaptations to a varying environment. The concurrent infection of the same tissue or animal by multiple viruses eventually results in new viral progeny having genome from different parents (a reassortment process). This process in RNA influenza A virus, which has eight single-stranded RNA segments, changed its the viral surface glycoprotein. The spike glycoprotein S of CoV is the critical component for their transmission. This S protein binds to a receptor called angiotensin-converting enzyme 2 (ACE2) to enter the host cell. This spike glycoprotein S already underwent significant evolution in CoVs [17]. These mutations accelerated intra and interspecies transmissions [18]. The spike protein from SARS-CoV can recognize ACE2 receptors from different animals—including bat, mouse, civet, and raccoon dog—boosting interspecies spread [19], [20]. On the other hand, bats, being as the host for many CoV, have incredible species diversity (~1240) and fly long distances ~ 2000 km. These features allow bats to get or disseminate viruses.

For both SARS and MERS, the virus transmission is zoonotic. Zoonotic diseases are ones that usually occur among animals but under specific conditions can also infect humans. Another term is zoonotic spillover, which refers to the transmission of a virus from a vertebrate animal to a human. Zoonotic transmission involved palm civets in SARS and camels in MERS [21], [22]. A virus can be transmitted easily from bats to animals or humans via bites and scratches. These animals can serve as an intermediate source and could give it to humans by direct contact (for example, rabies virus). The CoV from Malayan pangolin has a 99% similarity toSARS-CoV-2, but the bat RaTG13 CoV has a 96% identity toSARS-CoV-2 [23]. All this information indicates that the probable intermediate source is pangolin, and the primary source is bat (Figure 2B).

4. Spread of COVID-19

The first 27 COVID-19 patients were associated with the selling or buying of live animals. These patients had worked at or visited this place. With the progression of the disease, the primary mode of COVID-19 transmission remains person-to-person spread. Other factors are discussed below.

- **Spread among people**

Analogous to the spread of the influenza virus, SARS-CoV-2 spread mainly via respiratory droplets. Through droplet transmission virus discharged in the respiratory secretions can infect another person upon direct contact with their mucous membranes. Respiratory droplets are discharged from an infected person through coughing, sneezing, or talking. The large droplets fall on the ground, and the small droplets do not travel more than two meters (six feet) nor linger in the air. The maximum range of transmission is uncertain, but high-speed imaging study shows a 22 foot range for respiratory exhalations in a gas cloud after coughing or sneezing [24]. The viral RNA is also exists in air samples and the ventilation systems of hospital rooms occupied by patients of COVID-19 [25], [26]. How long SARS-CoV-2 remains viable is clear but also a big concern. It remains viable for three hours in experimentally generated aerosols [27]. SARS-CoV-2 also exists in non-respiratory fluids including blood, stool, and ocular [28-31]. The blood and fecal-oral transmission is not clinically described yet [32].

- **Spread from air and inanimate surfaces**

SARS-CoV-2 can also spread from fomites (contaminated surfaces) if susceptible individuals transfer infectious virus by touch from surfaces to their eyes, nose, or mouth. The CoV survives on non-living surfaces for up to six to nine days. SARS-CoV-2 can also persist on variable surfaces from hours to days [25,33,34]. However, various disinfectants, including ethanol (60-70 %), inactivated SARS-CoV within one minute and also work on SARS-CoV-2[35]. The virus can persist in the air without losing infectivity in unventilated buses for at least 30 min [36]. SARS-CoV-2-bearing aerosols could exist in hospital wards [37]. Experimentally, a reduction in infectious titer of SARS-CoV-2 with $TCID_{50}$ value (50% tissue culture infective dose per milliliter)is known for different surfaces. This value is 3 hours for aerosols ($10^{3.5}$ to $10^{2.7}$ $TCID_{50}$), 72 hours for plastic ($10^{3.7}$ to $10^{0.6}$ $TCID_{50}$),

and 48 hours for stainless steel ($10^{3.7}$ to $10^{0.6}$ $TCID_{50}$). On copper and cardboards, no viable SARS-CoV-2 survived 4 hours [27].

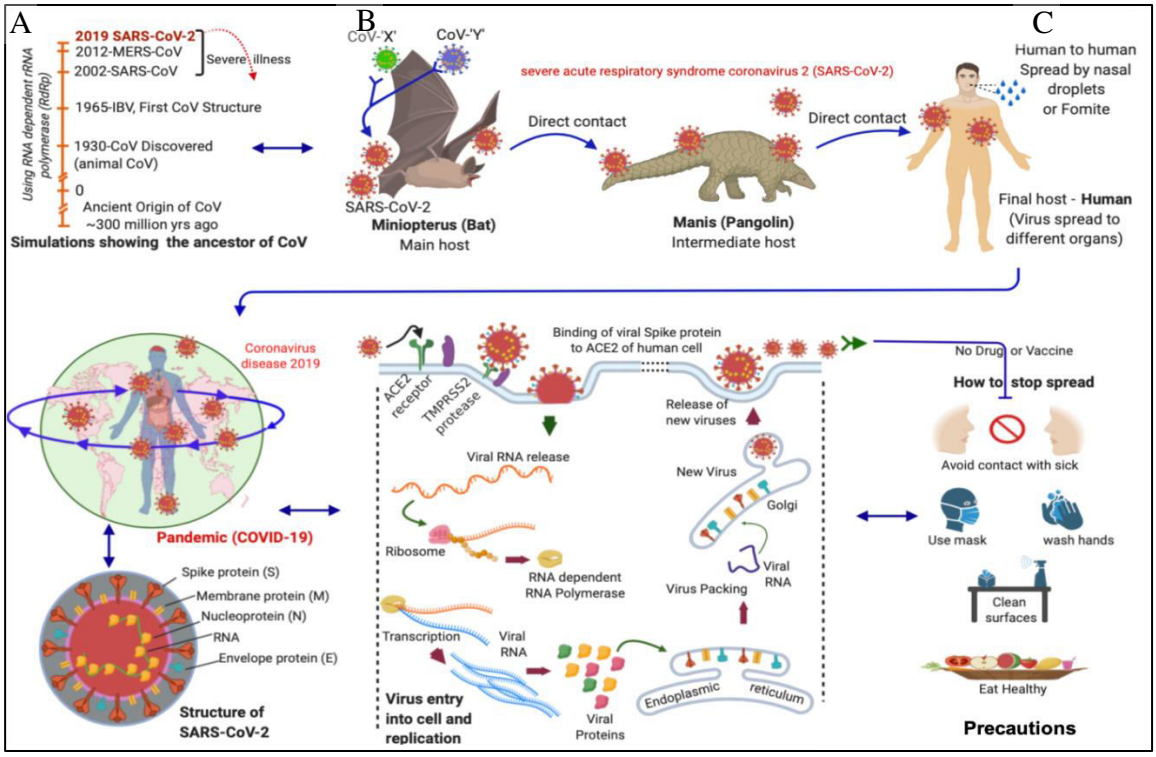

Figure 2. Spread of COVID-19. A: The most recent common ancestor (MRCA) of mammalian CoVs, and human severe pathogenic CoVs: simulations using RNA-Dependent RNA polymerase gene sequences date the probable origin of CoV to around 300 million years ago. Three severe CoV strains that are pathogenic to humans are listed with the date of origin. B: Transmission of SARS-CoV-2:The most probable origin of SARS-CoV-2 is from bats, as it has 96% identity to a virus found in bats and may have originated from recombination in two viruses. Malayan pangolin has a 99% similarity with SARS-CoV-2, identifying it as the probable intermediate host for spread to humans. C: CoV spread among people: SARS-CoV-2 spreads through direct human-human contact either by respiratory droplets or fomite. D: Structure of SARS-CoV-2: crown-like appearance of the CoV with highlighted essential proteins and RNA genome. E: Virus replication inside the cell: Virus Spike protein (a trimer) binds to the ACE2 receptor on the surface of the host cell and gets cleaved by protease calledTMPRSS2, leading to fusion of the membranes of the virus and the host cell. The viral RNA is released into the cytoplasm of the cell, where it gets translated directly. RdRp forms RNA copies that are translated. The viral proteins move to the endoplasmic reticulum (ER) and Golgi. From these compartments, new packed viruses bud into the membrane to form vesicles with the mature virus, which isthen released by exocytosis. F: Precautions for COVID-19 spread: social distancing, use of masks, washing hands with soap, and healthy eating to keep immune system robust. (Figure created with BioRender.com).

5. SARS-CoV-2 Period of infectivity

After getting infected, it is uncertain when the individual will be infectious to others. The uncertainty is because the COVID-19 RT PCR test detects virus RNA in the specimens collected from people but does not reveal whether it is infectious. It seems that the virus is not only transmitted throughout illness but also prior to the development of symptoms. A study of modeling the time of infection among infector and infected transmission pairs of COVID-19 has reported similar results. It suggested that infectiousness started about 2.3 days and peaked 0.7 days before symptom onset [38].

Asymptomatic individuals play a substantial role in virus transmission. It is tough to recognize any early signs and symptoms of the infections in these individuals. SARS-CoV-2 from upper respiratory tract specimens of these individuals (after testing positive by RTPCR test) has also been cultured. Surprisingly, asymptomatic individuals were found to be 24 out of 27 skilled workers in a nursing facility, with symptom onset at 7^{th} day after testing positive for SARS-CoV-2 [39]. Other similar reports also describe asymptomatic transmission [40-43]. The extent of the asymptomatic transmission and percent contribution to the pandemic remains unspecified. But it is an alarming way of spread as suggested by the simulation study. The emission rates simulated are> 100 quanta h^{-1} of infectious SARS-CoV-2 for a subject in just vocalization activity compared to emission rate of < 1 quantum h^{-1} for a symptomatic subject in resting condition. (Quantum is the dose of airborne droplets required to cause infection in 63% of susceptible persons [44] According to the CDC, 35% of the spread of COVID-19 is through asymptomatic people.

For symptomatic individuals, the period during which a person stays infectious can vary. It depends upon the severity of the illness, too. The virus-shedding ranges from one week to 6 weeks after onset of the symptoms in survivors or until death in non-survivors [45-48]. Notably, the virus load is higher in stool samples than respiratory samples [49]. However, fecal-oral transmission is not yet confirmed. Detection of viral RNA is different than detection of viral shedding, and how these processes correlate is uncertain. Understanding these dynamics in COVID-19 should be helpful in the clinical management of contagious people. It also suggests the need for prolonged observation, repeated testing, and new detection assays.

6. Cell-to-cell spread

One of the principal determinants of COVID-19 pathogenesis is the SARS-Co-V-2 entry into host cells. The surface spike protein mediates the CoV entry (Figure 2E). The spike protein is a trimer, and its receptor-binding S1 heads sit on the top of an S2 stalk [50]. The S1 head comprises a receptor-binding domain (RBD) that recognizes a receptor on human cells. The role of RBD is to continually switch between standing-up and lying-down positions for receptor binding and immune evasion, respectively. The receptor for the spike protein is an angiotensin-converting enzyme 2 (ACE2) on the host cell surface.

The spike protein needs proteolytic activation at the S1/S2 interface by TMPRSS2protease, which is present on the human cell surface. Proteolysis leads to the fusion of the membranes of the virus and the host cell. It releases the viral RNA into the host cell cytoplasm, where it is translated directly(Figure 2E). SARS-CoV-2 has 16 genes for nsp (nonstructural) proteins. Many of these nsps form the transcriptase complex which is helpful to provide the required milieu for the viral RNA and protein synthesis. Transcription of the sub-genomic RNAs is requisite for their service as mRNAs for the viral protein synthesis. The translation is necessary for making the viral proteins needed for the new virus assembly. The viral S protein contains an N-terminal signal sequence. This signal directs the spike protein into the endoplasmic reticulum (ER).This is the site of its N-linked glycosylation and proper folding. The three other most abundant viral proteins are M protein (which defines the shape of the envelope), E protein (which helps with the new virus assembly and also with virus budding), and N protein (which binds genome to help in viral assembly and in virus budding). These proteins move into the endoplasmic reticulum and Golgi. In these compartments, new packed viruses bud into the membrane to form vesicles with the mature virus. They are then released by exocytosisto infect host other cells, see also Figure 2E, [51, 52].

7. Symptoms

The SARS-CoV-2 incubation period is 14 days, with a mean incubation time of 5.2 days following exposure[53,54].More than 95 % of infected individuals show symptoms within 12 days. Most of the infections are not severe [55,56]. When pneumonia occurs,

it is characterized primarily by fever, cough, dyspnea, and bilateral infiltrates on chest imaging. COVID-19 spread occurs in both symptomatic and non-symptomatic carriers. The scale of symptomatic infection among patients ranges from mild to critical. Initial significant symptoms of COVID-19 include cough, fever, muscular soreness, and difficulty in breathing (dyspnea). In some patients, the patient exhibits fever (not very responsive to antipyretics) associated with a dry cough only. In older patients with already impaired lung function, infection triggers shortness of breath, unease, and increased respiratory rate leading to dyspnea. Symptoms may appear later in younger patients who do not have a primary respiratory impairment or any other comorbidities. These patients experience the worsening condition of inflammatory-induced lung injury, which causes a decrease in oxygen saturation levels (<93%). There may be a rapid relapse of respiratory functions. Some atypical symptoms are diarrhea and vomiting. But some of the patients also had one or more underlying medical conditions[45, 57, 58]

The percentage of symptoms varies: cough (59–82%), fatigue (38–70%), sputum production (28–56%), myalgia (11–35%), dyspnea (3–55%), and headache (6–34%) [59-62] Sometimes, the above symptoms accompany sore throat, chest pain, hemoptysis, conjunctivitis, and rhinorrhea [59–61]. The severity of infection is exacerbated by pre-existing comorbidities like cardiovascular disease, hypertension, diabetes, chronic lung disease, cancer, and obesity. Other less common symptoms are anosmia and dysgeusia (smell and taste disorders, respectively) in 34 % of patients of total COVID-19 patients. In mild COVID-19 patients, the percentage went up to 64% with age range, 20-89 years [63–66]. The nasal cavity olfactory epithelium is the probable site of SARS-CoV-2 binding, as its non-neuronal cell types express both the required receptors, ACE2 and TMPRSS2 proteases, used for the CoV binding. This may explain the loss of smell and taste. This feature is still uncertain for a distinguishing feature of COVID-19. COVID-19 patients have anorexia and diarrhea. Other GI symptoms are nausea, abdominal pain or discomfort, vomiting, and hematochezia. More indicators of COVID-19 include gastrointestinal (GI) symptoms, such as nausea and diarrhea [67], GI symptoms are uncertain as they vary from 10-35% [68]. Sars-CoV-2 enters the GI system via the ACE2

receptor, which is expressed on cells called enter ocytes of the GI tract in ileum and colon.

COVID-19 infection may result in dermatological manifestations, but the dermatological findings in patients are not well characterized. Skin symptoms like urticaria (red itchy welts) and maculopapular (raised red bump) appear. Sometimes transient live do reticularis (reddish-blue skin) and vesicular eruptions occur [69–71]. Some patients also noted a burning sensation on their skin. Another symptom that looks similar to pernio (chilblains, skin sores) occurs. In this case, reddish-purple nodules appear on the toe in children and adults [72]. Some are calling this finding "COVID toes." The three CoVs that cause human infections--SARS-CoV, MERS-CoV, and SARS-CoV-2--share many similar symptoms, including cough, fever, myalgia, dyspnea, and bilateral ground-glass opacities on chest CT scans. However, GI infection was more common in patients with SARS and MERS than SARS-CoV-2. Also, MERS infection showed a high incidence of renal failure, which is not often present in other human CoV infections [73].

8. Summary

Viruses have always surrounded the human population. But now it seems that human actions have worsened the problem by disturbing the ecological niche (of CoV). The COVID-19 epidemic has driven a global crisis. Within recent years three virus spillovers from wild animals have occurred, without any clear view of the possible animal reservoir. Perhaps the safest way to protect the human population from these CoVs is to keep a barrier between civilization and the natural pools. The SARS-CoV-2 virus is spreading everywhere, and whether it will appear again and again like a flu virus or die out is not clear. We need to explore the fundamental adaptation-evolution mechanism in order to design the best strategies that will ensure human safety. Investigating the molecular biology of the infection to get transparency on transmission will be helpful for such outbreaks in the future.

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CHAPTER-5

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CHAPTER-5

NEUROLOGICAL IMPACT OF COVID-19 PANDEMIC: LESSONS & CAUTIONS

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ABSTRACT

Coronavirus disease COVID-19 caused by SARS-CoV-2 infection leading the current precarious pandemic which is affecting most of the countries in the world. Clinical portrait of COVID-19 might vary from trivial to debilitating febrile illness. Recent hospital-based studies have recorded the possible neurological symptomatology of SARS-CoV-2 infection. Neurological complications might be of Central Nervous System (CNS) such as dizziness, headache, consciousness impairment, cerebrovascular illness, epilepsy, ataxia and encephalopathy. Peripheral Nervous System (PNS) illnesses include Guillain-Barré syndrome, hyposmia, hypogeusia, neuralgia. Positive results of Reverse Transcription-Polymerase Chain Reaction (RT-PCR) and serological assays in patients before and during neurological symptoms infer the possibility of both para and post-infectious association

Keywords

COVID-19 ASSOCIATED NEUROLOGICAL DISORDERS

TRANSNEURONAL

HAEMATOGENOUS

NEUROPATHOGENESIS OF SARS-COV-2

NEUROVIRULENCE

of neurological disorders with SARS-CoV-2. Elements of SARS-CoV-2 have been spotted in cerebrospinal fluid (CSF) too. Neuropathogenesis by SARS-CoV-2 may result from some independent or interdependent cascades. Direct neuro invasion can lead to metabolic disruption in the nerves. Nerves might be affected indirectly through systemic complications. Cytokine storms which elicit aberrant immune response can damage the nervous system. Molecular mimicry mediated pathway in which antibodies erroneously encroach on central and peripheral nerve fibres may be operational. Intrusion into endothelial cells might permit the SARS-CoV-2 to slip away through the blood-brain and blood-nerve barrier and invade into the nervous system. It is imperative to be cautioned about the potential neurological complications of SARS-CoV-2 infection during the acute course of COVID-19 symptoms as well as post-COVID-19 neurological sequelae. Introduction of SARS-CoV-2 vaccines is anticipated to cut down the neurological disease burden added up by SARS-CoV-2.

1. A prologue to COVID-19 and SARS-CoV-2

SARS-CoV2 is a single strand RNA-genomic virus which belongs to the genus Beta-coronavirus under the family Coronaviridae, order Nidovirales and realm Riboviria [1].The SARS-CoV-2 infection causes the corona viral disease i.e. COVID-19. To date, 213 countries and geographical territories reported the outbreak as per the statistics of the UN Geoscheme dashboard.

The cough droplets are the major reason of contamination of this ribovirus between people. COVID-19 has become such a global scale pandemicin 2019-2020 mainly because international travellers played as carriers of this ribovirus and initiated community transmission chain in destination countries. The SARS-CoV-2 also represents the leading cause of death of travellers in the pandemic period. The clinical spectrum of the COVID-19 ranges from severe febrile and respiratory illness to oligosymptomatic or even complete absence of symptoms. As the SARS-CoV-2 infection can be asymptomatic, the definite number of infected cases in a geographic territory very likely to be under represented. Recently, as evidence amassed gradually, neurological disorders found to be associated with SARS-CoV-2 infected patients. Sometimes it becomes a challenge to reveal the association between a neurological complication to the SARS-CoV-2 infection due to lack of clinical co-presentation of COVID-19 and neuropathologies, and paucity of serological evidence. The incidence and increment of SARS-CoV-2-associated neurological complications differ country-wise because of differences in national preventive policies. A new consensus for the diagnosis and prophylactics of neurological COVID-19 cases seems imperative. This is particularly important for healthcare professionals who are unaccustomed with its wide range of clinical manifestations including atypical presentations. In this synthesis, we will delve into the nervous system complexities associated with SARS-CoV-2 infection with a deep look at the emerging theories postulated about its profound impact on the central and peripheral nervous system.

2. Does SARS-CoV-2 damage nervous system?

Penetration to the nervous system by respiratory viruses is not uncommon [2]. Viruses can pierce the nervous system in a process called neuroinvasion. After invasion, viruses distress neurons as well as glia, a phenomenon popularly termed neurotropism. The trigger of different neurological disorders by infectious agents termed as neurovirulence. The theory of neuroinvasive potential of SARS-CoV-2 is grounded on five lemmas:

i. Patients infected with SARS-CoV-2 presented neurological symptoms within the clinically significant time frame.
ii. Discoveries of neurological complications associated with coronaviruses in non-human species.
iii. Neurological impairment by SARS-CoV-1, MERS and other taxa of coronaviruses in human and other species
iv. Nervous system connection by respiratory viruses of families phylogenetically close to Coronaviridae.
v. Experimental evidence of neural infection potential from animal and cell models of coronaviruses.

3. Neurological complications of SARS-CoV-2

The manifestations of neurological symptoms following SARS-CoV-2 infection reported are related to diverse type of neurological disorders. Physiological events caused or abetted SARS-CoV-2 and predisposed host factors conjunctively partake in neuropathogenesis. Based on different lenses, COVID-19 associated neurological diseases are classified as discussed below.

A. Classification based on pathologic puncta

Depending on the site of pathology, neurological manifestations can be broadly subdivided into four categories as summarized in **Table1**.

Table1: Classification of neurological disorders based on site of damage

Site of pathologies	*Candidate Diseases*
CNS disorders associated with COVID-19	Encephalopathy, Headache
PNS complications of COVID-19	Guillain barre Syndrome, Hypogeusia
Cerebrovascular diseases of COVID-19	Seizure, Ataxia
Skeletal muscle damage of COVID-19	Musculoskeletal pain

i. CNS disorders associated with COVID-19:

A sheer number of clinical studies indicate the SARS-CoV-2 involved in a number of neuropathologies of the Central Nervous System (CNS). Future investigations are required to differentiate whether diseases are caused by the virus or it is a mere concurrent manifestation. Major CNS pathologies include headache, encephalopathy, meningitis delirium and impaired consciousness [3].

ii. PNS complications of COVID-19:

Contrasted with the articles published on CNS engrossment of SARS-CoV-2 the literature refers to Peripheral Nervous System (PNS) pathologies are inadequate. Guillain-Barré syndrome is the most reported PNS disorder found to be associated with SARS-CoV-2. Other pathologies include Miller Fisher Syndrome, hypogeusia, hyposomia, polyneuritis and neuralgia.

iii. Cerebrovascular complications:

Cases with vascular risks are more likely to have cerebrovascular abnormalities linked with COVID-19. SARS-CoV-2 associated cerebrovascular manifestations are haemorrhagic stroke, seizure, ataxia, ischemic stroke and cerebral sinus thrombosis. The virus SARS-CoV-2 binds ACE2 receptors on the plasma membrane of endothelial cells which can heighten blood pressure. Rise in blood pressure, thrombocytopenia and bleeding-related complications may add up susceptibility of ischemic as well as haemorrhagic strokes in patients with COVID-19. Cytokine storm could further add up to the existing risk of stroke.

iv. Skeletal muscle damages:

COVID-19 associated skeletal muscle dysfunctions are myopathy, rhabdomyolysis and myalgia. Patients of musculoskeletal complications associated with SARS-CoV-2 infection tested with elevated creatine kinase (an enzyme that maintains ATP homeostasis in muscle).

B. Classification based on temporal onset

There might be a time interval between the commencement of neurological signs and infectious illness. According to the temporal profile of development of neuropathologies in connection with COVID-19 can be categorized into two subtypes:

i. Parainfectious neuropathies:

Diseases which are reported to commence at the time acute SARS-CoV-2 infection described as parainfectious neuropathies. Anosmia (loss of smell), headache and skin rash are examples of parainfectious complications associated with SARS-CoV-2.

ii. Postinfectious neuropathies:

Diseases that onset after an interval period constitute parainfectious neuropathies of SARS-CoV-2. Guillain-Barré syndrome is a typical example of post infectious pathology of SARS-CoV-2. Postinfectious encephalopathy and neuromyelitis optica are also reported in patients with COVID-19.

C. Classification based on pathophysiology

SARS-CoV-2 can impact the human body by means of multiple pathophysiological gateways. Based on molecular pathophysiologies that underlie SARS-CoV-2-associated neurological disorders, four core categories can be formed as tabulated in **Table2**.

4. Possible Routes of neuroinvasion

The precise route of viral transfer of SARS-CoV-2 to the nervous system remained undiscovered [4]. Two salient biologically plausible routes for access to the nervous system by SARS-CoV-2 are described herein:

i. Transneuronal route:

Nerve fibres innervate the human organs including lungs which can be exploited by SARS-CoV-2 as an entrance to the nervous system. Polarized nature of neurons let them receive the signal first followed by processing and conveyance to more neurons and other cell types. Certain viruses are able to infect and traverse along the sensory or motor nerve fibres. Viruses utilize two motor proteins viz. dynein and kinesins to execute their migration inside the nerve cell. These motor protein duosfacilitate anterograde and

retrograde neuronal transportation. Olfactory neurons characteristically connect with the nasal epithelium as well as the olfactory bulb, the gate to the CNS. This passage is usually exploited by respiratory viruses which are known to infect the nervous system [5]. SARS-CoV-2 intranasally penetrate the body and hence possibly invade via olfactory neurons to reach the nervous system.

Table2: Diseases of COVID-19 association as per pathophysiology

Pathophysiology	*Candidate Diseases*
Viral neuroinvasion	Meningitis, Encephalitis
Autoimmune reactivity	Guillain Barré syndrome, Neuromyelitis optica
Dysfunction of metabolism	Metabolic encephalopathy
Neurovascular impediment	Ischemic stroke, haemorrhagic stroke

ii. Haematogenous route:

Most neurotropic viruses move into the blood stream during the viremic period when they try to gain access to the nervous system. After entry to the bloodstream, viruses might cross the blood-nerve or blood-brain barrier through paracellular migration (destabilizing tight junctions) or transcellular migration (infecting the endothelial cells) pathway. SARS-CoV-2 might also enter via Trojan Horse transit in which viruses infect blood leukocytes such as monocytes or macrophages. Viruses use those blood cells as a vehicle to travel through the paracellular pathway to navigate through permeable points of the nervous system's barricade. Transneuronal and haematogenous passages of SARS-CoV-2 migration are depicted in Figure1.

5. Mechanism of Neuropathogenesis

SARS-CoV-2 can manifest neurological symptoms through multiple mechanistic pathways. Here we will discuss about the four key mechanisms that SARS-CoV-2 exploit for neuropathogenesis:

i. Direct neurovirulence:

Direct neurovirulence can potentially happen by SARS-CoV-2 after viruses gain access to the nervous system through the transneuronal or haematogenous pathway. However direct virulence in the brain and nervous system is not reported in SARS-CoV-2 infected patients. The cases shown brain damage are mostly through other means or pre-existing comorbidities worsened by COVID-19 exposure

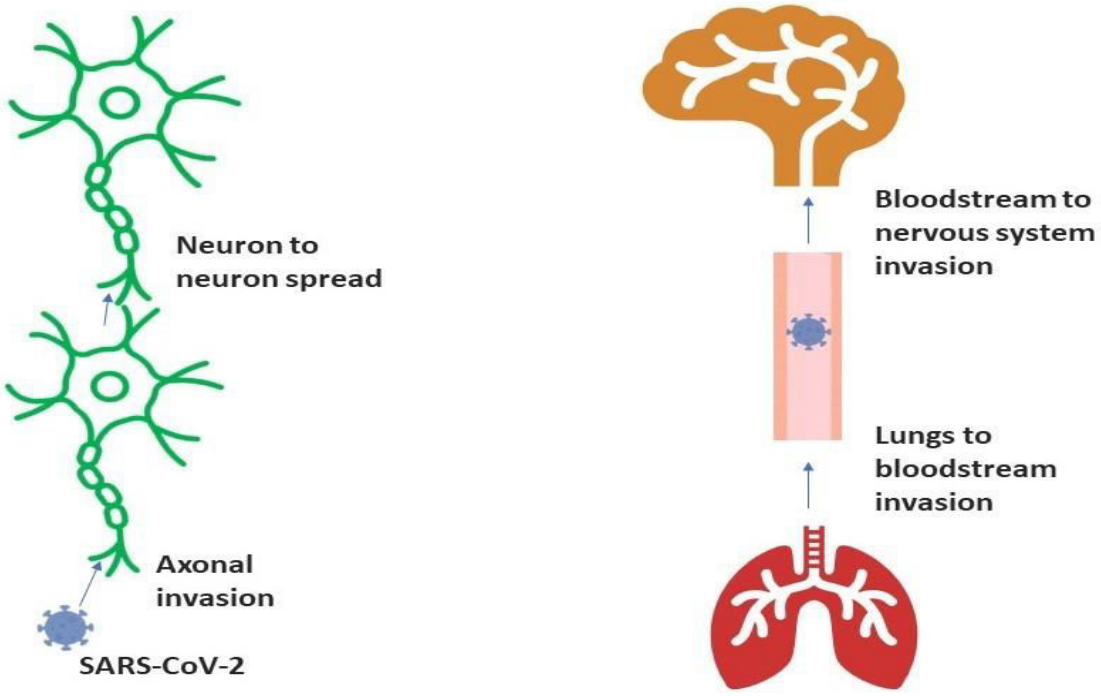

Figure1. Transneuronal (left panel) and haematogenous (right panel) passage of SARS-CoV-2 for entry into the nervous system. The blue arrow indicates the direction of migration of the virus.

ii. Indirect systemic neurodamage:

So far reported cases are predominantly affected by systemic means. During the proliferation of the SARS-CoV-2 in pulmonary cells, oedema and exudation happen. This impedes gas exchange inside lungs resulting hypoxia in the nerve cells which get mitigated by anaerobic metabolism in neuronal mitochondria. An acid build-up also might prompt vasodilation, neuron swelling, cerebral blood flow obstruction and ischemia-induced

headache. The hypoxia can deteriorate the nervous system function, develop cerebrovascular complications, drowsiness, and even loss of consciousness [6].

iii. Molecular mimicry-mediated pathogenesis:

Molecular mimicry is highly likely to happen for SARS-CoV-2 [7]. Guillain-Barré syndrome which is characterized as a template scenario of molecular mimicry, found to occur typically two weeks after COVID-19 onset in a large number of cases. More research is required to find out which human epitopes turning into autoantigens in the COVID-19 associated Guillain-Barré syndrome patients.

iv. Cytokine surge:

Nervous system impairment instigated by SARS-CoV-2 infection might be facilitated by the immunological malfunctions. The capacity of SARS-CoV-2 to invade inside macrophages and glial cells of the nervous system is especially critical. As a neurotropic virus, SARS-CoV-2 can potentially stimulate glial cells to evoke a pro-inflammatory event called a cytokine storm. Cytokine storm phenotype arises in patients with COVID-19 because of their immune system hyper activation which may turn out to be pathological [8]. Enhanced circulating levels of pro inflammatory cytokines and chemokines, which plays a crucial role in a cytokine storm, reportedly upregulate in COVID-19 [9]. Experimental studies suggest in vitro primary culture of glial cells exude inflammatory modulators like Interleukin (IL)-6, IL-12 and Tumour Necrosis Factor (TNF)-α after coronavirus infection [5]. Immune activation which remains unabated with time likely to consequence chronic inflammation and damage of the nervous system.

Conclusion

SARS-CoV-2 becomes the predominant source of pneumonia worldwide affecting all ages, particularly becoming serious in senior-aged and immunocompromised persons. The exact cascade of viral dissemination and neurotropic capabilities in nervous system not meticulously characterized hitherto. Diagnostic toolbox of COVID-19 neurological complications requires to be reevaluated especially for healthcare professionals who are unaccustomed with its diverse neurological manifestations. Current diagnostics of SARS-CoV-2 are based on real-time PCR assay to detect the viral RNA and/or serological

screening of immunoglobulins against the ribovirus. Additionally, the analysis of cerebrospinal fluid (CSF) for viral RNA and antibodies has proven potential as a diagnostic tool for COVID-19 associated neurological conditions which also provides important insight about the neuro pathogenesis of SARS-CoV-2. In pandemic hotspots or regions of tourists' interest, risks of SARS-CoV-2 infection which policymakers may need to think with high concentration. The association with SARS-CoV-2 with neurological difficulties likely to be neglected in patients who manifested mild or no respiratory difficulties. Refining diagnostic measures are instrumental for the superior prophylaxis of the COVID-19-associated neurological disorders and to circumvent long-duration hospitalization of patients. More research efforts need to be invested in the development of an effective vaccine to control the virus and eradicate of the COVID-19 altogether in the long run. At present, we are unaware of how SARS-CoV-2 triggers certain neurological sequelae and requires an urgent focus. Further investigations can bring up innovative provisions to deal with neuro-complications of COVID-19.

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CHAPTER-6

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CHAPTER-6

IMPACTS OF THE COVID-19 PANDEMIC ON GLOBAL EDUCATION

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ABSTRACT

Coronavirus Infectious Disease 2019 (COVID-19) has been one of the most dreaded, recent pandemics impacting multifarious global sectors, including education. To control contagion, affected nations ordered academic campus closures and home-schooling plans. Schools, colleges, and universities underwent a paradigm shift adopting internet-based delivery of lectures, synchronously or asynchronously (recorded), with virtual labs. Medical education suffered significantly; suspending student internships in hospitals decreased practical exposure to clinical specialties, impairing students' performance, and competency. Teachers of traditional classes, with technical assistance, undertook rigorous trainings to restructure pedagogical and assessment strategies online using web/mobile applications and other digital tools. This could potentially compromise instructional quality, particularly of tertiary education or tactile/experiential subjects, in absence of hands-on resources and live interaction. Lack of network capacity or educational opportunities would discourage socioeconomically challenged, struggling, disabled, or remotely/rurally located students. COVID-19-led isolation impeded numerous students' attendance, learning and cognition and caused psychological stress or anxiety among students

Keywords

COVID-19
PANDEMIC
IMPACTS
GLOBAL
EDUCATION

and academic staff. However, such environmental risks threaten vulnerable populations, especially children, whose physical and mental health along with future development and productivity builds upon early, formative years. These long-term consequences can be avoided through institutional guidelines for effective distance education, ensuring that curricular contents set and meet expected course goals and learning objectives, without being too overwhelming. Innovative, information-based e-pedagogy can be enhanced by relevant videos or problem-oriented approaches to foster students' interest, awareness and application, not only to achieve academic success but to be disciplined and well-rounded people valuing the importance of balanced diet, exercise, sleep, personal hygiene, interpersonal relationships, and social responsibilities. A major contributor in preventing and managing infectious diseases is health literacy, supporting which can help combat pandemics. Design and implementation of policy solutions should aim at promoting health and education. These require cooperation of individuals, communities, health professionals, media, governments, as well as non-governmental organizations.

1. Introduction

Coronavirus Infectious Disease 2019 (COVID-19), also called as Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), has been one of the most devastating issues of worldwide concern in recent times. COVID-19 was declared as a pandemic by the World Health Organization (WHO) on March 11, 2020. It had multifaceted consequences, direct or indirect, on almost all global sectors, among which a significant one was education. This chapter reviews notable published reports of the key effects of COVID-19 on multiple levels and disciplines of education observed across various countries and regions of the world.

2. Impact on K-12, STEM Education, and Higher Education

At the outbreak of the pandemic, governments of affected nations, starting with China, ordered academic campus closures and home-schooling plans to control the contagion [1]. Educational institutions needed to undergo a paradigm shift, adopting internet-based delivery of lectures through synchronous (live) and/or asynchronous (recorded) sessions, complemented by virtual labs.

Teachers of traditional classes, with technical assistance, had to undertake rigorous trainings to restructure pedagogical and assessment strategies online using web/mobile applications and other digital tools. This could potentially compromise instructional quality, particularly of tertiary education or tactile/experiential subjects, in absence of hands-on resources and live interaction. Lack of network capacity or educational opportunities would discourage socioeconomically challenged, struggling, disabled, or remotely/rurally located students [2]. COVID-19-led isolation impeded numerous students' attendance, learning and cognition, and caused psychological stress or anxiety among students and academic staff [3, 4].

In response to COVID-19, online education was introduced to a private school in Georgia with 920 students among 47 virtual classrooms using Google Hangouts [5]. In order to evaluate the efficacy of the shift to distance education, daily assessment of the online learning process was conducted. Adjustments were made to class time and lesson schedules. Class time was reduced from 35 or 45 minutes of face-to-face teaching before the pandemic to 30 minutes of online engagement during the pandemic to minimize the duration of the kids' contact with computer. Adjustments to lesson schedule allowed students a larger break between classes, with fewer lessons covered each day. Performance of lower grade students on assignments were noted to be better compared to students in higher grades. This could likely be owing to the removal of official grading during the process of online education.

In Zambia, the government ordered closure of all schools, colleges and universities indefinitely from mid-March 2020 [6]. Three teachers at a public secondary school in Chipata District of Zambia's Eastern Province were interviewed; the Natural Sciences

Department Head, the Mathematics Department Head, and a science teacher. The data indicated perceptions that performance in the G.C.E (General Certificate of Examination) would likely decline in absence of student-teacher contact. According to the findings of this study, the pass percentage of secondary school students in the year's national examinations could drop because of the untimely school-shutdowns and abrupt disturbance in the academic calendar. Teachers and/or students would hesitate teaching/learning in any environment with possibilities of COVID-19 infection; school-organized preparations would be hampered, and slow learners would struggle even more. Children's commitment to academics would be disrupted due to lack of live guidance by a teacher and greater workload of assignments to make up lessons missed. Loss of access to course materials and facilities not accessible at home, especially in STEM subjects, would put students at a disadvantage.

On the other hand, digital learning in mathematics education could have been catapulted by COVID-19; for instance, at the University of Zambia (UNZA), learning proceeded via e-learning platforms such as Astria or Moodle, while Rusangu University (RU) harnessed tools like YouTube for online instruction [7]. Students communicated with each other and with instructors through Google mobile applications such as Google drive, Dropbox and Cloud, while being educated via Moodle Cloud and Edmodo. They also used social media sites like WhatsApp, Twitter, Facebook, Instagram, and Yahoo. Based on 102 questionnaires provided to students pursuing a Bachelor of Science Mathematics Education at Copperbelt University (CBU), it was found that most students accessed technology via smart phones and least via campus computers. Student surveys of diverse teaching styles demonstrated that YouTube videos provided useful online math tutorials, live Skype casting helped with online lectures and discussion, social media platforms like Facebook assisted students to share information and collaborate to solve math problems, and emails or text messages permitted students to communicate regarding books and notes.

3. Impact on Medical and Healthcare Education

COVID-19 affected medical education significantly. Suspension of student internships in hospitals limited practical exposure to clinical specialties, impairing

performance and competency [8]. In the United Kingdom, all observership and medical students were suspended from attendance at clinical specialties, which caused degradation of their performance on exams. Furthermore, final year medical students faced challenges at taking their final assessments. Several measures have been adopted to counter the adverse effects of COVID-19 on medical education, such as online problem-based learning approaches. Formal medical teaching in hospitals was cancelled and exams were delayed in Chinese medical schools. In Canada, clinical clerkships and electives were paused for six weeks.

As a result of COVID-19, Pre-clerkship learning environment saw social distancing which decreased students' experience with learning studios, lecture halls, or small-group rooms [9]. The Pre-clerkship curricula were converted into online modes covering content in basic as well as health system and behavioral sciences. With small-group formats being transformed into virtual instruction and online exams, clinical skills often did not develop efficiently. Candidates were isolated from each other and from the instructor. Clerkship learning environment, too, was affected as the value of education diminished with surgical procedures, combined with telehealth, following cancellation of routine appointments, and frequent lack of personal protective equipment (PPE). Students were not involved in suspected or confirmed COVID-19 cases and were removed from clerkship environment. In March 2020, the Association of American Medical Colleges (AAMC) directed medical schools to halt clinical rotations for medical students, and schools were permitted to take their own decisions based on specific circumstances. Challenges in availing emergency medicine away rotations and standardized evaluation letters on account of this pandemic were addressed recently [10].

Neurosurgery residents' training and education were impacted as well [11]. Social distancing demanded cancellations of educational conferences and other large gatherings. Rotations were cancelled to avoid exposure and preserve personal protective equipment (PPE). Nonessential surgery volume was cut short. Teaching hospitals prohibited in-person didactics. To protect residents but not compromise the knowledge and experience, medical organizations recommended suspending contact between medical students and patients, requiring students managing suspected or COVID-19 cases to have

adequate supervision by faculty, postponing primary as well as oral examinations, and not punishing trainees for situations they had no control over. Online education and only emergency neurological surgeries were implemented. Likewise, a general surgery residency program in the Division of General Surgery at the University of Washington Department of Surgery was restructured on emergency during the pandemic [12].

Urology residency training had to be adapted during COVID-19 [13]. This included access to PPE and COVID-19 testing, precautions for residents, reformation of hospital protocols and COVID-19-related safety measures, and restructuring temporary residency (for e.g., rotating teams to take care of urological services). Clinical training in areas other than urology (for e.g., in emergency room or intensive care unit) was encouraged, coupled with telemedicine and virtual surgical simulation. In Italy, urologists had to incorporate management of COVID-19 patients as part of their practice, despite risk of the infection in some procedures like laparoscopy [14]. Response of radiology residencies amid COVID-19 dealt with clinical coverage and work redistribution centering around physical distancing, protection of patients and staff, pedagogical alterations, resident requirements, disaster preparedness training, etc. [15]. In the UK, simulation and technology-enhanced learning were proposed to negotiate and adapt to the challenges in healthcare education [16]. These included 360° field-of-view cameras to augment virtual settings, video case studies, etc. as well as embedded videos, links to videos on sharing sites, documents, websites, online learning courses, podcasts, webinars, and links to other online resources.

4. Impact on Dental Education

COVID-19 impacted dental education as well in the United States [17]. All 67 dental schools in the US had to submit a report to the Commission on Dental Accreditation (CODA) on curricular changes, distance learning, and alternative modes of assessment to ensure safety while maintaining continuity in the education. Various challenges encompassed transition to remote learning, social distancing in preclinical simulation lab exercises, inability to use mannequins online, lack of portability of virtual reality systems, need for programs to determine students' competency without exams, and timely graduation. Barring emergencies, clinical activities were suspended at most

dental schools. European dental academic institutions resorted to non-clinical teaching with live videos, pedagogical software, online meetings, links to other virtual tools, and social media groups.

5. Impact on Pharmacy Education

Across the US, students of pharmacy took part as frontline workers in combating COVID-19 [18], ranging from 38 fourth year pharmacy students in the Cedarville University School of Pharmacy to one student providing medications for Cleveland Clinic employees and patients, or assisting in curbside pickup at pharmacies.

6. Discussion

COVID-19 necessitated prompt and drastic transition of most face-to-face classes to online education. Innovative, information-based e-pedagogy can be enhanced by relevant videos or problem-oriented approaches to raise students' interest and application, not only to achieve academic success but to be disciplined and well-rounded people valuing the importance of balanced diet, exercise, sleep, personal hygiene, interpersonal relationships, and social/environmental responsibilities. Food safety and awareness about it is crucial [19].

Interestingly, it had recently been proposed that socially and scientifically relevant, cost-effective mobile applications with real-world applications could be leveraged as a virtual strategy to increase teenagers' interest in STEM disciplines of education [20, 21]. A creative way to stimulate engagement and learning among students of healthcare education could be designing and implementing virtual classrooms [22]. Subject-specific leadership forums, like a recent one [23], aimed at driving student engagement and achievement can enable students to learn and share ideas on media and technology use for mastering digitized course content during such pandemics in particular. These could complement novel assessment strategies postulated with established learning outcomes for research-based science laboratory courses [24-26].

Environmental risks amidst a pandemic threaten vulnerable populations, especially children, whose physical and mental health along future development and productivity builds upon early, formative years [27]. The long-term consequences can be avoided by institutional guidelines for effective with distance education, ensuring that curricular

contents set and meet expected course goals and learning objectives, without being too overwhelming.

Suggested risk management practices at universities include network teaching which can be developed for courses that are knowledge-based, tapping into the advantages of information technology [2]. Besides, curricula for practical and operational courses, or those involving research and discussion, and courses on physical education, could be appropriately modified once COVID-19 ends. A major contributor in preventing and managing infectious diseases is health literacy, supporting which can help combat pandemics [28]. Nonetheless, policy solutions need cooperation of all stakeholders – individuals, communities, health professionals, media, governments, as well as non-governmental organizations [29]. Effective implementation of the solutions must aim at promoting health and education around the world.

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CHAPTER-7
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CHAPTER-7

THE 10 INTERESTING FACTS ABOUT COVID-19

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ABSTRACT

The present chapter briefs about the 10 facts of COVID-19 which has generated tremendous impact in recent year of 2020. The report of first outbreak of COVID-19 was reported in late 2019 since then, the word COVID-19 has been the talk of the year and one of the most searchable subject on global scale. There has been severe implications both health and economic wise. Based on these important fact check, the chapter list out the 10 possible facts of COVID-19.

1. Anosmia (loss of smell) is the main Symptom of COVID-19

The most commonly reported symptom of COVID-19 incorporate fever, cough and windedness. In any case, as the ailment has spread the world over, social insurance suppliers have seen a couple of irregular manifestations, including loss of smell (anosmia) and diminished feeling of taste (ageusia). In South Korea, 30% of individuals who tried positive for the infection said that loss of smell was their first significant side effect

(Husain, 2020). In Germany, more than 2 out of 3 affirmed cases included loss of smell and taste.

2. SARS-CoV-2 binds tightly to human cells

In 2003, SARS, or extreme intense respiratory disorder, spread from Asia all through the world, nauseating in excess of 8,000 individuals and killing more than 700 over a six-month time span. The infection that caused (SARS-CoV) is like the one that causes COVID-19 both are sorts of corona viruses—however scientists have as of late found a significant distinction that may clarify why the new corona virus is so difficult to stop: SARS-CoV-2 (the infection that causes COVID-19) ties 10 to multiple times more firmly to human cells than SARS-CoV (the infection answerable for SARS).

3. Corona virus can make babies truly sick and Ill

Contrasted with grown-ups, kids show up substantially less prone to become ill on the off chance that they contract the novel corona virus [1]. Nonetheless, a report from China proposes that the extremely youthful might be more helpless against genuine ailment than more established youngsters. Scientists surveyed the records of 2,143 Chinese kids and found that almost 11% of wiped out babies were truly or basically not well, contrasted with 7% of kids ages 1 to 5 years, 4% of kids ages 6 to 15 and 3% of young people matured 16 and more established. In the United States, from February 12 to April 2, fewer than 2% of cases were in kids more youthful than 18 years. Of these pediatric cases, 15% were in kids under a year.

4. The COVID-19 infections can live on surfaces for a considerable length of time

COVID-19 is spread basically through respiratory beads. At the point when a contaminated individual wheezes or hacks, the infection can make a trip starting with one individual then onto the next, either legitimately (which is the reason the CDC suggests keeping up in any event a 6-foot good ways from others) or by means of a moderate surface. Scientists have discovered that the infection can satisfy 24 hours on cardboard and 2 to 3 days on plastic and tempered steel [2].

5. Individuals who don't have symptoms can spread the infection

Nearly 33% of 565 Japanese residents who were vacated from Wuhan, China in February who were positive for corona virus disease never displayed COVID-19 side effects; and an examination out of China reports the greater part of contaminated kids had no manifestations or just gentle indications. That is uplifting news for the influenced people; however terrible news for general wellbeing since individuals who are tainted yet don't have any indications can unexpectedly spread the infection to other people. General wellbeing authorities are asking all individuals as far as possible social contact to forestall the spread of ailment.

6. Individuals with type A blood might be more defenseless to contamination

A Chinese investigation of 2,173 people who were hospitalized with COVID-19 found that the extent of wiped out individuals with type A blood was fundamentally more noteworthy than analysts would expect dependent on the level of individuals with type A blood in everyone. The investigation likewise found that there were less debilitated individuals with type O blood than would be normal. Genomic investigations of patient from Italy and Spain have bolstered these discoveries, demonstrating a higher danger of creating COVID-19 respiratory disappointment in patients with type A blood.

7. Individuals have been contaminated already and do not have any symptom

A few people never create manifestations. What's more, a few people who had what they thought were an "awful cold" or seasonal influenza may have really had COVID-19. Researchers created tests that can recognize SARS-CoV-2 antibodies in the blood, which is proof of past contamination with the infection. Such tests may help us in the long run comprehend the genuine degree of this pandemic. Contact your primary care physician or general wellbeing office about neutralizer testing in the event that you think you had the contamination.

8. A few people with COVID-19 have stomach related side effects

High, fever and sore throat are the most widely recognized manifestations of novel corona virus disease, however numerous individuals likewise experience stomach related side effects, including absence of craving, loose bowels, spewing and stomach torment [3].

As indicated by study distributed in The American Journal of Gastroenterology, 48.5% of 204 individuals admitted to the emergency clinic with COVID-19 had stomach related side effects. A little rate (7 individuals) just had stomach related side effects; these people didn't have a hack, fever or windedness.

9. Reinfection might be possible

If the individual gets COVID-19, does he gets reinfected? Reinfection is hypothetically conceivable. Ten to 30% of our normal colds are brought about by four distinctive corona viruses, and we as a whole realize that having a virus doesn't shield you from getting another virus.

10. A worldwide preliminary is looking for successful corona virus treatment

On March 20, 2020, the World Health Organization (WHO) declared a huge worldwide preliminary called SOLIDARITY. Its motivation: to discover successful treatment for COVID-19. SOLIDARITY is inspecting four promising medication regimens: 1) Remdesivir—a trial antiviral medicine; 2) Chloroquine and hydroxychloroquine—jungle fever prescriptions; 3) Lopinavir and ritonavir—two HIV sedates that might be helpful in blend; and 4) Interferon beta-1a, a drug that works in the safe framework. WHO will gather information from patients everywhere throughout the world and it is based on patient medical history [2-4].

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CHAPTER-8

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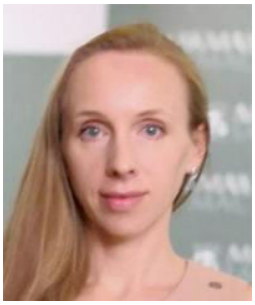

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CHAPTER-8

ROLE OF WHO IN CORONA VIRUS PREVENTION AND MANAGEMENT

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ABSTRACT

The present chapter examines the role of WHO in combating the pandemic outbreak, COVID-19. The chapter briefs up the important measures WHO has implemented and universal guidelines to suppress the spread of COVID-19 infection. The importance of WHO along with other governing agencies are important during the crisis time of pandemic situation and hence keeping this as consideration the present chapter highlights the role of WHO.

1. Introduction

The Coronavirus causes COVID-19 also called as acute respiratory disease-2 (SARS-CoV-2). It was started to spread from Wuhan, China, where critical circumstances have occurred. The World Health Organization (WHO) has confirmed that it was an pandemic outbreak (WHO, 2020). The pandemic outbreak was termed as COVID-19. By April 2020, the virus had spread to almost all parts of the world with random reports emerging and confirming the positive reports of COVID-19 [1-5]. The chapter examines the roles of WHO in order to combat the on going rapid spread. To control and succeed over the COVID-19 has been challenging for WHO as it forms to be one of the serious

outbreak of recent times and the world medical fraternity fails to develop first line of medication to the infected patients. The WHO is constantly working with other governing bodies to come up with the best suited and possible plans to suppress the spread based on the ground realities which may vary from country to country based on myriad factors like medical facilities, research and development, funds etc. Inspite of all these the WHO has come up with universal management protocols which are followed by all the countries. Some of the notable measures are Lock down, social distancing, wearing mask, use of sanitizers etc.

2. Significance of the WHO in the prevention of disease:

The experts and governments professionals are trying to implement ways to prevent the spread of COVID-19. According to WHO, the 6th pandemic world has witnessed and it is considered to be one of the severe pandemic of all times owing to the impact on all the sectors of lives. The World health organization is leading from the front to contain the present situation. The WHO has implemented various guidelines for citizens. The WHO team continues to seek the fastest growing conditions for COVID-19 in different countries across the globe. The health care professionals are reliable experts in the pharmaceutical industry and are at the forefront of the progress and process cycle [5-9]. As doctors in are considered to be the frontline warriors who are serving their respective countries and assuring the medication to the infected personal. At the same time, most of the business activities are paralyzed and are advised to work from home and virtual processes are implemented to avoid the large gathering. The WHO directors are aligned with basic guidelines for doctors and hospitals across the globe.

3. Role Of world health organization on COVID-19 management:

Although the primary objective should be to reduce the spread, it is also essential for WHO to mitigate the impact of the pandemic. The situation of COVID-19 comes with the shutting of the worlds major activities which eventually affects the global economy and fund flow. The developed nations have already raised concerned about the damage due to COVID-19 [9]. In the case of medical facilities, there is shortage of medical staff and equipments as there is rapid inflow of patients within shorter time. As of no, there has

been no proper drug which can act efficiently and control the spread of virus but there has been large number of scientific studies being conducted to prevent the spread and controlling the pandemic.

4. WHO guidelines to prevent and treat COVID-19:

- Maintain social distancing
- Wear masks
- Testing for infected patients
- Use of disinfectants
- Sealing the international tourist exchange
- Sealing the wild trading
- Quarantine measures

5. Practice to be followed in hospital:

- Explain the staffs about the importance and practice of controlling and testing the disease and their spread.
- Maintaining the patient records
- Examine their pre-existing health implications
- Sanitizing the hospitals frequently

6. Patients to be asked for the following information:

- Travel history on the past 14 days
- Respiratory disease reactions or symptoms, such as fever, wheezing, and sore throat

7. Guidelines for inpatients (health facilities):

- It is becoming more and more relevant to allow someone to go out with each patient.
- Reduce outpatient visits
- Any staff with different symptoms of illness is asked to leave.
- Staffs, patients and all persons should manage hand sanitization and use personal protective equipment, such as a mask.

- Zones must provide appropriate guidelines for cleaning and changing health structures.
- We need to adopt different, manual and personalized thought frames.
- Recognize workers as the primary transfer objective for the organization of employee pools.

8. Hospital Patient Management and Staff Guidelines:

- Hospital staff should receive regular information about this disease.
- If people are visiting a health centre, PGD or nursing home, people should contact an expert immediately if a person thinks they have COVID-19 or similar qualities.
- If any of the nurses is sure to have side effects on COVID-19, they should contact a specialist immediately.
- This examination requires the approval and prompt division of other patients who cannot be excluded from the unwanted entry of all persons and medical staff.
- Therefore, hospital staff should care for anyone who is admitted.
- Staff should regularly check with patients, specialists or regular all persons for any signs.
- People with multiple respiratory illnesses in hospitals should contact the nearest health service for further advice [9].
- Hospital staff must quickly adhere to the understanding of disease control of all aspects of the hospital.
- Reusable medical products should be disinfected or cleaned to quality before reusing other patients.
- Periodic checking of temperature
- Consider the hand sanitization, the personal well-being of patients and perceived staff.
- Recognize staff as the primary point of contact for family members in the registration area.
- Hospitals need to control the increased appearance of persons in all situations [3].
- Security is everything, and all persons should be the hospital's first concern.

- The visitor must be 18 -50 years old.
- All persons are screened before entering the patient area.
- All persons should not be allowed to enter IPD areas if the suspect or patient is suspected of having COVID-19.
- All people's access to counseling rooms/places should have a solid understanding of disease control.
- For the rest, visits by young people must be kept away from them and systematically led by adults when they have no chance of going to hospitals/services.
- All persons should do hand sanitization [8]. When they appear early, all persons should wash their hands [5] with disinfectant and water [7] or use an alcohol-based hand sanitizer [5] before entering [4] and leaving the patient's room [9].
- Transport vehicles and ambulances must have strict disease control rules.
- Ambulances, cribs, seats should be disinfected.
- Nasal sequence tests must be performed correctly.
- Consumables should not be reused.
- Hand sanitization and personal well-being procedures must be followed at the pharmacy of medical or crisis centers.

9. Consultation system

In an emergency like the Corona virus, the government and WHO uses technology to visualize the country's overall success. In such emergencies, WHO must ensure that everyone's needs are taken into account [4]. Although time is an essential factor in the cause of the disease, a small step should be taken in these situations. Therefore, the national government must quickly acquire critical perspectives in these situations. In this spirit, the central government has made sufficient efforts to minimize the time between risk separation and ensuring the use of the strategy. In such situations, it is practically unthinkable that there is a way to manage another problem management for all registered work environments since association structures can eventually deteriorate [9-15]. Therefore, when the most critical government power is united, it is difficult to find

essential options, for example, portability and subtraction controls. Biotechnology has been the subject of many debates because it focuses on the citizens associated with documents, whether or not they require an immediate risk.

10. Resolving the problems:

There are undoubtedly two significant problems for WHO during the COVID-19 pandemic: the growing need to allocate resources and support worldwide. It is more challenging than allocating a large number of goods and services. It should be noted that WHO decide that a large part of their income comes from large private companies. These highlights are complicated today. Large amounts of money are exchanged by large companies, different effects, products and manufacturers. In particular, the government and world organizations should assist private sector businesses by expanding premium options and liquidity, along with supporting medical considerations [8]. Also, citizens need financial assistance. In this way, the issue that WHO think of their citizens is to ensure that basic needs are met. Whatever their plan, it is necessary to mitigate the impact of the financial crash associated with trying to help a less profitable business. All this, despite the downs of the government, among others, fluctuates gradually in the distribution of assets. Cooperation is generally required during COVID-19 illnesses as WHO cannot control the spread of the disorder without assistance. However, this is challenging because all countries generally offer a guarantee to their citizens. Given the scale of the pandemic, countries need strengths to find harmony between their economies and their citizens. Specifically, the coordinated effort provides positive physical evidence, but again, the sequence of secure communication statements needs to be verified. It requires direct correspondence between governments regarding transfer issues, the size of confirmed cases and certain other information specified in the selection. In this context, WHO should prevent these pandemics spreads; it is evident that the various countries interested in the test need considerable financial assistance to accelerate this practice. The WHO should exchange advanced training as it is essential to import and use alerts, medical supplies and other essential equipment [4]. Accepting the world is important issues that all

governments and WHO should consider. Further, developing novel devices or technologies to combat COVID-19, infection is of great concern in recent times [16].

Conclusion

The COVID-19 pandemic is driving WHO around the world because it poses the most significant challenges. Keep in mind that at this point, WHO must continue to protect the necessary capacity to insure citizens. Either way, as in the case of a growing financial emergency, qualified open health cares about issues of open aid. With this choice, WHO now have two main objectives to control the spread of the disease and ensure the ultimate recovery of the economy. WHO are likely to get confused with the heap of problems associated with the pandemic. Unlike succinct support systems, the governments must cooperate with WHO to improve various types of COVID-19 guidelines.

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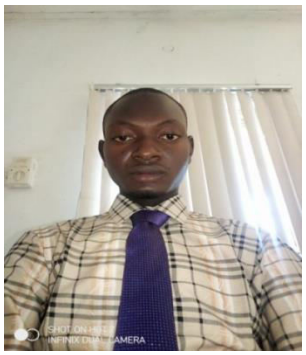
CHAPTER-9

AUTHORS' INFORMATION



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CHAPTER-9

IMMUNE RESPONSE TO COVID-19 INFECTION

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ABSTRACT

Corona viruses are diverse group of viruses belonging to the order Nidovirales and family Coronaviridae. In 2002, there was an outbreak of a virus with pneumonia-like symptoms. The virus that causes that illness is Systemic Acute Respiratory Syndrome Corona virus (SARS-Cov), which belongs to the genus β-Corona virus and was believed to have originated from bats. Later on in 2003, the outbreak of Middle East Respiratory Syndrome Corona virus (MERS-Cov) had been experienced. MERS-Cov originated from camels. In December, 2019, there was an outbreak of Systemic Acute Respiratory Syndrome Corona virus type-2 (SARS-Cov-2) in Wuhan province, China. The virus causes a disease known as Corona Virus Disease-19 (COVID-19). COVID-19 has an incubation period of 2-14 days and the only factor that delays the onset of the symptoms is the immune system as there is no approved vaccine or drug for the virus. Two kinds of immune responses have been exploited in COVID-19 infection: Innate (which include Cilia, Action of Phagocytic and Natural Killer cells, Interferon, Complement proteins, Cytokines) as well as

Keywords

CORONAVIRUS
IMMUNE SYSTEM
VACCINE
INNATE-IMMUNE
RESPONSE

Adaptive (which include Action of T-lymphocytes and Humoral Immune Response). Immunoglobulin of M class (IgM) was detected in the serum of COVID-19 patients barely 3 days after exposure; whereas immunoglobulin of G class (IgG) was not detected until 6 days after exposure to the virus. This chapter will explain the host defensive mechanisms involved in the pathogenesis of COVID-19 infection.

1. Introduction

Immunology is the study of the immune system and the term was derived from two Latin words: *Immunos* (meaning safe) and *Logos* (which means study). In broad terms, Immunology is the study of defensive mechanisms to foreign invaders [1]. The immune system consists of proteins, cells and organs that are concerned with defense of the individual, primarily against the threat of disease caused by infectious organisms. An infectious organism that causes disease is called a pathogen and the individual (person or animal) that is infected by a pathogen is called the host [2]. The word *immunity* refers to the ability of a living organism to resist infection. This happens due to various complex processes occurring in the body whenever the immune system is activated by infectious microbes or other foreign (non-self) substances [1]. *Corona viruses* are diverse group of viruses belonging to the order *Nidovirales* and family *Coronaviridae* [3].

In 2002, there was an outbreak of a virus with pneumonia-like symptoms. The virus that causes that illness is Systemic Acute Respiratory Syndrome Corona virus (SARS-Cov), which belongs to the genus β-Corona virus and was believed to have originated from bats. Later on in 2003, the outbreak of Middle East Respiratory Syndrome Corona virus (MERS-Cov) had been experienced. MERS-Cov originated from camels. In December, 2019, there was an outbreak of Systemic Acute Respiratory Syndrome Corona virus type-2 (SARS-Cov-2) in Wuhan province, China. The virus causes a disease known as Corona Virus Disease-19 (COVID-19) [4]. The genome of COVID-19 virus is single-stranded RNA (positive sense) with approximately 30, 000 base pairs. It encodes five structural proteins; these are the

Spike (S), Membrane (M), Envelope (E) glycoproteins, Hemagglutinin Esterase (HE) and Nucleocapsid (N) protein. All envelope proteins and N proteins are present in all virions but HE is only present in some beta coronaviruses [5]. For effective understanding of the immune response to this infection, it is important to review the strategy this virus uses to replicate.

2. Replication and Pathogenesis of COVID-19 Virus

The replication of coronaviruses occurs in host cell cytoplasm. The viruses primarily bind to the receptor which is Angiotensin Converting Enzyme -2 (ACE-2) on the surface of alveolar cells via the spike (S) protein. When S protein is bound to the receptor, a conformational structure occurs in the structure and the process of entry into the virus cell begins [6, 7]. This process with endocytosis is dependant of P^H[8]. After entering the cytoplasm, the virus particle releases the RNA genome. This genome is a single-stranded, non-segmented RNA, which is approximately 26-32 kb [9, 10]. The genome consists of seven genes. It is organized into 5' non-structural protein coding regions comprising the replicase genes (gene 1), which are two-thirds (2/3) of the genome, and 3' structural and nonessential accessory protein coding regions comprising gene 2-7 [11, 12]. The replicase gene 1 products are encoded two very large open reading frames ORF1a and 1b, which are translated into two large polypeptides pp1a and pp1b, which are synthesized directly from the 5' two-thirds of the genomic RNA of CoV. After synthesis of these proteins, they are then cleaved by viral proteases in to sixteen (16) units (nsp1-nsp16) [13, 14].

These 16 proteins form Double-Membrane Vesicles (DMV). At the same time, this DMV is virus Replication and Transcription Complex (RTC) [15]. These nsp proteins, especially non-structural protein3 (nsp3), have an important role in the virion structure, the replication and transcription of CoV [16]. Genes 2 to 7 are translated from sub genomic mRNA. Sub genomics RNAs encode the major viral Structural proteins: Spike protein (S), Envelope protein (E), Membrane protein (M), Nucleocapsid protein (N), and the accessory proteins, which are essential for virus-cell receptor binding. The newly synthesized structural proteins are released into the endoplasmic reticulum. All of these proteins, along with the N protein, are linked to the viral genomic RNA and localized in the ERGIC region [15, 17]. Although, N protein is

known to be necessary for coronavirus replication, the specific role that this protein plays in this process remains unknown. But, many studies suggest that N protein when interacted with nsp3 plays a critical role in the viral replication in early infection [3].

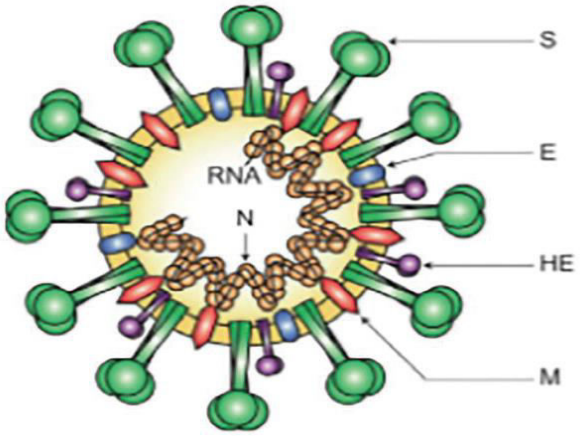

Figure1.1 Structure of Coronavirus Showing Structural Proteins**: Source:** (Susan and Julian, 2011)

3. TYPES OF IMMUNE RESPONSE TO COVID-19 INFECTION

Two types of immune response have been identified in COVID-19 infection. These are:

1. ***Innate (non specific) immune response***: The innate (non specific) immune response provides a first line of defense that can often prevent infectious agents from gaining access into the body. These defenses are described as nonspecific because they do not target any specific pathogen; rather, they defend against a wide range of potential pathogens in a similar way. They are called innate because they are built-in mechanisms of the human organism. Broadly speaking, nonspecific (innate) defenses provide an immediate (or very rapid) response against potential pathogens. Furthermore, this type of response does not have immunological memory [18].

The mechanisms involved in innate response include:

- Cilia
- Action of immune cells (Phagocytic and Natural Killer cells)
- Interferons
- Complement proteins

- Interleukins
- Tumor Necrosis Factor-α

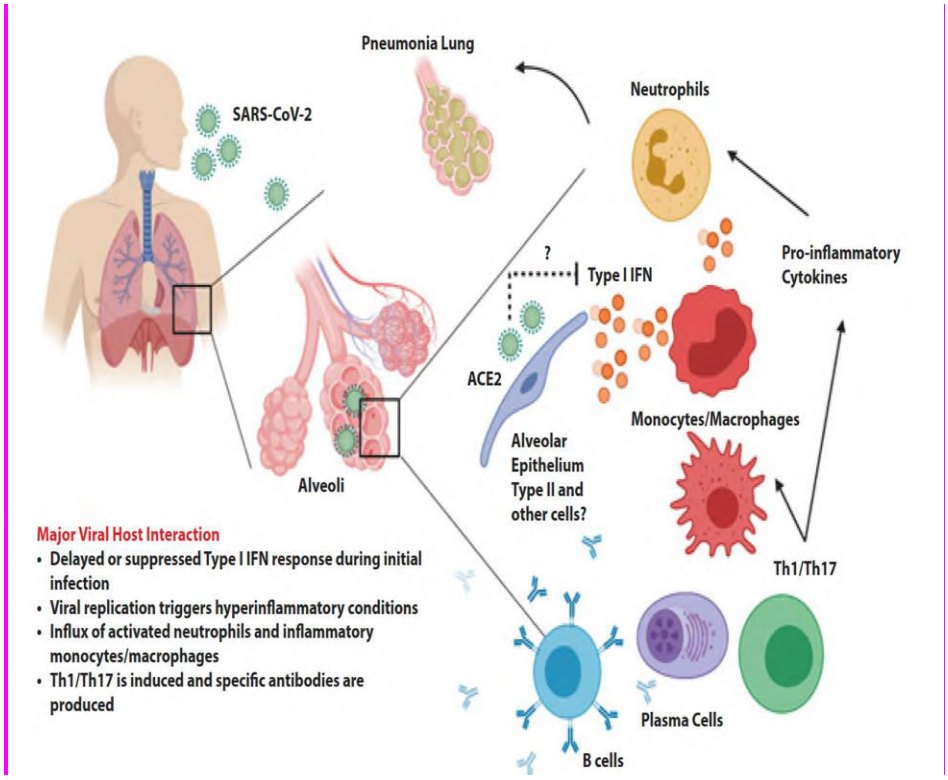

Figure 2.1: Pathogenesis of COVID-19 (Prompetchara *et al.,* 2020)

Cilia

COVID-19 virus enters the body through mouth or nose via infected droplets and moves through trachea (wind pipe) into the lungs, then alveoli [19]. The most important anatomical structure that could flush the virus out of the body is the *cilia*. Cilia are a hair-like structures found on epithelial cells in many parts of the body (such as respiratory and digestive tracts).

Mechanical actions of cilia serve to flush mucus (along with trapped or dead microbes) out of the body or away from potential sites of infection. In the respiratory system, inhalation can bring microbes, dust, mold spores, and other small air borne debris into the lungs. This debris becomes trapped in the mucus lining the respiratory tract, a layer known as the muco-ciliary blanket. The epithelial cells lining the upper parts of the respiratory tract are called ciliated epithelial cells because they have hair

like appendages known as cilia. Movement of the cilia removes mucus away from the lungs. The expelled mucus is then swallowed and destroyed in the stomach, coughed up, or sneezed out.

This system of removal is often called the *mucociliary escalator*. The mucociliary escalator pushes mucus away from the lungs, along with any debris or microorganisms that may be trapped in the sticky mucus, and the mucus moves up to the esophagus where it can be removed by swallowing. The mucociliary escalator is such an effective barrier to microbes that the lungs, the lowermost (and most sensitive) portion of the respiratory tract, were considered to be a sterile environment in healthy individuals [18].

Action of Immune Cells

The cells responsible for both specific and nonspecific immune response are the *leukocytes* (white blood cells) [20]. The major leukocytes that participate in COVID-19 response are the *Macrophages* and *Natural Killer* (NK)cells. However, it is important to have a quick glance at the *cells of the immune system*. Cells involved in immune response can be categorized in to *Granulocytes and Agranulocytes*.

Granulocytes

Granulocytes have visible sand-like structures (granules) when viewed under light microscope after they are stained with acidic or basic dyes. The neutrophils, also called polymorphonuclear neutrophils (PMNs), have a nucleus with three to five lobes and small, numerous, lilac-coloured granules. Each lobe of the nucleus is connected by a thin strand of material to the other lobes. The eosinophils have fewer lobes in the nucleus (typically 2–3) and larger granules that stain reddish-orange. The basophils have a two-lobed nucleus and large granules that stain dark blue or purple [18].

Neutrophils:

Stain readily at a neutral pH, have a nucleus with three to five lobes connected by slender threads of chromatin, and contain fine primary and secondary inconspicuous granules. Neutrophils have receptors for antibodies and complement proteins and are highly phagocytic cells. However, neutrophils do not reside in healthy tissue but rapidly migrate to the site of tissue damage and infection where they are the principal phagocytic and microbicidal cells. The lytic enzymes and bactericidal substances in

neutrophils are contained within large primary and smaller secondary granules. Primary granules contain peroxidase, lysozyme, and various hydrolytic enzymes, whereas secondary granules have collagenase, lactoferrin, and lysozyme. Both of these granules help accomplish intracellular digestion.

Neutrophils also use oxygen-dependent and oxygen-independent pathways that generate antimicrobial substances and defensins to kill ingested microorganisms [20]. As neutrophils fight an infection, a visible accumulation of leukocytes, cellular debris, and bacteria at the site of infection can be observed. This build-up is called pus. The presence of pus is a sign that the immune defences have been activated against an infection [18].

Eosinophils:

Eosinophils are granulocytes that protect against protozoa and helminths; they also play a role in allergic reactions. The granules of eosinophils, which readily absorb the acidic reddish dye eosin, contain histamine, degradative enzymes, and a compound known as major basic protein (MBP). MBP binds to the surface carbohydrates of parasites, and this binding is associated with disruption of the cell membrane and membrane permeability [18].

Basophils:

Basophils have cytoplasmic granules of varied size and are named for their granules' ability to absorb the basic dye methylene blue. Their stimulation and degranulation can result from multiple triggering events. Activated complement fragments C3a and C5a, produced in the activation cascades of complement proteins, act as anaphylatoxins by inducing degranulation of basophils and inflammatory responses. This cell type is important in allergic reactions and other responses that involve inflammation. One of the most abundant components of basophil granules is histamine, which is released along with other chemical factors when the basophil is stimulated. These chemicals can be chemotactic and can help to open the gaps between cells in the blood vessels. Other mechanisms for basophil triggering require the assistance of antibodies [18].

Mast Cells:

Hematopoiesis also gives rise to mast cells, which appear to be derived from the same common myeloid progenitor cell as neutrophils, eosinophils, and basophils. Functionally, mast cells are very similar to basophils, containing many of the same components in their granules (e.g., histamine) and playing a similar role in allergic responses and other inflammatory reactions. However, unlike basophils, mast cells leave the circulating blood and are most frequently found residing in tissues. They are often associated with blood vessels and nerves or found close to surfaces that interface with the external environment, such as the skin and mucous membranes in various regions of the body [18].

Dendritic Cells:

These cells can recognize specific pathogen-associated molecular patterns on microorganisms and play an important role in nonspecific resistance. They can differentiate between potentially harmful microorganisms and "self" molecules. After the pathogen is recognized, it binds to the dendritic cell's pattern recognition receptors and then is phagocytosed. These cells are also stimulated by endogenous activators such as interferon-α, heat-shock proteins, and tumour necrosis factor that are released in response to microbial infection. After stimulation, dendritic cells migrate to the bloodstream or lymphatic system and present antigens to T cells. Thus dendritic cells also play an important role in the specific immune response [20].

Agranulocytes:

As their name suggests, agranulocytes lack visible granules in the cytoplasm. Agranulocytes can be categorized as lymphocytes or monocytes. Among the lymphocytes are natural killer (NK) cells, which play an important role in nonspecific innate immune defences. Lymphocytes also include the B cells and T cells. The monocytes differentiate into macrophages which are collectively referred to as the mononuclear phagocytes [18].

Natural Killer (NK) Cells:

These are large mononuclear lymphocytes that kill viral infected cells or tumour cells by direct cell-cell contact. These cells are non specific (fights all cells infected by any of the numerous viral species in a similar manner) and have no

memory. NK cells have specific receptors that bind to the infected cells. Tumour cells and cells infected with viruses display abnormal proteins on their surfaces. When NK cells are in circulation, they can recognise such cells displaying abnormal surface proteins and therefore bind to them. The NK cell then injects its granules which eventually kills the infected cell by cytotoxicity or causes the cell to kill itself (apoptosis) [1].

Monocytes:

The largest of the white blood cells, monocytes have a nucleus that lacks lobes and they also lack granules in the cytoplasm. Nevertheless, they are effective phagocytes, engulfing pathogens and apoptotic cells to help fight infection .When monocytes leave the bloodstream and enter a specific body tissue, they differentiate into tissue-specific phagocytes called macrophages and dendritic cells. They are particularly important residents of lymphoid tissue, as well as non lymphoid sites and organs. Macrophages and dendritic cells can reside in body tissues for significant lengths of time. Macrophages in specific body tissues develop characteristics suited to the particular tissue. Not only do they provide immune protection for the tissue in which they reside but they also support normal function of their neighbouring tissue cells through the production of cytokines [18].

4. Macrophages engulf and destroy particulate pathogens by a process called phagocytosis.

Phagocytosis can be described in the following steps:

1. Attachment of the phagocyte to the particle being phagocytosed, which may be COVID-19 viral particle, a dead or damaged host cell or a piece of tissue. Attachment is mediated when Pattern Recognition Receptors (PRRs) found on the surface of the phagocytic cells bind to some structures on the pathogens. Such structures on the pathogen recognised by phagocytic cells are called Pathogen Molecular Associated Patterns (PAMPs) [2]. In case of COVID-19, the PAMP is the spike protein.
2. Ingestion. By extending membrane protrusions called pseudopodia around the particle, the phagocyte is able to engulf the particle, which is taken into the cell in a phagocytic vacuole [2].

3. Killing. If the ingested particle is a live cell of a pathogen (e.g. a bacterium) the phagocyte will normally kill the cell by one of the number of mechanisms [2].
4. Degradation. The phagocytosed particle, whether it is a dead cell or a piece of tissue, is broken down by enzymes in the phagocytic vacuole [2].

Lymphocytes: Are the major cells of the specific immune system. Lymphocytes can be divided into two populations: T cells and B cells. B cells or B lymphocytes reach maturity within the bone marrow, circulate in the blood, and also settle in various lymphoid organs.

T cells or T lymphocytes mature in the thymus gland; they can remain in the thymus, circulate in the blood, or reside in lymphoid organs such as the lymph nodes and spleen [20]. B lymphocytes differentiate in to memory cells and plasma cells (which in turn produce antibodies) that play key role in humoral immune response.

T lymphocytes are responsible for tissue or organ rejection during transplant. There are 3 types of T lymphocytes: T helper (Th) lymphocytes, Cytotoxic T-lymphocytes (Tc) and Supressor T-lymphocytes (Ts).

Interferons

Interferons are a diverse group of immune signaling molecules and are especially important in our defence against viruses. Type I interferons (interferon-$\alpha$and interferon-β) are produced and released by cells infected with virus. These interferons stimulate nearby cells to stop production of mRNA, destroy RNA already produced, and reduce protein synthesis. These cellular changes inhibit viral replication and production of mature virus, slowing the spread of the virus. Type I interferons also stimulate various immune cells involved in viral clearance to more aggressively attack virus-infected cells. Type II interferon (interferon-γ) is an important activator of immune cells [18]. Production of IFN-α and IFN-β is stimulated by COVID-19 single-stranded RNA molecule. Effective innate immune response against viral infection relies heavily on the interferon (IFN) type I responses and its downstream cascade that culminates in controlling viral replication and induction of effective adaptive immune response. While SARS-CoV and SARS-CoV-2 seem to share the entry receptor of ACE2, MERS-CoV uses dipeptidyl peptidase-4 (DPP-4) as a specific receptor [21].The putative receptor of SARS-CoV-2, ACE2, is mainly expressed in a small subset of cells

in the lung called type 2 alveolar cells [22]. It has been reported that SARS-Co-V directly infects macrophages and IFN-stimulated genes (ISGs) under the control of IFN-stimulated response element (ISRE) containing promoters [23]. A successful mounting of this type I IFN response should be able to suppress viral replication and dissemination at an early stage. IFNs have many other functions in addition to inhibiting viral replication, two of which are to activate macrophages and natural killer cells. IFN-α was found in the serum of many COVID-19 patients.

Complement Proteins

Complement system: Is a group of inactive proteins present in low concentration in serum. They can be activated by enzyme cascade (when products of the first reaction become the substrate of the subsequent reactions) [1]. The complement system is composed of more than 30 proteins (including C1 through C9) that normally circulate as precursor proteins in blood. These precursor proteins become activated when stimulated or triggered by a variety of factors, including the presence of pathogens. Complement proteins are considered part of innate non-specific immunity because they are always present in the blood and tissue fluids, allowing them to be activated quickly. Also, when activated through the alternative pathway, complement proteins target pathogens in a nonspecific manner. The process by which circulating complement precursors become functional is called complement activation. This process is a cascade that can be triggered by one of three different mechanisms, known as the *alternative, classical, and lectin pathways*. The alternative pathway is initiated by the spontaneous activation of the complement protein C3. The hydrolysis of C3 produces two products, C3a and C3b. When no invader microbes are present, C3b is very quickly degraded in a hydrolysis reaction using the water in the blood. However, if invading microbes are present, C3b attaches to the surface of these microbes. Once attached, C3b will recruit other complement proteins in a cascade. The classical pathway provides a more efficient mechanism of activating the complement cascade, but it depends upon the production of antibodies by the specific adaptive immune defences. To initiate the classical pathway, a specific antibody must first bind to the surface of the Corona virus to form an antibody-antigen complex. This activates the first protein in the complement cascade, the C1 complex.

The C1 complex is a multipart protein complex, and each component participates in the full activation of the overall complex. Following recruitment and activation of the C1 complex, the remaining classical pathway complement proteins are recruited and activated in a cascading sequence. Although each complement activation pathway is initiated in a different way, they all provide the same protective outcomes: opsonization, inflammation, chemotaxis, and cytolysis. The term opsonization refers to the coating of a pathogen by a chemical substance (called an opsonin) that allows phagocytic cells to recognize, engulf, and destroy it more easily.

Opsonins from the complement cascade include C1a, C3b, and C4b. Additional important opsonins include nnose-binding proteins and antibodies. The complement fragments C3a and C5a are well-characterized anaphylatoxins with potent proinflammatory functions. Anaphylatoxins activate mast cells, causing degranulation and the release of inflammatory chemical signals, including mediators that cause vasodilation and increased vascular permeability. C5a is also one of the most potent chemoattractants for neutrophils and other white blood cells. The complement proteins C6, C7, C8, and C9 assemble into a membrane attack complex (MAC), which allows C9 to polymerize into pores in the membrane of COVID-19 [18].

Cytokines

Cytokines are soluble proteins that act as communication signal between cells. In a nonspecific (innate) immune response, various cytokines may be released to stimulate production of chemical mediators or other cell functions, such as cell proliferation, cell differentiation, inhibition of cell division, apoptosis, and chemotaxis. When cytokines are released from mononuclear phagocytes, these proteins are called monokines; when released from T lymphocytes they are called lymphokines; when produced by a leukocyte and the action is on another leukocyte, they are interleukins; and if their effect is to stimulate the growth and differentiation of immature leukocytes in the bone marrow, they are called colony stimulating factors (CSFs). When a cytokine binds to its target receptor, the effect can vary widely depending on the type of cytokine and the type of cell or receptor to which it has bound. The function of a particular cytokine can be described as autocrine, paracrine, or endocrine. In autocrine function, the same cell that releases the cytokine is the recipient of the signal; in other

words, autocrine function is a form of self-stimulation by a cell. In contrast, paracrine function involves the release of cytokines from one cell to other nearby cells, stimulating some response from the recipient cells. Last, endocrine function occurs when cells release cytokines into the bloodstream to be carried to target cells much farther away [18]. In a report where 99 cases were investigated in Wuhan, increased IL-6 in and C-reactive protein were detected in the serum of COVID-19 patients as reported by Zhou *et al.,* 2020. Furthermore, patients needing ICU care had higher plasma levels of many innate cytokines like TNF-α [24].This clinical feature suggested the likelihood of involvement of highly pro-inflammatory condition in the disease progression and severity. This early high rise in the serum levels of pro-inflammatory cytokines were also observed in SARS-CoV and MERS-CoV infection, suggesting a potential similar cytokine storm-mediated disease severity [25, 26].

5. Adaptive (Specific) Immune Response

Adaptive immunity is defined by two important characteristics: specificity and memory. Specificity refers to the adaptive immune system's ability to target specific pathogens, and memory refers to its ability to quickly respond to pathogens to which it has previously been exposed. Specificity and memory are achieved by essentially programming certain cells involved in the immune response to respond rapidly to subsequent exposures of the pathogen. This programming occurs as a result of the first exposure to a pathogen or vaccine, which triggers a primary response. Subsequent exposure (secondary response) is faster and stronger as a result of the body's memory of the first exposure. This secondary response, however, is specific to the pathogen in question. Adaptive (specific) immunity involves the actions of two distinct cell types: B lymphocytes (B cells) and Tlymphocytes (T cells). Although B cells and T cells arise from a common hematopoietic stem cell differentiation, their sites of maturation and their roles in adaptive immunity are very different. B cells mature in the bone marrow and are responsible for the production of proteins called antibodies, or immunoglobulins. Antibodies are involved in the body's defence against pathogens and toxins in the extracellular environment. Mechanisms of adaptive immunity that involve B cells and antibody production are referred to as humoral immunity [18]. There are two types of specific immune response:

a. **Antibody Mediated (humoral) immune response**
b. **Cell mediated immune response**

Antibody Mediated (Humoral) Immune Response

This is also called humoral immune response. The cells responsible for the synthesis of antibodies are the B-lymphocytes. Each B-lymphocyte has an immunoglobulin of appropriately coded specificity on its surface that is determined at the genetic level 1.

Activation of B-lymphocyte by antigen can be:

i T-cell independent

ii T-cell dependent

Both i and ii depend on the nature of the antigen.

T-Cell Independent Activation

Polymeric antigens such as spike proteins, Membrane glycoproteins, Envelope proteins and other SARS-Cov-2 antigens can directly induce B-lymphocytes to produce antibodies against the specific antigens that induced their production. The antigen subunit binds to a side on the specific surface immunoglobulins on B-lymphocytes to proliferate in to clone of identical cells. These clone of cells later mature in to plasma cells that produce and secrete antibody molecules into body fluids. There are 3 characteristics of T-cell independent activation [1]:

1. It can only produce immunoglobulin of M class (IgM) which were detected in the serum of most COVID patients barely 2-3 days following exposure to the virus
2. It does not require help from T-helper (T_H) cell
3. No memory cells are produced from this type of response

T-Cell Dependent Activation

This is a mechanism that stimulates the production of antibodies induced by many antigens. The characteristics of this response are:

1. It can produce immunoglobulin of any class (IgG, IgM, IgE, IgD and IgA). IgG were detected in the serum of some patients 6 days after infection with the SARS-Cov-2 virus [27]. IgG also serves as indicator immunoglobulin in diagnosing most COVID-19 cases by serological tests.
2. It requires a help from T_H lymphocytes

3. This response produces memory cells; such that in the subsequent exposure to the same pathogen, the memory cells produced can proliferate and mature in to plasma cells.

6. Mechanism of Antibody Production

The mechanism of antibody production is explained in the following steps:

1. When an antigen (coronavirus) comes in contact with macrophages, it will be phagocytosed. Within the macrophages, enzymes partially degrade the virus in such a way that its antigenic determinants are exposed.
2. The partially degraded antigen is placed on the macrophage surface next to the Ia marker, which is the genetically determined class II antigen or Human Leukocyte Antigen (HLA) system
3. T_H cell has a receptor, specific for each antigen on their surface in association with CD3 molecule. When such T_H comes in contact with a macrophage having the Ia-antigen complex, they bind each other.
4. At this stage, the resting T_H cell is activated by monokine (interleukin-1/ IL-1) produced by macrophage. The activated T_H then undergo some biochemical changes resulting in cell stimulatory responses by production of large quantities of lymphokines including interleukin-2 (IL-2)
5. The activated T_H cell also produce IL-4, IL-5 and IL-6 which participate later in B-cell proliferation and differentiation.
6. B-lymphocytes can come in contact with antigen in 3 ways:

   A: Direct binding of antigen to the specific surface immunoglobulin molecule on B-cell

   B: Presentation of antigen by activated T_H cell to B cell

   C: Presentation of the antigen by macrophages or other B-cells possessing bound antigens on their surface
7. At this stage, only antigens capable of initiating B-cell proliferation without the influence of T_H cell can induce antibody production independently. Other antigens can only do so under the influence of IL-5 and IL-4 released by T_H cell
8. After proliferation of B-cells, IL-5 and IL-6 trigger differentiation of B-cells into plasma cells to secrete antibody molecules specific for inducing antigens. Some

stimulated B-cells will transform into memory B-cells instead of plasma cells. These memory cells have a very long life span and can be activated upon exposure to the same antigen [1].

7. Cell Mediated Immune Response

The T in T lymphocyte stands for thymus. While B cells complete their maturation in the bone marrow, T lymphocyte precursors migrate to the thymus where they develop into mature T lymphocytes. The mature T lymphocytes then leave the thymus and circulate through the bloodstream and lymphoid tissue. T cells can be categorized into three distinct classes: helper T cells, regulatory T cells, and cytotoxic T cells. These classes are differentiated based on their expression of certain surface molecules, their mode of activation, and their functional roles in adaptive immunity. All T cells produce cluster of differentiation (CD) molecules, cell surface glycoproteins that can be used to identify and distinguish between the various types of white blood cells. Although T cells can produce a variety of CD molecules, CD4 and CD8 are the two most important used for differentiation of the classes. Helper T cells and regulatory T cells are characterized by the expression of CD4 on their surface, whereas cytotoxic T cells are characterized by the expression of CD8.Classes of T cells can also be distinguished by the specific MHC molecules and APCs with which they interact for activation.

Helper T cells and regulatory T cells can only be activated by APCs presenting antigens associated with MHC II. In contrast, cytotoxic T cells recognize antigens presented in association with MHC I, either by APCs or by nucleated cells infected with an intracellular pathogen [18]. T cell response in SARS-CoV was extensively investigated. In one study using 128 convalescent samples, it was reported that CD8+ T cell responses were more frequent with greater magnitude than CD4+ T cell responses. Furthermore, the virus specific T cells from the severe group tended to be a central memory phenotype with a significantly higher frequency of polyfunctional CD4+ T cells and CD8+ T cells, as compared with the mild-moderate group. Strong T cell responses correlated significantly with higher neutralizing antibody while more serum Th2 cytokines (IL-4, IL-5, and IL-10) were detected in the fatal group as per the scientific literatures.

Conclusion and Future Perspectives

COVID-19 does not respect wealth status or border and presently, there is no approved vaccine or treatment protocol for COVID-19. However, many vaccines are on trial and some countries have approved the use of Chloraquine, Remedisivir, Hydroxychloraquine and Ritonavir. Recently, Ivemectin (anti parasitic drug used in the treatment of onchocerciasis) had been found to effectively inhibit SARS-Cov-2 in vitro. Many scientists have proposed that specific antibodies (IgG) from the sera of recovered patients should be isolated and mass produced by hybridoma method and then administered to those with active infection. However, this would not confer immunity for a life-time but it could provide a solution before a vaccine is produced and approved. International Society for Stem Cell Research (ISSCR) has proposed the use of stem cell in COVID-19 treatment due to their immunomodulatory and tissue repair activities.

Furthermore, scientists and pharmaceutical industries should share their findings to the scientific community, as they should remember that this is struggle to save humanity, not struggle for fame.

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CHAPTER-10

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CHAPTER-10

WORLD UNDER THE PANDEMIC SITUATION: NOVEL CORONA VIRUS PARALYZING WORLD'S ACTIVITIES

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ABSTRACT

Since the origin of human species, there have been several diseases that are documented. Of these many diseases are cured themselves without even being noticed and showing any signs and symptoms. Some are eradicated from society by the administration of vaccines. Though few infections like Spanish flu killed several people initially, they are also gradually eliminated. But at present, it is the turn of a new virus named COVID-19. which is originated from Wuhan city from wild life market of China in December 2019. Though it is transmitted from bats to humans in the first case, it got spread to people all around the world and now even making the world upside down. As it is a novel virus and change in its structure, the development of therapeutic agent has become serious concern across scientific communities. By far, WHO and other governing agencies have come up with management strategies like physical distancing, wearing face masks and use of sanitizers etc. In this chapter, the overall brief information is compiled to sum up the ongoing efforts to combat the COVID-19 situation.

1. Introduction

Coronavirus which is named shortly as COVID-19 was known to take its birth in the Wuhan market of China in December 2019. Though it is transmitted from bats to humans in the first case, it got spread to people all around the world [1]. The main mode of transmission is through droplets of saliva or cough. But recently, it came to know that it even spreads through physical contact. Recently, WHO declared it as a pandemic and named it scientifically as SARS - CoV- 2. In India, till now there are more than 21,00,000 cases out of which more than 60% are active cases. This count has already crossed the range of 20,00,000 in the entire world with about 7% death rate. India stands at third place with corona cases in the world with an approximate of 11.1% of world cases. Though the first case was seen in China, at present, the maximum number of cases are reported in America.

2. Structure Of Virus

The corona virus belonging to the family Coronaviridae and order Nidovirales as like other virus is neither living nor dead. Virus particles called virions are proteinaceous structures studded with an envelope of glyoproteins called spikes which attach to host cells. The complete structure of virus was elucidated though the method of cryo electron microscopy which is done under highly reduced temperatures and passing through high energy electrons [2].

3. Indications

The symptoms vary from patient to patient. Though the main symptom being mild to moderate respiratory illness with cough and cold, breathlessness, other common symptoms are fever, tiredness, weakness and in some cases, even loss of speech and movement [3]. The new symptom which has been observed n some patients is anosmia or loss of smell and rarely in about 13% patients hearing loss or deterioration. The continued infection may cause damage to other internal systems. So, with other comorbid conditions like cardiovascular diseases are more prone to the severity and even death[4]. However, even though an individual contacts a patient with a coronavirus, there is still a chance of not being infected if his/her immunity level is high. But, this chance is very less.

Most of the corona patients usually show the symptoms within 10 - 14 days. In the case of carriers, they do not show any symptoms but unknowingly they are responsible for the spread of disease [5].

4. Detection

The most important thing in coronavirus is its detection. In most of the cases, it is misdiagnosed as simple flu or cold with fever. the Main test to detect this virus is the swab test which is based on polymerase chain reactions. In this, a cotton swab is passed into the nose to collect samples from the respiratory tract and tested for the presence of a virus [6]. But in some cases, though the patient was positive, the test may show a negative result if the sample is not sufficient to detect. In such cases, saliva tests and antibody tests can be done to detect the presence of antibodies produced against virus particles. Usually, these tests take about 24 hours to show the results. But recently, rapid tests have been developed which give the result within 15 minutes [7].

5. Treatment and cure

The main reason for the lakhs of deaths and arousal of positive cases is the lack of correct information about exact treatment. At present, there is no exact treatment or vaccination available for this pandemic. The only available treatment available was directed towards symptoms. In about 85% of the cases, the symptomatic treatment is showing a positive result. But there is no 100% confirmation as the disease may reoccur and show its effect as observed in many countries. In case of mild to moderate infection, care should be taken to control them by giving fluids, simple rest, etc [8]. NSAIDs and acetaminophen can be given to control normal sore throat, body aches, fever, etc. Antibiotics show no effect as Corona is not bacteria but a virus. Antimalarial drug Hydroxychloroquine is being suggested by many physicians but it showed mixed results. Recently, antiviral drug Remdesivir which is used widely for treating the Ebola virus is gaining attraction as it helped in curing some patients. Plasma therapy using plasma from recovered patients which contain antibodies is still under trial in some patients though it is showing positive result in more patients [9].

6. Vaccination

Synthesis of the vaccine against this coronavirus is becoming difficult because of mainly two reasons. Firstly, the virus is a new one and there is no information regarding it previously. Secondly, the virus has been mutating rapidly which made it difficult for scientists to produce a vaccine. However, many studies and researches are going on in various places. Though the production of a vaccine takes several years, scientists are working to bring it within 12-18 months. Till date, many countries and companies are showing positive results. even some brands have been in their phase III. But, still there is no confirmation that vaccine will be available to public shortly. So, in present conditions prevention of this virus is much better and safe.

7. Preventive measures

It is always better to take some safety measures. This is very much applicable to Corona Virus. The only method to avoid this virus is by following simple preventive measures like:

- Following physical distancing
- Washing hands frequently with soap and water or with alcohol sanitizer
- Avoiding crowdy places
- Using masks and gloves while going outside
- Avoid touching face randomly
- Covering mouth and nose while sneezing or coughing [10]
- Development of novel device to monitor and prevent the infections [11]

Conclusion

Though in all cases, Corona infection is not life-threatening, neglecting it may still lead to severe complications. So preventive measures are the only alternative as there is no exact cure and should be strictly implemented. Researchers are working hard to find out the exact treatment options and studies to produce vaccine are under trials. As there are chances of reoccurence, negligence after cure may cause great loss and care should be taken.

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CHAPTER-11

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CHAPTER-11

CASCADE EGRESSION OF SOME CORONAVIRUSES CONCERNING SARS-COV-2 VIRUS, ITS EXPANSION AND INDICATIONS' ERUPTION

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ABSTRACT

The present chapter describes brief information about corona viruses and COVID-19 which is also known to be SARS-CoV-2. The chapter envisions brief information on the basic of COVID-19, its symptoms and its theory which is reported to be circulated across the globe. The chapter marks interesting information regarding the spread and its complications associated.

1. Introduction

Coronaviruses belong to Coronaviridae family. They are classified into 4 genera: Alphacoronavirus, Betacoronavirus, Gammacoronavirus and Deltacoronavirus. Gammacoronavirus and Deltacoronavirus infect birds but some of them infect mammals. Alphacoronavirus and betacoronavirus infect humans and animals. Seven Coronaviruses' species can infect Humans. Three species cause severe infections. They are SARS-CoV, MERS-CoV and SARS-CoV-2 (nCOVID-19). In 2002, Severe Acute Respiratory Syndrome (SARS-CoV) had transmitted from civet cats to humans. In 2012, Middle East Respiratory Syndrome (MERS-CoV) had transmitted from dromedary camels to humans. In October 2019, Severe Acute Respiratory Syndrome (SARS-CoV-2) emerged in Wuhan, Hubei province, China. It transmits to humans from animals. It is zoonotic. Until May,2020, it was impossible to prove or disprove the theories of SARS-CoV-2 emergence. Scientists found

that SARS-CoV-2 isn't derived from any previously used virus backbone or from laboratory. They believe it is originated via natural selection. There are two characteristics in the virus make it different from previous known coronaviruses. They are the mutations in the RBD portion of the spike protein and its distinct backbone. Researches established two hypothesis of the emergence of COVID-19, according to its genomic sequence data and other related viruses' data. 1-A natural selection happened in a non-human host and then the pathogenic version transmitted to humans. Scientists suggest the bat as the first host for COVID-19 as it is very similar to two bat-derived SARS-like coronaviruses (bat-SL-CoVZC45 and bat-SL-CoVZXC21). They suggest that there is a second intermediate host involved between bats and humans. 2-A pathogenic version of the virus is evolved within humans after it had transmitted from an animal. The host is pangolin. There might be an intermediate host such the civets or the ferrets. Another study suggests the snake as an intermediate host of COVID-19. The study found that 4 regions of the spike protein of COVID-19 were the same as HIV-1. A new study in ACS Journal of Proteome Research, suggests pangolin as the most likely intermediate host for COVID-19. They found that there are only 5 amino acids differences in the RBD portion of the spike protein between human and pangolin viral protein compared with 19 differences from the bat coronavirus compared to COVID-19 protein. They concluded that there might be another intermediate host but not the snake [1-7].

2. According to some facts and theories:

An animal sold at Wuhan seafood market might be the intermediate host. The second host is uncertain till now, there is a suggestion that it might be the Snail. This suggestion is based on some facts. It guides lights to make genomic sequence data of snail to get sure. Since the snail's meat contains higher protein than chicken and lower fat with several minerals and amino acids, France is the first consumer of snails followed by Italy, Spain and Germany. Snails are farmed in America and Africa too.

Their meat is more expensive than other animals' meat [1]. Based on recent studies more than 300 million people are affected by many Snail-transferred diseases.

Snails were an intermediate host of Schistosomiasis [2]. Land snails' season is winter (typically October through April). They may also appear in Summer [3]. Snails can enter bat's caves. They can be very close to it.

3. The spread of SARS-CoV-2 around the world:

SARS of 2002 originated from Beijing, China spread to 29 countries, infected 8096 people and killed 774 people within one year. MERS of 2012 originated from Saudi Arabia, infected 2494 people and killed 858 people. SARS-CoV-2 of 2019 originated from Wuhan, China and has spread to 210 countries. Its infection rate in drastically increasing even after its first report since the six months [5-8].

4. The symptoms of nCov-2019:

Symptoms appears 2-14 days after exposure to the virus. People with these symptoms or combinations of symptoms may have COVID-19.

Mild infection:

Fever: Fever comes when body temperature exceeds above 99 Usual body temperature is around 98.6 F. Fever is not come under any disease but it is a sign that your body is trying to fight an illness or infection. Infection is the most cause of fever. It can be treated through medicine or putting cold bandage on head and other body parts.

Dry cough: A cough is a reaction action that clears your airway of irritants and mucus. There are two types of cough that is productive and non-productive. A productive cough produces phlegm or mucus, clearing it from lungs. A nonproductive cough, is dry cough which doesn't produce phlegm or mucus. Common causes of dry cough are Asthma, Gastroesophageal reflux disease, Postnasal drip and viral infection. One can cure with medicine, taking OTC cough suppressants and adding honey to drink hot water to soothe irritated throat.

Lethargy: It is a lack of energy and enthusiasm. It happens when most of the people feeling low and lazy. It can be treated by taking lemon water or instant energy juice to get energized.

Dehydration: Dehydration occurs when your body loose more fluid than you take in. And your body doesn't have enough water or fluid to carry out its normal functions. It can

be treated by refilling the fluid level in the body by consuming liquids like water, sports drink, electrol, frozen water etc.

Severe infection: There are many type of severe infection which have different symptoms like discoloration of skin in patches, less urination, low blood clotting or excess bleeding. There are many more visible infection that are caused in the body due to some sort of reaction in body which can be caused through anti-allergy or if it is more severe than you can contact to your doctor. It can a symptom of COVID-19 which is pandemic disease worldwide.

High fever: Normally in the hectic lifestyle and busy schedule in the hot season body temperature reaches to 99 but if it rises to 100 or more don't take it normal you must directly contact to the doctor it can be prior symptoms many diseases so don't take it casual before it become more severe issues as COVID-19 which is worldwide high fever is the most prior indication of it.

Shortness of breath: If your affected by corona virus then the most affected part of your body is chest as it directly attacks to chest result in difficulty of breathing and shortening of breath. So if you feel like you feel like shortening of breath make sure you must visit to the doctor for your test.

Chest pain: As I mentioned chest is the most affected parts when COVID-19 attacks you so it includes severe aching which resulting in shortening of breath. If you feel uncomfortable in chest and think it must be COVID-19 attack you must visit to the nearest COVID-19 hospital.

Hemoptysis: It is the disease in which patient start coughing up of blood or mucus of blood stained from the bronchi, larynx, trachea and may be from lungs. In other way, bleeding from airway is hemoptysis. It may affect your lungs and turn many diseases like lung cancer, infections like tuberculosis, bronchitis, pneumonia and many cardiovascular conditions. One can recover from this by Bronchial artery embolization, bronchoscopy and surgery.

Also doctors can recommend few medicines like Antibiotics for tuberculosis and antibiotics, Chemotherapy for lung cancer and steroids for inflammatory conditions.

Complications

ARDS (Acute Respiratory Distress Syndrome): *It* occurs when fluid develop in the small elastic air sacs in lungs. The fluid keeps lungs from filling with enough air, which makes flow of less oxygen and reach to bloodstream. This remove the organs of the oxygen which need to be function. It can be treated by oxygen therapy to raise the oxygen level in your blood through resting tubes in your nose, a face mask or a tube placed in windpipe.

Pneumonia: It is the infection which inflames the air sacs on one or both lungs. The air sacs fill with pus or fluid which causes coughing with phlegm or pus, fever and difficulty in breathing. It can be treated by fever medicine to control fever, anti-inflammatory drugs, drink plenty of fluids etc.

Sepsis: It is a life threatening infection and body normally release chemicals into the bloodstream to fight an infection. Sepsis happens when body's releases chemicals into the bloodstream to fight an infection. It can damage multiple organ system of a body. It is treated by antibiotic by giving directly into vein. This disease can cause death too.

Multi organ failure: MOF that is multi organ failure is a syndrome that shows a complicated and dynamic pathophysiologic pathway primary to organ functional derangement and ultimate death. Severe disease can cause death and shock begins an inflammatory cascade that cannot be reversed in some patients. It is treated by antimicrobial therapy or surgery, regular cardiovascular monitoring required, and to disrupt the pathogenesis of multiple organ dysfunction syndrome. During COVID-19 people need take preventive measures strictly otherwise any above discuss disease can harm more if infected by coronavirus and lead to death in many cases. Symptoms like loss of taste, smell and lethargy is also towards coronavirus [9,10].

Conclusion

COVID-19, a very serious and dangerous virus which is declared as a pandemic worldwide. It was firstly noted in the Wuhan in China and got spread in the world, people are scared but some out of them are taking is casual so them it's quite uneasy for them to suffer in this pandemic. As I described how dangerous it is and the symptoms of COVID-19 that uncomfortable it makes you when it attacks

so its better to take precaution is it is rightly "masksare more comfortable than a ventilator" means it's better to wear mask else you will have to on ventilator which is next level uncomfortable. So try to avoid getting accumulated in a small place and be at social distance to avoid attacking the corona virus on your body. Basically it attacks to those who has weak immune system so try to add the thing in your meal that increases your immune system so there is low risk to get affected by this virus. Family is more important so Make yourself and your family immune system strong, ask them to wear masks and be at a social distance of at least 6feets to save yourself and your family from this dangerous pandemic.

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CHAPTER-12

AUTHOR'S INFORMATION

Capt. Kuntak Dutta is a pilot as well as pursuing Candidate of Science. He gained his Commercial Pilot Licensing from Georgia by securing highest academic marks and stood among his fellow batch mates. He has post graduated in Technical Exploitation of Flying Machines and Engines from Siberian State Aerospace University named after Academician M.F. Reshetnev, Krasnoyarsk, Russia. Wherein he was honoured topper among his batch mates. He has teaching experience of 3 years at Blue Hawk Aviations Pvt.Ltd, India. He has mastered his skills on Air Navigation, Aerodynamics and Meteorology. During his academic career he has proudly possessed National Cadet Corps "A" certificate (Air-force wing).Besides being pilot and scientific cadre in the field of aerospace. He has passion of disseminating knowledge through his YouTube channel "Pilot Pilot". He has decent track of publications in renowned international journals. He has attended and presented scientific papers in many international conferences. During his conference proceedings, he has bagged 1st place at 15th International conference "Youth, Society, Modern Science, Technology and Innovations" under Master's Research section, He has also secured 2nd place at 2nd International Scientific and Practical Conference dedicated to Day of Cosmonauts under section "Actual Problems of Aviation and Cosmonautics". Further towards his credit, he was awarded 3rd position at "International Conference of Students, Post graduates and Young Scientists , Prospect Svobodny-2018 under the session of "Operations and Reliability AT" at 20th International Conference in 2016 which was dedicated to the general designer of Rocket-Space systems academician M.F. Reshetnev. He is passionate towards social service and has also volunteered during noble causes such as flood relief, also participated in welfare of orphanages across the globe.

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CHAPTER-12

GLOBAL IMPACT OF CORONA VIRUS DISEASE

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ABSTRACT

The influence of COVID-19 has greatly affected different domains and sectors with large number of businesses are partially down and few are completely shut down. At the same time there has been great demand for normal supply of essential commodities as there is complete shortage. The demand is shooting up with limited supply from the production domains. The present chapter briefly envisions the impact on different sectors owing to corona and COVID-19.

1. Introduction:

There has been global emergency owing to pandemic COVID-19 situation. Ever since the report of COVID-19 was confirmed in December 2019 by experts from the emergency clinic in Wuhan, China. Since then, there has been increased mortality and morbidity rates from different countries according to the World Health Organization. The spread of the coronavirus is causing a global crisis. Despite the horror of massive government assistance, the spread of the coronavirus is affecting the global economy. Sooner or later, the best starting suffixes in China are particularly unacceptable in the face of the decline of COVID-19. Chinese experts called for a decision in January 2020 to link industrial factories in many parts of the country to prevent the coronavirus spread. Although it was renewed in early February, many of them were closed. As Dan and

Bradstreet note, these development lines are shifting from pharmaceuticals to vehicles and devices, resulting in the deaths of nearly 60 million Chinese professionals. Many tests deny the coronavirus and SARS 2002-2003 [1-10]. However, due to China's general importance to the global economy, the test is not correct, which has become noticeable in recent years. At that time, China greatly expanded its trade with the rest of the world, and many companies are now closely associated with its economy. Corona has virtually exhausted all of the functions of the economy in the standard work process. In almost all regions, global businesses are confident that businesses will not last. Business analysts have warned that the corona viruses could cost the global economy $ 1.1 trillion in lost wages. Some predict that the effects of post disease will bring the global economy back this quarter - since late 2008, the currency has surprised unions around the world.

Many countries plan to develop vaccines to reduce the effects of coronavirus. On March 3, 2020, the Federal Reserve lowered the credibility ceiling by one. The high crisis rate has dropped considerably since 2008, the most significant decline since then [8]. The International Monetary Fund (IMF) has said it would provide additional assistance to the displaced countries [8]. However, these efforts cannot prevent certain links and specific liberal organizations from the catastrophe, which can undoubtedly lead to epidemics [7].

In particular, companies are looking for a source on clothing and machine manufacturers, such as transportation experts, qualified chain systems, aeroplane and surplus products. On the contrary, the level of wages should crush the United States, which will have to bear the costs of agriculture, organizations, and manufacturing in China, and delay the real recovery in many parts of the American economy. Look at the houses, the rust belts, and the displacement of America. Exchange relations with China. Below is a review of the systems most commonly affected sectors by the pandemic outbreak.

2. Electronic sector

The device comes from most Chinese who acquire large quantities of manufacturing plants. An extended reflection can affect the work. Many operating companies have warned that quarterly rules will not be followed after the development chains are closed. They anticipate delays in events, migration, and the display of the latest

models. Various hardware manufacturers must create a membership account, without visible clips of corrupted viruses.

3. Travel sector

Countries are a hindrance to the travel industry in many countries, especially from countries with high coronavirus levels. Blake's desperate effect on travel business in the E.U. is $ 1 billion a month. The biggest disaster we encountered in an ideal introduction was an exciting proposition for the travel industry from a limited number of Chinese customers and a massive social phenomenon from luxury buyers [10].

Travel authorities are expecting more achievements than initially anticipated, as travel to Asia has been restricted. If the Asian stock market is suspended until the end of April, 5 385 to 445, 45 million will be added without a failed attempt. Corrected flight officials will not give up due to the Corona 1 virus.

4. Food and entertainment

Restaurants and food companies can be incredibly insecure. Some of the strings were covered with small wires in China from the beginning. Private companies expect significant increases in the prices of raw materials and proteins. Essential conditions of progress, for example, are affected by the streets and extraordinary ideas. The Louvre Corona in Paris has closed its doors to ensure protection from viruses. Significant rugby coordination has changed between Italy and Ireland. Massive international furniture has been pushed to Milan as it faces real travel restrictions in its efforts to contain the coronavirus. Even at the Olympics, we have to leave some doubts [8].

5. Security

Security professionals who spread travel or business mediation can expect to be primarily affected by travel corridor virus mediation. Without any doubt, additional travel and roles can pay for retirement, work, litigation costs, and disability benefits.

6. Pharmaceuticals services

The Food and Pharmacy Administration (FDA) requires that manufacturers and producers in its region report any tire and versatile disappointments. As revealed in the WHO Declaration, the pharmacy's expression is confused with a single case of coronavirus. Regardless, the FDA may not even have its name, ingredient, area, or gear in

it, nor does it talk about organized business information. The Pharmacy industry in India expects spectacular coronavirus problems. Keep in mind that the India Business Promotion Council is taking action, with 85% of the cases of powerful pharmacies imported from India coming from China, and 66% of the stringent imports from pharmaceutical and medical intervention in 2018 and 2019.

7. Luxury products

Ensure the immaculate style. Shop brands are an option for international travellers, who often spend $ 200 billion on luxury goods in the United States each year [1-3]. The luxury product extends the impact of the Corona Virus on all luxury orders. Likewise, companies expect the end of the scene to unravel.

8. Transport sector

This year alone, aeroplanes are expected to fly around the world for more than ten years, according to the International Aviation Association (IATA), a global trade consortium for carriers planning to reduce passenger demand by $ 29 billion. In 2003, due to the SARS situation, passengers lost 3.7% of revenue per kilometre (the amount of regular air traffic), and flights to North America lost about $ 1 billion, the International Aviation Association said. The International Air Transport Association expects the coronavirus to be better than SARS [3]. After almost 30 days of essential visibility, some U.S. investors have said they will not provide managerial assistance to Chinese domains until April 24, 2020. Also, the end of China's growth lines and the end of foundations are affected by the materials.

9. Automobile sector

Car manufacturers represent less than 92% to 2% of Asian and European manufacturers in China. Some American manufacturers can resist the adverse effects of defective parts if they do not have fourteen days a day [9]. Asian automakers have made deals with industries due to the lack of Chinese parts, and 3 British and European automakers have warned of the closure of the material handling plant due to the downturn.

10. Construction industry

The global construction industry is poised to improve the growth of current funds. Singapore, Canada, and the United States must now integrate solar panels and components, plumbing, hard panels, and surface tiles into the plumbing. It is particularly unacceptable, as Singapore relies on Chinese construction data to meet its primary business needs. Postponing construction activities can lead to massive objections.

11. Transport

The transport sector is affected by coronavirus infection from China and by falling prices. From mid-February to April 1, 2020, at the port of Los Angeles, aircraft carriers killed more than 40 aircraft, reducing the hostel's size by 25%. These conditions may not be available to express owners who control their vessels, although vessels and fines may indicate the required code conditions. Container pioneers leave endless flights from China.

12. Human resource

Businesses should review their physical employment contracts to determine how their privileges, duties, and business relationships affect growth and sustainability. Likewise, with other legal provisions in the event of disobedience to employment contracts, we consider the linear unfolding of hostile dreams of progress and conditions of power, such as a board error. Companies should be aware of the legally binding provisions described in these various common scenarios, including the management of essential damages and time elements [5]. The open structures are based on real space to reveal the impact of sharing on the front. Insurance plans and managers need to assess approved increases and understand business and distribution segments, report events, and reward workers. Upon request, the experts agree to provide safe and secure working conditions, which may or may not lead to traffic or actual physical damage. When looking for coronaviruses, superiors must take security into account to ensure their prosperity and protect their representatives. Operating tables and free maps must compensate for the restructuring of the links to maintain a strategic distance from interstices that are not part of the exhaust systems.

13. Assets

Although it is challenging to measure coronaviruses' impact in the world economy, this effect is liberal and inevitable inside and out. So far, the most critical Money-related professionals often increase the corona virus's effect with global experts. The U.S. currency market has identified unimaginable weakness, with the Dow Jones Industrial Average expecting a significant turnaround since the monetary emergency of 2008. When the tide changes rapidly and the disease disappears, the effect becomes more energetic. Some things with low margins and unnecessary transaction records have been overlooked [10-15]. Others may need to consider a guarantee to identify liquidity problems, deficiencies, or unique partnerships. We have a dedicated and diverse set of commitments and money to help us, and the customers explore the inevitable difficulty of coming.

14. Social impact

Lockdown and social isolation to prevent the spread of COVID-19 has raised concerns about the acceleration of domestic violence, including physical and sexual violence. The time spent in the lockdown shows that the mentally ill mistreat them and that it is difficult to ask for help. In response to growing concerns, the world government has issued rules on how to prevent domestic violence, how to report it and when and where it can be spoken more broadly. An essential consequence of the COVID-19 epidemic appears in the computer games industry [7-15]. Web games are developing as self-isolation, and an equal number of people leave their homes in several situations. Again, the negative impacts include significant annual revenues, the modification of E3 2020, a partial upgrade and major economic structures to come.

Conclusion

Due to the pandemic outbreak, these conditions require varied and pragmatic management of prosperity, institutions, government and order. Rapid assistance strategies for people who may lose a little attention by accepting them should be fair and changeable. Medium and long term exercises are necessary to rebuild and revive the economy after this critical situation. It is also essential to prepare a comprehensive financial improvement plan and to remember the unique impacts of area efforts and business awareness so that individuals with sophisticated and creative game plans can thrive. Governments and

significant communities continue to investigate and ensure that "whatever is needed" is delivered quickly.

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CHAPTER-13

AUTHOR'S INFORMATION

Mr. Rahul Reddy Nadikattu, is a budding research scholar from University of the Cumberlands. He has gained scientific recognition from his scientific novel device which is serving to track the COVID-19 infected patients roaming in outdoor environments. He has published significant track of publication since 2014 in reputed peer reviewed journals which have gained substantial interest based on the increasing citation score. He is also serving as editorial board member of various reputed international journals. His scientific area of interest includes in the field of artificial intelligence, machine learning, data science and management.

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CHAPTER-13

ROLE OF INFORMATION SCIENCE DURING COVID -19

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MANAGEMENT

ABSTRACT

Information science consists of so many inclines of Science and Technology. Information science deals with information related to particular which includes organizing, selecting, collecting, processing and management of data. Information science use many tactics and tools for doing such activities. COVID-19 is the newly grown virus in the family of coronavirus which in incurable once get infected by it. As there is no vaccine developed as of today July, 2020. It is first found in Wuhan, China and spreads in all over the world like fire. Impact of coronavirus on human is very dangerous and harmful. In this paper we will discuss and highlight the role of information science during this situation and how its handling the COVID-19.

1. Introduction

The COVID-19 is the new virus belonging to the family of coronavirus. At present it is considered as incurable pandemic which has spread throughout the world. It was first noticed in Wuhan, China. Government and health care centres have declared guidelines to prevent from this life threatening virus by taking various prevention measures and following social distancing everywhere. Governments and medical care takers (doctors)are advising the People who are found ill with moderate respiratory problems and not require special treatment for recover. During this tough time, apart from scientific and medical fraternities, the only domain which has

influenced the current scenario if information science which has played immense important roles. The tools of information sciences are well explored to keep the world momentum working this can be gauged right from delivering the information of COVID-19 every second to the working model via virtual and online resources. The information science has given excellent platform to display world its importance to carry forward the global activities even when the world is completely lock down to witness its severe pandemic ever reported. All the governing bodies including WHO, is relying on the information tools to come up with best possible solution to combat the present crisis. The research and scientific teams are best utilising the online databases to elucidate the virus and its structure by implementing the bioinformatics tools and BLAST techniques which are well advance with the latest information technologies. Thus the information technologies are shaping the world to survive and bounce back to meet the global standards. Based on these important facts and consideration the present chapter is executed to depict the roles of information science during the present scenario [1-5].

2. INFORMATION SCIENCE

Information science is scientific domain which deals with the technologies related to information and data sciences. This has grown rapidly to conquer the world in almost every sector and has uplifted the existing mode of standards and user friendly applications to gain one click information across the globe. This scientific streams has different sub branches such as data science, machine learning, artificial intelligence, neural networking, nano informatics, bio informatics etc. [4-6].

3. ROLE OF INFORMATION SCIENCE IN COVID-19

Information science focus on understanding and implementing the desired activity with the aid of information tools and techniques. During the COVID-19 situation, ever before any domain could initiate the work and understand concept of pandemic crisis, the information scientist or data scientist were the frontline professionals who can the world the ongoing impact by elucidating the root cause of the pandemic. It was the information technology which helped in elucidating the structure of the virus, predicting the drug strategies, its preventive measures as per the WHO which is also relied on the information tools. The world is completely

dependent on the information science to even come up with the best possible drug or vaccination. Apart from this, the information tools were used to come up with apps which aided to track the infected patients and predict the next possible outbreak and hotspots of COVID-19. The worldcoronameter is completely gathering information and updating it every second which is possible due to usage of information technologies, Every governing bodies are constantly working to deliver their best by using the available resources of online tools [5-12]. In the next section, the chapter will segregate the ongoing usage of information technologies to curb the current situation.

Some of the basics done by information science to tackle this situation-

i. **Software development-** Application like AarogyaSetu and AyushKavachCOvid helps people to get updated information on COVID-19 and of their surroundings to take more precaution. These apps will help you to find if anyone is infected in near area so that you won't step out. They get data about number of cases and prevention measures need to be taken. In every country, they have launched application to get data in detail. You can also assess your health and check if any symptoms arise.

ii. **Information center-** Information science created center from where one can get data of everywhere to know the current situation of COVID-19. Also updating all prevention measure on daily basis to circulate the information.

iii. **Online Center-** It is because of the information science; everyone is moving towards online to handle the situation. Online schools, offices, work from home, data transfer etc. is done by the information science.

iv. **Contactless Commerce** - As COVID-19 situation best prevention measure is social distancing. Therefore, contactless commerce is started where people can buy and sell without contact. Though social distancing impacted badly to global economy potential. This is because of information science where people can get anything and handle the situation from home having all preventive measures.

v. **Supply chain management-** In this pandemic, everything went low. Demand patterns also changed. As everyone work from home, school shifted to online

classes etc., demand of goods like toiled paper, food, stationaries, and more has changed. Production need to take place with the same supply limitations of social distancing which affected the overall demand of such demands. It is thus information science, which is fulfilling the demand of consumers in terms of contactless shopping.

vi. **Use of social media for information-** Information science well using data from social media to create awareness and spread information through social media platform. Today, most of the people uses social media platform like Facebook, Twitter, Instagram etc. So we get data like number of cases, about red zone areas through twitter or any other social media as well. And thus shared in media to show the information worldwide.

vii. **Online education issues-** The current world is not accepted and allowed smooth transition to the online world in terms of education. In India, many people do not access internet, laptop, phone etc. and any don't have that knowledge to shift online 100 percent drastically. They need knowledge and time to learn and then make their children to learn through online. This created mental stress so much. This rapid move is not acceptable everywhere not to students too. They finding it tough. Here, information science supported and guided but then also it takes time to settle down smoothly.

viii. **Technological and changing work culture-** People are facing issue in working too as social distancing is compulsory everywhere and then it need different work criteria in office too following social distancing. Because people can work from distance then there will be a change in their requirement too to go to workplace. But in this COVID-19 situation people are preferring to work from home rather going to workplace. It is information science due to which employees get connected to each other through networks and computers to do work done.

ix. **Susceptible and Non susceptible-** This has become the new challenge where everyone seeing each other with suspicious. Companies and healthcare need to track people on the basis of susceptible and non-susceptible to ensure the safety and avoid lawsuits. One must need to take care and know all

symptoms of COVID-19 to take care. Information science bought all the data tracker app and computer based application to ensure and handle the situation.

x. **Physical Activity –** The physical activity during COVID-19 will be benefits in many ways like it will help in enhancing immune function and will reduce inflammation therefore it can help in reducing the severity of infections ,it will improve common chronic conditions that increase the risk of severity in COVID-19, it will help in managing stress by reducing symptoms of anxiety and depression, It will help in to bring cortisol levels in balance as stress and distress create imbalance in cortisol which tend towards negativity to influence immune function and inflammation. Information science has taken care of this by broadcasting on every app compulsory show of physical activity.

xi. **Concern of Classic Science design-** COVID-19 situation will be an opportunity to define the role of ontologies, knowledge management issues, artificial intelligence, big data and many other to solve the problems with COVID-19. Classic science can use information science get all the information and all current knowledge related to COVID-19 to solve the issues related to it and provide the solutions which will drive everyone in a positive way.

xii. **RPA** – RPA stands for Robotics and Robotic Automation. It is used to know all the controls on behavior during COVID-19 pandemic by assessing social distance and contactless commerce and increase the use of robotics to limit human exposure to handle the dangerous situations. For example, in few hospitals, medicine has been distributed by Robotic machine to the positive patient of coronavirus. Many places human are replacing by robots for manual work. Many places robots are used to spray disinfectant, dispense hand sanitizer, check temperature, find those who are not wearing masks and many other activities. Robots are also used for many other white collar activities. It is done in China during this pandemic where robot has done health screening, they remind people for survey, if anyone have high temperatures, employer get notified. Robot also gather information by zip code and summarize the statics data of COVID-19 of that particular activity. This all possible because of information science and its process.

Advance Going- Analysis have shown through information science that this COVID-19 pandemic will go till December 2019 end, thus we need to take care following considerations-

- Easing work with social distancing
- Contactless commerce
- Pearson recognition while wearing masks
- COVID-19 app for privacy, gather information, tracking cases etc.
- Gather information and get updated through social media platforms.
- Robotics impact on companies
- Susceptible versus non- susceptible monitoring and its impact on the work place.
- Channing pattern of supply chain and its management to meet need and demand in this pandemic.
- Artificial intelligence application to manage the knowledge and information systems through science technologies.
- Computer generated communication tools to get connected to everyone and everywhere like workplace, online classes etc.
- Changing and developing work

Conclusion

COVID-19 that is coronavirus acknowledged as pandemic which is very serious and harmful virus spreading like fire all over the world. Started from Wuhan market of China and spreads everywhere and harmed many lives. Hence the world is completely dependent on the information technologies to manage the crisis situation. Much more research is essential to come up in information scientific domains which will be guided resources to predict such future outbreak in coming years. information science brings together and use the theories, techniques, technologies and principles of various disciplines toward the solution of information problem.

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CHAPTER-14

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CHAPTER-14

REBOOTING THE WORLD WITH INFORMATION TOOLS DURING COVID-19

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ABSTRACT

The present chapter envisions the influence of information technologies during the pandemic situation of COVID-19. The chapter makes important marking on different tools of information sciences employed in combating the situation. Among all the different sectors, information scientific domains is leading from the forefront ever since the first COVID-19 case was registered. The governing bodies like WHO is also greatly dependent on the techniques of information science and disseminates the accurate information across the globe. Based on these facts and consideration. The present study is presented to cite the technological advancement of information sciences and its role in rebooting the worlds activities to normalcy.

1. Introduction

The world has witnessed severe pandemic situation owing to the emergence of COVID-19, one of the novel member of corona viruses family. The impact of COVID-19 has ushered huge impact on all the spheres across the globe. At the same time world has witnessed rapid response against this virus attack and is bouncing back

with latest technological advancement. One such area which has burgeoned tremendous influence in combating the pandemic is the technological tools of informatics and computer applications which as greatly aided the WHO to rapid response in management of COVID-19. The role of information science cannot be underestimated in the current world wherein almost all sectors are greatly dependent on the online resources and with per click information at the finger tips. This has been successful with the untiring research and development in the scientific domain of information technologies. This the present chapter, we report and highlight some of the interesting tools playing significant roles in the current pandemic situation. Now more than ever, the technologies are ensuring the safety and security of the individuals and connects them with the world of information of their interest. Similarly, during the times of pandemic crisis, the information science coupled with telecommunication technologies are working well with the governing bodies to update the accurate information on the severity and the condition of the infected patients and forecasting the hotspots.

This can be cited with the development of different health care apps for example AROGYASETU which alerts the nearby infected patients and provide day to day updates on the happens of COVID-19 situation. This information is unleashing the power of communication technologies along with information sciences and are able to save many lives being infected for instance the WHO jointly with ITU has come up with the initiative of disseminating the health and infected messages with the subject of "BE HEALTHY BE MOBILE " this initiative works well even at remote areas and are able to connect with the health officials to track down the records during the survey process and prevent the infection rates. The health workers are utilizing the resources and coming up with the telemedicine process which can easily predict the patient conditions and triage them to connect with the nearby hospitals and triage them. Thus these efforts are clearly indicating towards the influence of digital world to cope with the impact of COVID-19 infections. In current world, the frontier technologies like artificial intelligence, big data sciences, machine learning, data mining tools are in leading from front to develop digital health solution and also predict the future hotspots and leverage the best possible solution to contain the infection rate [1-5].

2. Artificial intelligence

The use of artificial intelligence [AI] has grabbed wider attention in recent decades owing to its applications in different sectors of the world. One such area is use of artificial intelligences during COVID-19, wherein the health care authorities are well utilizing the principles of artificial intelligence to early diagnosis of the infection which aids in faster decision making and early treatment to save lives. The artificial intelligence can help in developing diagnosis and management platforms for infected patients by using the algorithms. Also, the use of AI is well documented in medical imaging process for instance in computed tomography (CT) and Magnetic resonance imaging to scan the human body in details and provide the accuracy of the disease. Further, neural network can help the health individual to diagnosis the patient with the visual features via contactless model, this can be very handy to health professional who can be protected from getting infected. The concept of AI can be utilized to track the infected patients from the healthy individual and identify the future hotspot and cluster spots. The AI can be also utilized to study the disease pattern of the virus by documenting the mortality and morbidity rates and their spread with the facts and parameters like geographical area, biotic and abiotic factors and predict the most vulnerable regions and individual thus acting efficiently to control the spread of the infection. The AI can aid in developing the best suited drug and vaccination process by accelerating the clinical trials and predicting the drug target molecule against the different components of the viral particles which can speed up the drug testing trails in real time and come up with the best drug candidate against the virus. [4-6].

3. IOT and Computing

The use of computing and internet of things can greatly work towards managing the spread of COVID-19, for instance, the can be useful in developing virtual business models as most of the companies and industries are working from home. This can cut down the reduction in human efforts to work on the ground and enables the business continuity with the physical presence of work forces. Further, the use of IoT and GPS enable the governing authorities to track the infected patients movement the countries are focusing on the Geofencing technologies by developing the tracking apps and wrist bands along with the unique QR codes. The development of 5G network based

connectivity using IOT principles to enhance the bandwidth in different rural and urban areas to connect with the people [1-7].

4. The automated and drone technology

At the contaminated zones, it is expected to have higher viral loads which can easily transmit the disease to the worker, hence the automated and drone technologies are being employed in place of humans which can work efficiently to sanitize the infected area for instance use of e-vehicles can be utilize to deliver the safe and facile route of spraying the disinfectants. Similarly, the use of drones can be implemented to sanitize the epicentre by spraying the disinfected using aerial route thus making it one of the ideal and safest route to clean the contaminated zones across the globe. Also use of robotic technologies can be handy to employed in the hospitals which are treating the infected patients, similar strategy was implemented in China to combat the spread of infection to the doctors and health care workers. The robots are the best replacement to the humans at the contaminated areas [5,6].

5. Web based learning tools

The pandemic situation has changed the functioning of the education system across the globe. The academic institutions and universities are operating online and are mainly dependent on the web based learning tools. One of the most popular application is zoom app which is the best way of learning and teaching the academic curriculum. In recent times of COVID-19, most of the scientific conferences and meetings are virtual based and happening using web based tools. Web based learning has been expanded remembering the pandemic limitations by a large portion of the training foundations. One of the best instruments for keeping a high pace of understudy maintenance alongside the upkeep of access to learning has seen to be that of an online course. There are colleges everywhere throughout the U.S, especially who have had the option to alter their projects as a reaction to that of the spread of Coronavirus. Though there is no replacement of traditional teaching practices but the use of innovative approaches are being implemented as quick response to COVID-19. The virtual curriculum is based on designing the remote learning process with learning models by using the digital content and resources [3-5].

6. The usage of online resources

The use of online resources is of ultimate choice during the pandemic situation wherein the different segments can be fulfilled it might be entertainment, connecting the loved ones, arranging the meeting, developing business models and many more. It has been estimated that during the pandemic time of COVID-19. The usage of internet has increased with almost every individual is directly or indirectly dependent on the online tools. People are using online sites for shopping the essential commodities, Large number of worlds population is on social networking sites to connect and expand their activities this might be in the form of entertainment by using tools like netflex, amazon primes and Youtube etc. At the same time usage of social platforms online like Facebook, VK, Instagram, Google, Yahoo etc, are estimated to be doubled compared to its previous algorithms.

7. Sensing and Monitoring

The use of sensing and monitoring has become one of the popular choices which are installed in the areas like hospitals, residential place, agriculture fields, warehouse, business places etc. which can be controlled and monitored with your mobiles and control the activity by minimal workload. This techniques are widely used in the remote areas and rural places which can provide the connectivity as per your needs without visiting the site you can easily monitor the happenings around.

8. Online and satellite tracking systems

In the situations like low network availability, the best alternative is the satellite tracking systems. This is one of the assets in tracking the movable commodities in logistics and transport systems. As there is shortage of supply chain process across the globe with most of the countries have stopped air cargo and sealed their border, use of local transport system is working with limited resources. During such circumstance, tracking of shipped goods are essential hence tracking systems are important.

9. Digital retailing

It is estimated that owing to shortage of supply process, there is great demand for the basic and essential groceries and medical supplies. During these tough situations, online merchants and e-commerce has gained popularity with chain stores working in US and Canada has estimated 80% increased in their sales. The online

resources like AMAZON is working towards fulfilling the ongoing demands and meeting the timely delivery of the ordered goods by using the local seller firms [6-8].

10. Chatbots

The use of chatbots are becoming the revolutionary in the digital world. It is an interactive portal which is replacing the humans to answer the slack calls during the pandemic times. Even the WHO and CDC are using the chatbots to address the queries and provide the accurate information. During the time of COVID-19, the extraction of scientific knowledge and reports on the ongoing clinical trails, updating the in-depth status of corona patients are highly important but to meet this demand, there is shortage of human work force, hence chatbots and robots are working well to replace and reduce the work load.

11. Bioinformatics

The use of information tools to serve in biology can be cited from past, but during the COVID-19 situation, when world is looking for the drug therapy and management. It is the bioinformatics platform which is providing the detail information about the novel corona virus with its morphological and molecular characterization. This information is highly essential to segregate the virus among its other family members. In the past decade the world has witnessed the emergence of other human infecting corona viruses such as SARS and MERS which had created pathetic situations. Even at present, the novel corona virus is also acting on the similar lines with much more infectious rate and spreading borderless across the globe. In order to contain this infection, use of bioinformatics tool is important which elucidate its identity with the previously reported corona viruses [6-8].

Conclusion

Overall the chapter highlights the importance of different technical advances related to information science and its influence on the world during COVID-19. The presented information is highly valuable in near future to bring back the normalcy. The chapter provides the importance of IT tools which cannot be underestimated towards the betterment of the society much more scientific research is awaited to expand the existing applications to other domains.

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CHAPTER-15

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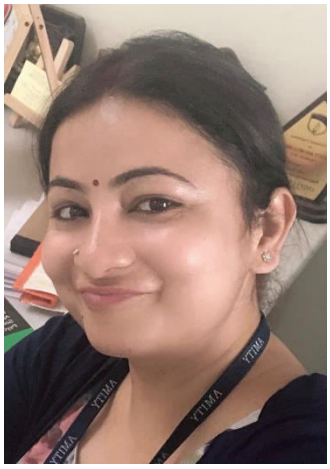

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CHAPTER-15

PSYCHOLOGICAL IMPACT OF COVID-19

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ABSTRACT

This chapter discusses the novel disease from its origin to its psychological impact on the different population around the globe. This pandemic not only changed the social norms but also changed the behavioural pattern of an individual. Insecurity, fear of contracting the disease, anxiety will leave its mark on the psychology of the human being. Losing jobs to fear of losing loved ones, social distancing has its own psychological impact on the population. This chapter will review the psychological impact of COVID-19 on different population and conclude with the number of suggestions which would not only help in overcoming the negative emotions people are facing but also help them in developing the positive well-being.

1. Introduction

The new coronavirus (COVID-19) is the deadliest and highly contagious respiratory disease that emerged at the end of 2019, in Wuhan, China affecting millions of people around the world, causing the World Health Organisation to declare a pandemic and an emergency across the globe. Since, none of the countries has yet developed a

vaccine for COVID-19, leading a feeling of anxiety and stress among people. The World Health Organisation has issued a guideline to manage physical and psychological problems that people are facing at the time of crisis. Considering the situation and crisis across the globe, helpline numbers and online counselling services has started by many NGOs and by many organisations to assist the vulnerable population. Many psychologists and mental health workers have also started writing blogs, columns and also started sharing on radio and television and on social sites how to stay positive and develop immunity and strength to fight disease, improving the well-being of the vulnerable class. As the COVID-19 cases are increasing around globe, stress, fear, anxiety and many psychological problems are also increasing which is natural and quite expected with the changing situations that people are finding themselves [1]. There is also additional stress of Social distancing, lockdown and extended lockdown which is also creating a long-term psychological problem among people. Self-harm, anxiety, stress, depression, insomnia, helplessness, separation anxiety, hypochondriasis, panic attacks, obsessive-compulsive disorder, fear of falling ill and dying, fear of being infected, loneliness, thinking of the past traumatic events or epidemic, restlessness, post-traumatic stress disorder, guilt, anxiety and prolonged grief are some of the psychological impact of COVID-19 on people [2].

After this pandemic gets over it will leave behind its mark in the form of some behavioural changes which are as follows: social isolation and decreased social networking, judgemental attitude towards others, mistrust, physical distancing with outsiders, an obsession of contracting the disease and washing hands frequently or frequent use of sanitisers will be seen. Flu-like symptoms will not be treated casual, avoidance behaviour will be on the rise causing lower self-esteem and constant worry that can impact the person problem- solving skills.

2. The Psychological Effect of COVID-19 on Younger Ones:

It is equally a tough time for children as well. They are likely to be experiencing constant worry, stress and fear, fear of losing their parents, loved ones, siblings, grandparents and oneself. They are also experiencing separation anxiety as they are not

able to meet their friends and get social support for good mental well-being. Child physical, psychological and sexual abuse is a matter of concern for the government. NGOs and child protection cell are continuously working on to rescue the vulnerable child who was not feeling safe in their homes. NGOs have also circulated a helpline number via newspaper, on the Facebook page, twitter, Instagram and also requesting adults to report the same if they encounter or notice such events in their neighbourhood or nearby places. Children have also developed many psychological issues like anger, loneliness, irritability because of the lockdown and have also experienced constant pressure from their parents who are staying in the house for the longest time, earlier child was not used to it [3]. Parents constant worrying about child usage of mobile phones has left them in pressure too. Simple strategies could help the child: Love, affection and attention to the child need and wants. Spending quality time with them, engaging them in purposeful work, maintaining daily schedule and being honest with the child what is happening around can help them to understand the situation. Parents need to behave pro socially and manage their emotions that can help the child to model their behaviour by looking at them.

3. Psychological Effect of COVID-19 on Older Population:

This is the most vulnerable population as far as COVID-19 pandemic is concerned. In the news and every single announcement by the community workers and even by the WHO members, they issued a warning for elderly people saying, they are ones who need to take proper precautions and care, because of their low immunity and number of health issues [4], they are the ones who will easily get infected and recovery is low, this could be a frightening and fear-inducing message for the elderly [5]. The psychological impact like constant anxiety about the family members staying far, anxiety for the future outcomes, fear of dying, fear of catching an illness, loneliness is very difficult for them to handle especially if they are suffering from dementia [6], Alzheimer or suffering from a prolonged illness, especially if they are bed-ridden, or if they are living alone, social isolation and loneliness could worsen the situation and can cause negative effect on their mental health as well [7]. Strategies that can save the mental health of elderly people are as follows: they

should focus on their diet. Meditation, while lying or sitting, will help. Stick to the routine, if they are the digital person they can talk to their friends and family members over a video call, engaging in purposeful activities will encourage them [8]. Spending less time on television could be an additional benefit [9]. Watching movies, songs can heal their mind and spread positivity around them.

4. Psychological Effect of COVID-19 on Women:

This is the population who is positive as well negatively charged with the COVID-19 pandemic. An expert believes that women's mental health needs to be a priority for the nation. On a positive note, women are getting family time with their children and spouse. Spending quality time act as a stress-busters for women. Whereas on the other hand, lockdowns and quarantine have increased the workload on women especially when all the family members are staying together and are home-bound and if women are menstruating or pregnant, lack of social and emotional support from the family will harm them psychologically and physically both. Depression, anxiety, lack of concentration, developing negative emotions about herself, sleep disturbance, constant worry about her future, self-harming tendencies, mental exhaustion, panic attacks could develop. There is another issue where most of the women during COVID-19 outbreak, faces emotional and physical violence in the family. Many women are isolated at home with their abusive spouses and in-laws causing an adverse effect of social-distancing on women's mental health. In India as well as in other countries commission for women has raised an alarm about the rising number of domestic violence cases since the lockdown began [10].

Lockdown may have caused women to live with their relatives or with the abusers in an unsafe place, many women have called their home an unsafe place to live in causing unwanted pregnancies, rape and sexual assault. It may create a long-term negative effect on their mental health which may develop self-harming tendencies and mental shock and mental trauma, distrust, lower self-esteem for which proper care and therapies from the expert is needed to lead a normal life post lockdown. The world is also witnessing an increase number of divorce cases among couples. COVID-19 have a devastating effect on

women worldwide. Gender-based violence and unwanted pregnancies (whether it is caused by marital rape, sexual abuse or lack of contraceptives) may have a devastating effect on the mind of the women or girls. Anxiety, self-harming tendencies, unmanageable post-partum depression, acute depression, sleep disturbance, lack of proper prenatal care and postnatal care can cause long term psychological impact on the concerned population. Many NGOs and women helpline numbers are working around a clock to rescue women who are suffering from such issues, they safely rescue the women and placed them in a temporary home and strict actions would be taken against the person involved in violence and abuse.

5. Psychological Impact of COVID-19 on Healthcare Professionals:

Health professionals includes doctors, care giving staff, ambulance drivers to sanitation workers those who are working endlessly day and night without break, and also bearing physical assault, social rejection [11] from the society for transmitting the disease have increased the burden of psychological trauma and negatively affecting the mental health of the people working day and nights without break, without meeting their families, maintaining social distancing with them [12]. Social rejection by the people for spreading of disease lead the medical staff on an additional anxiety and social isolation, constant worry for the self and family have put their mental health at risk and developing a new level of stress in them [13]. Mental health of the people working in a concerned area are least talked about. In such situations, where they are working as a counsellor, friend and caretaker to the patients as outsiders, families are not allowed. Sometimes to reduce the mental fatigue as well as physical stress, professionals started taking alcohol, eating less or more, taking pills to build their immunity. Psychological help is mandatory for them [14]. Respecting them, honor them for their hard work. Family should support them by checking on them on a regular basis [15]. Psychological aid should be provided to them as they are also facing the grief and emotional breakdowns. Talking to their children, and loved ones could help them in maintaining their positive mental and physical health both [16]. Psychological Burden of COVID-19 on Migrant Workers: After the outbreak of

COVID-19, lockdown and extended lockdown has created a loss of Job, food, shelter and induced a fear of contracting virus among migrant workers. Insecurity for their jobs, finance, fear of dying in an unknown city, fear of losing family are some of the factors creating a psychological burden on migrant workers [17]. Medical check-ups, Quarantine before reaching home is like an additional trauma for them. Suggestion could be: Respecting emotions of the migrant worker with dignity and help them in every possible way, helping them in reaching home, providing them with ration and proper food [18], and helping them with some finances are the areas which can relax them, at least on a temporary basis. Feeling of social rejection [19], depression and anxiety of losing work and insecurity for their future may rise as lockdown has extended.

6. Psychological Effect of Quarantine on People (suspected carrier of spreading virus):

Quarantine is the separation and limited movement of those who are exposed to a contagious disease and are risk of infecting others. It is an unpleasant experience for all who are experiencing it. Staying away from family and friends [20], restriction of movements, loss of freedom, anxiety and fear over blood sample status (whether it will come positive and negative, for how long I need to stay here) create negative effects on the mind of the people. Suicide, anger and fear of stigmatized by people are the factors which bring down the person morale, irritability, insomnia and lead a person to develop a negative self-image and also develop a tendency to self-harm [21]. A study reported that after the quarantine periods gets over, many participants started showing long term behavioural changes like avoiding crowded places, frequently washing hands, hand-shaking to physical distancing [22]. Psycho-educate them about telling why they are quarantined and how many days are expected, meaningful and transparent communication, and purposeful activities should be communicated to them by counsellors to reduce their boredom [23]. Providing all the necessary medical and household supplies will help, talking to loved ones over video and audio call will channelize their negative behaviour to a positive one.

7. Psychological Effect of Social-Distancing on People:

Along with the COVID-19, the most stressful thing people are currently facing is a "New Normal" living style, i.e. social distancing also known as physical distancing, and self-isolation which is mandatory by the government to reduce the spread of coronavirus [24]. Humans are social creatures, they tend to interact, socialise and share emotion with family, friends and near and dear ones. Once, this process is restricted by any other means, it will create psychological distress in human beings [25]. Nowadays video call, audio call, Face time everything is available, but physical distancing still causing nightmares, loneliness, anxiety and emotional turmoil especially to the vulnerable population that is elderly ones. Stick to routine, exercise and meditate regularly, stay in touch with family members over the phone, voice call, following passion like singing and painting will help in developing positive attitude and help in the fight with the disease. Limited use of COVID-19 news can also help in reducing anxiety and stress. Fear, anxiety and stress should be acknowledged and if it is interfering in a day to day life should not be ignored and in that case, seek expert help [26].

8. Psychological Effect of Rehabilitation on Recovered Patients of COVID-19 (Post Quarantine):

Recovered patients may have a feeling of guilty for getting the infection and spreading in the family or community. This may lead to a feeling of helplessness and anxiety. Their rehabilitation in the society is sometimes difficult, because of the stigma people have for the recovered or suspected individual. The risk of stigma occurs when people get confused between the virus and the individual. People need to understand precaution and six feet distance is important but avoiding individual and their family can develop a sense of rejection, a feeling of exclusion and can lead to a self-harming tendency in them.

Conclusion:

On a positive note, there are many psychological impacts of COVID-19 on people from insomnia to depression on every age group, class, creed, gender, religion, colour, race, language and borders. Practising meditation, yoga, breathing exercises will help in concentrating and focusing on the positive things around. Practice Gratitude. Grounding at the time of anxiety will help in controlling the emotions [27], walking in nature can help in reducing anxiety, stress and will enhance creativity and togetherness. Practise mindfulness. Spending time with family, shared household work between couples, respecting and acknowledging every emotion will help in developing a positive thought. When people face fear, or anxiety they can ask themselves a few questions as: Is there anything under my control? When I was stressed in the past, how have I managed myself? What are the things that can divert my mind and calm me down? Staying connected with others via phone call ,video call will also help in reducing the negative effect of COVID-19. Don't discuss disease and statistics, discuss happy events and memories, cooking, singing and playing games, spending time with yourself will keep the problem at bay. If negative emotions or feelings still persists in you, contact the expert and seek counselling. Apart from these, the technological upliftment can ease in combating the COVID-19 situation across the globe [28].

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CHAPTER-16

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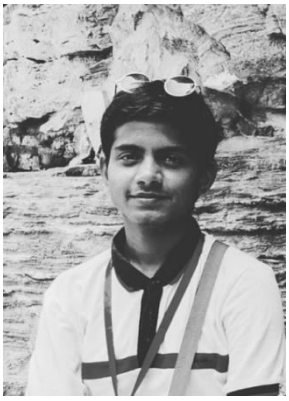

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CHAPTER-16

IMPACT OF COVID-19 ON AERONAUTICAL ENGINEERING

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ABSTRACT

The world today is experiencing what no one had anticipated as one of the worst pandemics of all time. Industries are struggling to stay afloat, given the uncertainty of when all this will be over. One such sector to be impacted is the aeronautical or aerospace industry. In the course of this report, we will be understanding what aerospace engineering is all about, its employment opportunities in the industry, and what impact COVID-19 will have in the short-term and mid-term. Many companies have diversified the use of their aircraft, drones, helicopters, etc. to stay afloat. What is noteworthy is that most of these companies cater to the military belonging to the Governments. The defence is a crucial element and key to a nation's survival.

1. Introduction

Aeronautical engineering, which is now popularly known as aerospace engineering is the field of engineering concerned with the development of aircraft and spacecraft. Branches of Aerospace Engineering. Aerospace engineering can be broadly categorized into two branches:

- **Aeronautical Engineering**

This type of engineering focuses on how certain objects fly within the earth's atmosphere and then apply that knowledge to plan and build aeroplanes, helicopters, fighter jets, missiles, unmanned aircraft, etc. The subfields in this engineering branch array from research and development, testing, assembly, and aircraft maintenance. The noteworthy is the fact that how interdisciplinary this branch is. It has elements of math, electronics, apart from other elements. It may comprise the maintenance of aircraft also. It also encompasses studying how the environment might be affected by the usage of aircraft, its potential risks, how efficiently does the aircraft use the fuel i.e. fuel efficiency and last but not the least systems efficiency. All of the above involves a deep-dive study of aerodynamics and propulsion (these subjects are also extensively used in the automotive industry; hence aeronautics engineers have a lot of scope in this industry too). Aerodynamics is the study of how air intermingles with solid objects. Propulsion is the study of how to generate enough energy to achieve and remain in flight.

- **Astronautical Engineering**

This branch of aerospace engineering focuses on the exploration of space flight and the delineation of spacecraft and satellites. This branch is quite technical and encompasses various disciplines and elements. The engineer studies how to best launch a space flight, developing systems to control the spacecraft apart from studying the environmental effect the spacecraft launch will have. Astronautical engineering is a relatively new field. The first spacecraft took off in the early 20th century. Did you know that mid-century rivalry between the United States and the Soviet Union to get to space first led to propelling scientific discovery and engineering design to the forefront? Similar to aeronautical engineering, this branch of engineering is based on concepts of propulsion and in this case astrodynamics. Propulsion involves the engine systems of spacecraft, which includes launch capabilities. Astrodynamics centres on studying trajectory and orbital patterns. Designing a spacecraft involves studying, manufacturing, and application of a spacecraft's body and systems. To successfully build a spacecraft, specialists from the department must work collectively and closely to give shape to an all-inclusive vehicle that can endure the

gruelling environment of space. You can build rockets that are used to launch space shuttles and satellites into space.

2. Satellites have multiple purposes:

- Directing television signals to your homes
- To take high-quality images of the earth
- Forecasting weather
- GPS satellites
- Military purposes (conducting recces or communicating securely)

3. Industry Application

The aerospace engineer's role is not restricted to the aerospace industry alone. Since this discipline is based on aerodynamics, they play a prominent role in the automobile industry too. The vehicles- like cars, motorcycles, ships, etc. are designed keeping in mind the optimum utilization of speed and efficiency. What's noteworthy is the fact that an aerospace engineer's role isn't restricted to only the two branches mentioned above. The mechanisms applied in the aerospace industry amalgamated with the automobile industry during the 20th century when the aviation industry was going through a lull. A few roles that an aerospace engineer can be employed in the aviation sector is that of either a crash investigator or performance analysts amongst others.

Here are a few representational areas in which the aeronautical engineer can be employed:

- Fuel efficiency testing
- Airframe design
- Flight testing
- Investigating aeroplane crashes
- Collecting information via test flights
- Overseeing the assembly of aircraft and missiles

The influence of aerospace technology has filtered down to many companies engaged in the research and development of flight simulation, robotics, drones, medicine

and other high-technology fields. There are two career options that you can explore as part of aerospace technology:

Design: A good illustration of designing involves developing aircraft wings on the computer and then using the computation of fluid dynamics, you can stimulate to see how it will respond to interactions with air.

Testing: Once the design team is done with designing the testing team needs to test how well the design will work given the physical conditions like air, pressure, etc. in the real scenario. For example, they can test it using a wind tunnel. They put the physical structure in a large tunnel and run fast winds through it to see whether it behaves as the computer simulation predicted. An important area of research in current times is - flexible wings (wings that can morph and change shape during flight). This is being investigated by NASA to increase the efficiency and performance of flights.

4. Future of Aviation

Unmanned Aerial Vehicle or UAV or more commonly known as a drone is the future of aviation. This type of aircraft minus a physical pilot's presence onboard is fast gaining popularity. They are quite resourceful in military operations that are considered rather dangerous or murky or not worth the human effort. An unmanned aircraft system or UAS includes- UAV, controller which is ground-based and a communication system to communicate between the two. UAVs can be operated either by a remote control which is handled by a human or independently by onboard computers. As technology advancements take place, the human's roles have to evolve too. While handling UAVs or drones you need to be able to collect and process data and then present it. You need to be able to manage projects exuberating dynamic leadership through and through. Drones were originally used for military purposes, but over the years their use has widened into other industries and niches like- agricultural, commercial, recreational, surveillance (widely used during the coronavirus pandemic), aerial photography, smuggling and drone racing. Ironically, the usage of UAVs in commercial space has outnumbered its usage in military activities. Drones can fly beyond the visual line of sight (BVLOS). Commercial industries have maximized on this capability and increased production. This has also lead to reduced

costs, risks, ensured site safety and regulatory compliance. Dependability enhancements target all aspects of UAV systems, using resilience engineering and fault tolerance methods.

5. Impact of COVID-19 on Aerospace Industry

As 2019 came to an end and the new year started, the global economy was in for a rude shock. Coronavirus or COVID-19 as it is famously known as now forced the global economy to come to a complete shutdown. Governments across the world enforced a lockdown so severe, that many companies had to shut shop. Only essential services were allowed to function. Travel across cities, states and countries were banned. The aerospace industry took a massive hit. Companies across industries have adopted new remote work technologies and procedures to limit the impact of the virus on the economy and their employees. Most recently, in the wake of the coronavirus pandemic, usage of drones has ensured the safety of the human workforce. Companies manufacturing drones even discovered new ways that they can be deployed to combat viruses. The police force used drones to survey humans from a distance and this led to controlling the pandemic to a certain extent. Since drones can be remotely piloted, human interactions become minimum, which is critical when the very officers meant to guard the communities can potentially become transmitters for the virus to spread.

6. Inspection and Broadcast

Drones have become effective tools to sieve through complicated dense urban areas and communicate with the public. These machines have ensured efficient scanning and if required broadcasting important messages such as- wear your mask, timings of the curfew, where the essential goods and services will be available, etc. All along keeping the police away from coming in contact with infected people.

7. Delivering Essential and Critical Supplies

Governments are trying to deliver care packages and food via drones. This helps in encouraging citizens to stay at home. Although, delivering via drones aren't full scale yet, since the global tests (using drones) have only been conducted in the USA and the Dominican Republic, they have proved to be an effective and efficient way of delivering

lifesaving medical supplies. Drones can be modified with a payload drop mechanism. The maximum load that they can carry is 6 Kgs, without risk to both parties. This is most helpful in containment zones where no outsiders are allowed.

8. Sanitizing Common Zones

As information is being shared across the world amongst health officials, evidence states that virus can survive on doors, chairs, etc. Public spaces, as well as doors and corridors where residents reside, are being sanitized every two weeks using drones. The drones used in farming for spraying pesticides over the farmland are now being used to spray disinfectants over public spaces, house doors and common areas. These drones can cover 100,000 m2 in an hour with a tank capacity of 16L.

9. Measuring Temperatures

Supermarket to apartment complexes to hospitals, you name it and they have implemented temperature checks for the visitors. To limit the exposure of security guards to the virus, some of them are using drones armed with infrared cameras to take temperatures. With proper calibration, these drones can do the job. In commercial aviation, a lot of the companies are experiencing a disturbance in production and demand slowdown as workers are heading home given the uncertain future. Passengers have stopped travelling, leading to a slowdown in air travel which has had a cascading effect on demand for maintenance and spare parts. Manufacturers of aircraft, helicopters, automobiles are capital intensive by nature, hence triggering short-term anxieties about cash flow and liquidity. Defense contractors aren't majorly affected when it comes to short-term and long-term as they are better positioned. Despite production slowdown, demand will most likely not be affected over the next two years since budgets for projects were allocated much before the pandemic. Another major reason for the projects to be not affected is the fact that they are quite important and play a major role in the defense sector.

Conclusion

While these are unprecedented times, industries and sectors around the globe are trying to innovate how their products, services and machinery can be used. Boeing, for

example, is using its Dream lifter to transport urgent supplies to healthcare professionals across the globe; shipping masks and other equipment to the impacted areas. They are working with various stakeholders like- industry experts, passengers, global regulators, etc. to establish industry-recognized safety rules and regulations. They are also advising operators on the approved disinfectants to be used aboard the flight decks and cabin. Enhanced cleaning, rigorous temperature checks are helping maintain cabin cleanliness. High-Efficiency Particulate Air (HEPA) filters are 99.9+% effective at eliminating viruses, bacteria and any other contamination before the air is re circulated back to the cabin.

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CHAPTER-17

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CHAPTER-17

IMPACT OF COVID-19 ON ACADEMICS AND RESEARCH

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ABSTRACT

The present chapter focuses on the impact of COVID-19 on the activities of academics and research. The emergence of sudden pandemic outbreak of COVID-19, there has been completely paralysis of worlds activities. Majority of academic institutions are working online and research institutions are partially shut down in order to prevent the infections among the colleagues and workers. Keeping these points, the present chapter is designed to report the impact of COVID-19 and their influences.

1. Introduction

College campuses and universities are the places where a student lives and studies within close proximity of one another. These are also the buzzing hubs of a culture where the students have been brought together from different nations all across the globe (Surveying the impact of COVID-19 on Africa's higher education and research sector, 2020). As of recent times, the foundation of such a unique ecosystem has been impacted severely by that of the rapidly spreading COVID-19 or novel Coronavirus. This has created a lot of uncertainty in regards to that of the repercussions on higher education. It has severely propelled research however in regards to coming up with a vaccine that can cure the disease. In the past couple of months, officials in relation to education are being forced to be cancelling their classes and closing the campus doors all over the world as a

response to that of the growth in the outbreak of Coronavirus. Additionally in institutes of the U.S classes are being switched to being online in order to catch up with the learning (The impact of COVID-19 on student achievement and what it may mean for educators, 2020). The students are heartbroken over their spring breaks and trips getting cancelled as the students who are currently students in South Korea, China and Italy have been officially requested to be going back home for the completion of their studies. There are tremendous closures of classes along with dips in the enrollment, from that of the beginning of the brand new semester. The cancellations could be temporary and it is very hard to be able to foresee if the Coronavirus breakout will be resulting in a long-term inconvenience for that of the system of education. Impact on education also makes a huge impact on the economy and this is the main concern for this sector. They are wondering as to what will be the rate at which international students who consist of the markets of higher education that is domestic. Speaking of America alone, there are Chinese students who make up about 33.7 per cent of that of the foreign body of students along with 18.4 per cent of Indian students. There are serious travel restrictions from and to that of China which are helpful in the slowdown of the spreading of the disease leaving the foreign students to be stranded. As per the Institute of International Education (IIE), there are surveys being conducted that state that about 830 of the Chinese students have not had the chance to go back to America in order to attain their degree. This is, however, a very small number. The economic downturn that is inevitable intensifies if the number keeps increasing. The question that comes up is for what length of time this will go on and it remains unanswered. The restrictions are making sure that the economic downturn is called out to be the fault of America once it starts to happen. It is a lot of trouble retaining enrollment of student program while providing accessibility to the students in the wake of this crisis [1-3].

Online learning has been maximized keeping in mind the pandemic restrictions by most of the education institutes. One of the most effective tools for keeping a high rate of student retention along with the maintenance of access to learning has seen to be that of an online course. There are universities all over the U.S, particularly who have been able

to adjust their programs as a response to that of the spread of Coronavirus. The University of Stanford has cancelled the remnants of the 2 weeks of lectures to be held in classes encouraging the professors to be moving the remainder of the lessons online. The Washington University has announced a campus-wide ban on the classes to be held on campus until spring break is officially over and the staff members have been diagnosed with the disease in the past week. There are also other universities like the Hofstra University in New York, Princeton University in New Jersey along with Seattle University who has started making a move by shifting to that of virtual classes.

There is a maximum of colleges along with universities all around the world who have integrated one or the other form of education online into that of their coursework while having moved all the programs online is definitely a matter of feasibility and a challenge. There are some universities that have already online systems which are very strong but smaller universities are struggling to meet the need of the hour and succumbing to pressure [4]. The course creators of a university have to be working closely with that of their IT facilities so as to ensure that their programs can be supported virtually or online. There is one university that has currently undertaken all of the measures in Southern California and that is their bespoke university. They are currently testing the waters by trying to channelize their online platforms so as to ensure that their technology will be able to handle more than 7,000 of its lectures. Online learning is the best method for now as proven however the universities should additionally ensure the staffing and students are well-protected while they are on campus. COVID-19 is a great amount of risk for individuals who are over the age of 60 however the traditionally aged students of universities are facing lower risks from that of the disease [5]. In a recent few weeks, it has come to light that the novel virus can be spreading really quickly in an area having a higher concentration of population with the university campuses being no exception to that rule. The administrators should be undertaking simple measures so as to prevent spreading of the virus on the campus. There should be a strict following of instructions in the form of education regards to the protocols which are appropriate for the washing of hands, covering of coughs and sneezes with elbows and self-isolation if someone is

experiencing a cold or flu-like symptom. The educators should also bring these guidelines to the awareness of the students who have been travelling extensively throughout their spring break and reminding those of who have spent time abroad in places that are greatly affected to be minding hygiene habits if at all it is safe to return to campus.

The students who have a disability are the ones who are affected the most since they are in the requirement of some specific support along with that of teaching tools which cannot always be available in the distance learning mode. The chairs of UNESCO at that of the University of Padua in Italy along with the University of Zagreb in Croatia have reported some specific actions that have been set in motion by the host institutes [6]. Ever since the rector has announced in regards to distance learning the e-learning Center within the centre for computing in the University of Zagreb has monitored and supported lectures implementing the guidelines of teaching courses online. Inclusive learning that is in the distant mode ensures that the lecturers have been called forth to be applying specific recommendations and instructions like that of the guidelines that have been developed by that of the Office for Students with Disabilities [7]. This office had been established in the year 2007 has the aim to give an equal opportunity to the students who by sheer dint of their illness, disability or impairment are facing difficulties in the fulfilment of their day-to-day academic obligations. The Inclusion Office of that of the bespoke university at Padua had sensitised all of the lectures that offer classes online to that of the student's needs for the ones having a hearing disability that is the ones who would normally benefit from services of stenotypes. It has further been published on the website that there are specific guidelines on the ways of making tools for that of special teaching, such as PowerPoint presentations and videos that are accessible to the students with visual and hearing disabilities.

The endemic of Coronavirus has grown exponentially since the first phase of its outbreak all over the world. Doctors, technologists and researchers worldwide in collaboration with workers for healthcare have worked night and day for the developing of medicines and vaccines so as to treat and control the virus [8]. In light of the present situation, it is of utmost importance that people make adequate research on the topic

since SARS-CoV-2 is very lethal and infectious. The disease is highly contagious as people in even the most advanced countries are dying of the same [9]. This is an ideal opportunity for research to be conducted on the same, both practical and theory-based so that the virus is eradicated like the Spanish Flu of the 20th century. The cost involved is however very high and cannot be sustained by that of the wealthiest of nations. It has already come to light that several corporate houses and research laboratories that are large have been working as speedily as they can so that they are able to develop a vaccine or medicine for that of the preventing and the treatment of the same. Ever since The World Health Organization (WHO) has declared that the disease has reached pandemic levels on the 11th of March 2020, it has suddenly become very important to study and identify the areas of research made academically that can be affected by the disease.

Even after a lot of research scientists have not been able to identify the animal source of the agent that is infectious enough to cause a pandemic. It is also yet to be declared if the virus has a likeness with influenza and will recede with a change of seasons [10]. It may also be reemerging seasonally and the future global manifestations maybe even more virulent. Apart from that of development of the vaccine, the virus has also opened up avenues of research in the areas of therapy or medications [11,12]. There is also a specific need for Equipment and healthcare along with research on the lines of medication and therapy. Researches are also being thoroughly conducted on the norms of social distancing during the pandemic. The economic, environmental, sustainability, psychiatric sides are also being studies as well as monitored however most of the researches are based on the emerging of the new working culture alongside that of the workplace along with the revolution in the Information Technology or IT [13]. There are also other researches being made on the lines of online awareness workshops and that of capacity building, biological warfare, psychological issues, industry 4.0, the growing importance of having a life at home, global commerce and trade, chains of medical supply, Policies of Public Health. There is the requirement of immediate research for the sake of the revival rather that of the survival of the global economy. As of now, the topic is being embraced with a lot of jitters since it is a hefty and exacting topic [14].

2. Conclusion

The colleges and the universities are still yet to be implementing the changes to that of the campuses as a response to that of the massive outbreak of the coronavirus by taking cues from the others that have taken actions already as appropriate. They are expected to be analysing each step that has been taken by another educator so as to understanding it is working or not and in what ways to be effectively tackling any hiccups they may be facing along the way. The spreading of that of the disease is expected to be worsening even before they get better as the administrators should be taking quick actions for the safeguarding of the campuses along with the students preparing for closing that is imminent. The sector of higher education has withstood a lot of terrifying hurdles in the past along with tragic economic crises. In the world of rampant digitisation, colleges and universities are altogether better placed to be providing their students with easy access for the continuance of barrier-free studies online.

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CHAPTER-18

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CHAPTER-18

INFLUENCE OF COVID-19 AT GLOBAL LEVEL

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ABSTRACT

With the wake of the Coronavirus pandemic, the scenery of the world has grown to be changed as duly noted by WHO or that of the World Health Council. They have also stated that there are reported to be a loss of over 500,000 people of the world population by death due to disease Coronavirus Disease COVID-19 events as they happen, 2020. The impact is however much more than this, as will be explored further in the essay. As of the first of July 2020, it has been reported that the treatment and prevention of non-communicable diseases or NCDs have been badly interrupted ever since the pandemic began.

1. Introduction

The aforementioned survey that had taken into account a total of 155 countries within 3 weeks of May has confirmed that the result is prevalent globally and countries with lower GDP or Gross Domestic Product have been the most affected by COVID-19 significantly impacts health services for non-communicable diseases, 2020). This situation has worried the medical world since the general population who are living with non-communicable diseases are at risks that are higher with relation to death and illness. The survey results have brought to light what the official bodies such as WHO have heard for quite a few weeks as per Dr Tedros Adhanom Ghebreyesus who is the present Director-General of the body of WHO. There are people who are in the need of treatment for a

disease such as diabetes, cardiovascular problems along with cancer [1]. They are yet to be getting the medicines and the services that they need since the onset of the pandemic. Countries are still fighting to find a way so that the services that are essential can be gotten through to those people in need.

One of the major findings is that the health services are completely or partially in a state of disruption in most of countries. There is 53 per cent of the countries that are facing complete disruption of services for the treatment of hypertension. 49 per cent of the countries have undergone partial or complete disruption in the arena of diabetes-related or diabetes cases, 42 per cent for the treatment of cancer along with 31 per cent for the emergencies of cardiovascular services. The services of rehabilitation are disrupted in about 63 per cent or two-thirds of the countries under the purview of WHO. Rehabilitation is, however, one of the key paths to recovery after one has been struck down by Covid-19 [2,3].

The major parts of the countries have responded to the ministry of the health staffing who have worked within the areas affected by NCDs and have been fully or partially reassigned for supporting the outbreak of the disease. The postponing of that of the screening programs for the public, as in for cervical or breast cancer is also widespread and have been reported to be there in more than 50 per cent of the countries [4,5]. These occurrences have been consistent with the initial recommendations of WHO for the minimization of non-urgent care that was facility-based during the COVID-19 crisis. However the most common of the reasons for the reduction or discontinuing of services was that of the abatement of the planned treatments. There is also a lack of proper functioning of transport and an overall lacking of staffing since the health workers are being reassigned for the full-time support of Coronavirus services. In about 20 per cent of the countries that have reported disruptions the main reason for the aborting of services was the scantiness of medicines, other technologies and diagnostics.

There is unsurprisingly a correlation among that of the levels of disruption in regards to the services for the treatment of NCDs along with the evolution in the outbreak of the COVID-19 crisis. Their services are increasingly being disrupted as a

country is moving from cases that are sporadic to transmission as a community of the deadly virus. There are globally about two-thirds of the countries that have reported that they have included services for NCD amongst their nation-wide response and preparedness plans. 72 per cent of the countries with a higher income have been reporting on inclusion as in comparison to the 42 per cent of the countries with a lower income. There are services that have addressed cardiovascular diseases, diabetes, cancer along with that of the diseases of chronic respiration being added the most frequently with the commonly seen exclusion of tobacco cessation, rehabilitation and dentist services. 17 per cent of the countries have reported having started allocation of additional funding from that of the budget of the Governments so as to be included within the provisions of services related to NCD within the national plan in response to COVID-19.

There encouragingly certain findings through the surveys that have reported that alternative strategies having been established within most of the countries so as to be supporting people being at the highest risk so that they are able to be receiving some kind of treatment for incommunicable diseases. There are also countries which have reported disruptions of services at the rate of 58 per cent in countries where telemedicine is now being used. The advice online or by telephonic means have had to replace consultations in-person in countries with a lower income group at the rate of 42 per cent. There has been triaging done so that policies are able to be determined along with priorities that have been used widely that is in two-thirds of the countries that have reported. It is also encouraging to see that greater than 70 per cent of the countries have reported the collection of data based on the total number of patients of Coronavirus who were also having NCD [1-6].

It has however been assured that it will take some time to know about the entire extent of the effect of the disruption to that of health care amidst the COVID-19 crisis of that of people having an NCD. This has been said by Dr Bente Mikkelsen who is the Director of the Department of non-communicable Diseases at the WHO [4-7]. What is now known is that not only the people having NDCs are more vulnerable to be falling seriously ill due to the virus but there are many who are unable to be accessing the kind

of treatment that they may need for the managing of their illnesses. It is of utmost importance that not just people having NDCs are included within the national preparedness and response plans for that of COVID-19 but the finding of innovative ways for the implementation of the plans matter too.

During the lockdown, all of the domestic flights along with railway services except the goods trains, trucks, buses along with other vehicles and transportations have been suspended with the special exemption to the ones who are associated with commodities that are essential. In all the countries struck down by the disease the facilities of education, commerce, spiritual institutes along with that of sports are closed. There are industries that have suffered tremendously and have gone under a total closure with the exception of the products that are essentials. The people who are belonging to that of the transportation and tourism industries have faced major losses among other difficulties. The levels of production have dipped to being below normal. The powerful economies of many countries are under threat of ensuing inflation which will be high along with mass unemployment which will be the result of a lacking in productivity along with an excess of expenditure for that of the rehabilitation and treatment of the Coronavirus victims with their families.

The lockdown has directly affected the GDP of every country in that of the major part of economics. For every month there is an approximate losing of 2 per cent of points in the annual growth of GDP [6-8]. The sector of tourism alone is facing a decrease in output which is as high-up as that of 70 or 50 per cent. According to that of the WTO or the World Trade Organisation and the OECD or the Organisation for Economic Cooperation and Development the pandemic is the largest global threat to the economies since there had been a financial emergency in the year 2008-2009. There are experts who have said that the civilisation of humans has not faced such unprecedented emergencies since that of the Second World War. The COVID-19 pandemic has without a doubt put forward a very regressive effect on that of daily living of that of the whole human society along with the economy of the world.

The COVID-19 crisis has also had an effect on the world environment. It has been seen from the very beginning that humans have selfishly manipulated nature for their own benefits [7-9]. In order for the satisfaction of the demands of the increased population, urbanisation and industrialisation have become the norm with it being detrimental to the environment. There were already many concerns about the environment such as the pollution in the air, changes in climate, depletion of layer of ozone, global warming, lowering of water level underground, changes being recorded in regards to ecosystem and biodiversity along with that of arsenic contamination among others [10]. Global warming is the proven result of that of the increased concentration in GHGs or greenhouse gases. In the desire to be driving nature according to one's own desire and whims the humans have destroyed nature in a million ways. This was an inevitable consequence of the pollution accumulating in the environment which is one of the biggest issues of today.

The outbreak of Coronavirus is albeit unusual and almost all small and big cities along with villages within the countries that have been affected like that of Italy, Taiwan, China, Spain, France, USA, Germany, Iran, Turkey, India, the U.K, South Korea, Australia etc is undergoing partial or total lockdown for that of a long period of time going from that of a few weeks to that of a few months as well. All centralised and local administrative systems worldwide have been putting a ban on the free movement of citizens when outside of their homes so that community transmission is avoided. There are many cultural, religious, social, cultural, sporting, science and political programs and masses which have led to be cancelled like the Olympics and Hajj etc [6-9].

There are many kinds of industries which are also not functional like that of the travel industry. In the meantime, there are efforts made for the restriction of transmission of the COVID-19 virus by the restriction of movement having a longstanding effect on the environment. Due to the ill-functioning of various industries, the tremendous emission of wastage has been taken control of to that of a great extent. Vehicles can hardly be seen plying on the streets anymore that is resulting in about emission that is as low as zero. 2020 has seen a reduction in GHG emissions and tiny toxic particles that are suspended in the environment. The demand for power is not overbearing and the lower demands have

reduced usage of conventional energy and fossil fuels. There are ecosystems which have partially recovered due to lesser commercial activities. There are many major cities of the world that have reported seeing the skies clearly for the very first time in the history of their life. The level of pollution in a tourist spot like a sea beach, a forest or a hill trail has reduced considerably [10-12].

Conclusion

There are lives lost due to Coronavirus that have created an irretrievable void in society. It has also seriously demobilised the economy reaching worldwide. This has resulted in countries restricting further transmission within communities by undergoing a complete lock-down. Other problems have also been reported as the major flights which are international along with other types of business transportation have been placed on hold in different countries. All in all, the countries have to be ready so as to be building back better and the strengthening of the services in order to have better equipped for the care provision, diagnosis and prevention for that of NDCs in the near future, given any circumstance.

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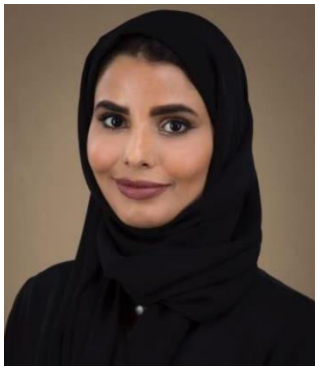
CHAPTER-19

AUTHOR'S INFORMATION



Dr. Hessa Al Kaabi has obtained her doctorate degree in Business Administration from Swiss Business School, Switzerland. She has also completed Diploma of Future-Foresight from Prime Minister Office, Dubai. She has enriched her skills in leadership by completing Diploma in Leadership from Cambridge University, UK. She has also completed her master's degree in Management with specialization in Marketing.

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CHAPTER- 19

INFLUENCE OF COVID-19 ON BUSINESS, MARKETING AND SUPPLY

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ABSTRACT

The present chapter is based on influence of COVID-19 to the business, supply and marketing. Most of the business organization has been influenced by the emergency, the intended depth and nature of its effect contrast by firm size. Based on this the first part has associated with the influence of COVID-19 to the major business place and from the next parts onwards the assignment critically evaluated the influence of COVID-19 for both marketing and supply chain management point of view.

1. Introduction

While the statistics on the COVID-19 disease show contrasts across nations and worldwide country, different deep economy based consequences results of the wellbeing emergency are undoubtedly. Accordingly, monitoring scale, little and medium-sized business organization (MSMEs) are enduring far and wide, remembering for geographic areas not yet clearly influenced by the infection itself. On April 20, the International Trade Center (ITC) executed an exceptional study to quantify the effect COVID-19 has on private ventures. Here are the outcomes from the primary influx of information dependent on the reactions from more than 1,200 organizations in 109 nations and gathered between 20 April and 4 May.

2. Influence of COVID-19 in Business

✓ **The crisis is influencing organizations over all the Regions**

The pandemic has firmly influenced most by far (60%) of the organizations met. While private ventures feel the impact over all districts, African organizations appear to be hit the most: three out of four talked with organizations see serious results [1]. Measures to contain the infection, for example, lockdowns and isolates, have had obliterating repercussions for business tasks and disturbed many existing neighborhood and universal worth chains. Reviewed business supervisors report their deals having altogether diminished and that getting to inputs has gotten progressively troublesome. At the end of the day, organizations face challenges both on the interest and on the gracefully side.

✓ **COVID-19 influences business activities Worldwide**

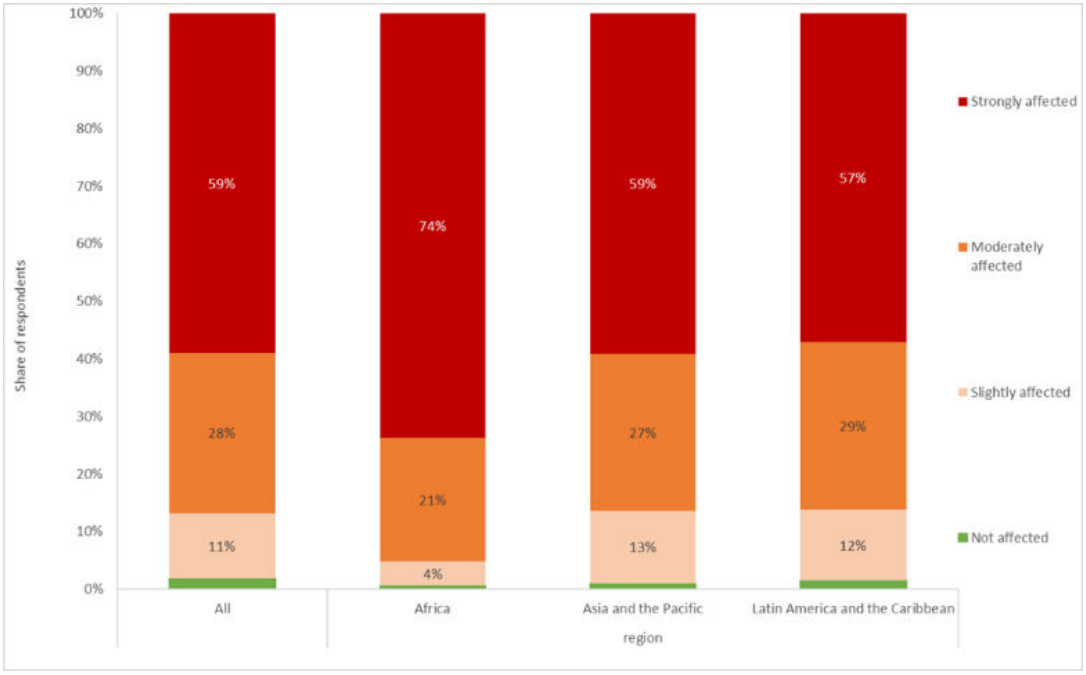

Figure 1: Impact of COVID-19 on Business (Survey Analysis)

Respondents were asked 'How have your business activities been influenced by the corona virus (COVID-19) pandemic ? and 'Which nation is your organization situated in ? Data has gathered on 1201 organizations in 109 nations. Just areas with in excess of 150 perceptions are remembered for the diagram.

Small Business faces higher danger of permanent Closure

Survey findings discoveries show that 66% of small scale firms are unequivocally influenced by the emergency, contrasted and 42% for huge organizations. The impact on smaller scale, little and medium-sized ventures is particularly serious, incompletely on the grounds that they are overrepresented in segments most unequivocally hit by the emergency, for example, convenience and food administrations, or discount and retail services [2]. Based on this particular pandemic attack small business organization are especially helpless: they will in general have less resources and constrained money stores to cushion the lockdown-incited liquidity deficiencies. Overview discoveries affirm the degree of this weakness, with around one out of four miniaturized scale, little and medium-sized ventures in danger to close down for all time inside the following three months. This features the requirement for governments to act quickly in all possible case scenarios.

Issue Face by Smaller Business Organization

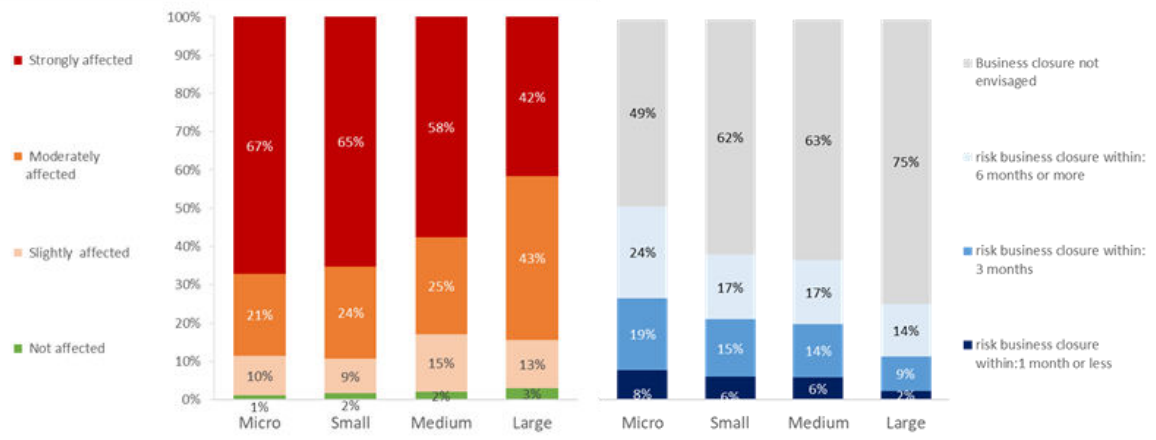

Figure 2: Survey Analysis

Respondents were asked 'How have your business tasks been influenced by the corona virus (COVID-19) pandemic?', 'Do you think there is a hazard that your business will forever close down as a result of this emergency, and provided that this is true, when could this conclusion happen?' and 'What number of full-time representatives does the business have?' Data has been gathered on 1201 organizations in 109 nations. Accessing Information about business is the main factor. For organizations to profit by help

programs set up by governments, straightforwardness and access to data are critical. It is subsequently irksome that half of the overview respondents thought that it was troublesome or exceptionally hard to get to data and advantages from government help programs identifying with COVID-19. Additionally, even with little ventures requiring support the most, they are frequently to the least extent liable to profit by these upgrade bundles: our outcomes affirm that littler firms think that it harder to get data and advantages. Governments, once COVID-19 related help programs are set up, need to guarantee quick access to such projects with straightforward methodology.

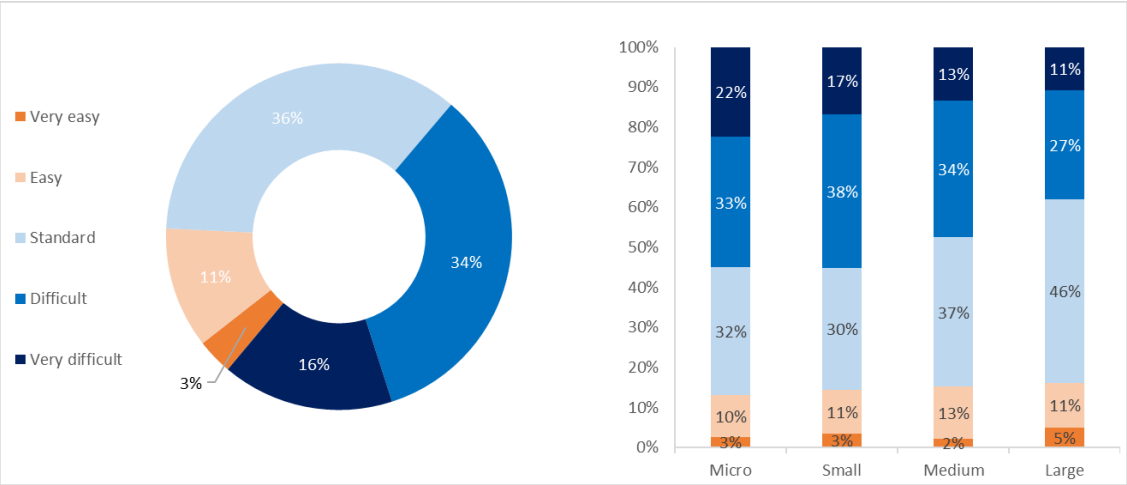

Figure 3: Accessing Information by Government Intervention

Respondents were asked 'How simple is it to get to data and advantages from government COVID-19 related SME help projects ? and 'What number of full-time workers does the business have?' Data has been gathered on 1195 organizations in 109 nations. Small business organization makes up over 95% all things considered, representing roughly half of significant worth included and 65% of all out work, when both formal and casual organizations are taken into account [3]. A broad breakdown of miniaturized scale, little and medium-sized ventures could directly affect national economies and worldwide development possibilities. In their reaction to the COVID-19 pandemic, governments ought to organize approaches that help independent ventures. The International Trade Center stands prepared to help these endeavors - and its COVID-19 Business Impact

Survey is one of such endeavors: we depend on the current and up and coming outcomes gathered under this review to advise the important help from national governments and global funders.

3. Influence of COVID-19 in Marketing and Supply

The COVID-19 outbreak has disturbed individuals' lives just as organizations that can different kinds of challenge for their new business setup and in the marketing point of view. This emergency has changed the business scene, and the phenomenal outcomes are looked about the world. No business or market has been left immaculate. Luckily, everything isn't lost. With interruption comes development openings and systems to beat difficulties [4]. Emergency times power organizations to get keener, more imaginative, and more effective than before strategies during emergency. With the correct outlook, you can utilize the emergency to your advantage and discover future key plans to cause your organization to flourish. The mystery lies in understanding your market and clients to distinguish new chances to take your business to more significant levels of accomplishment.

Impact of business organization Marketing and Sales Funnel

Things are hard at the present time and will be for some time. Most businesses are enrolling low transformation rates. In the movement ventures, for instance, things are awful, with Delta Airlines losing $60 million every day. By and by, despite the fact that purchasers are not accepting at the present time, they will do as such later on. Along these lines, it is best practice to change your advertising and deals channel to oblige this new reality. Uncommon proposal during crisis Offer your crowd something free during these hard monetary occasions: free preliminaries, free courses, or free meetings. Furnish them with more substance and even give them premium substance for nothing. By offering steady and top notch substance to your clients, you manufacture trust, interface with your crowd, and increment brand mindfulness [5]. Business organization additionally empowers changes since shoppers have the data they require to settle on educated buying choices. Computerized advertising masters, HubSpot, and Neil Patel are driving the route with complimentary gifts and limits. Neil Patel is offering Ubersuggest premium highlights for nothing while HubSpot is surrendering out to half limit on their foundation.

React to the COVID-19 Crisis

An ongoing report by the American Association of Advertising Agencies uncovers that 56% of shoppers are cheerful that brands are helping in the COVID-19 pandemic. While a few brands are supporting influenced networks, others are offering the genuinely necessary assistance in social insurance establishments. They are giving levity, alleviation, and assets that the individuals who need them most. A decent number of organizations are reacting to the COVID-19 emergency with extraordinary offers, new administrations, exceptional asset pages, and other supportive methodologies. Here are a few models. Sisense is helping clients and networks battle COVID-19 with investigation. It is offering alleviation bundles for clients, free investigation, proficient administrations, and vital counseling. HubSpot has presented a few help measures and assets to support clients and networks adjust to these difficult occasions [6]. Among them incorporate new substance arrangement, showcasing and deals benchmark information, and a HubSpot people group for individuals to associate with similarly invested experts all around. Quasar is helping clients during these seasons of battle by offering help on business progression. By growing its assembling limit, the organization is helping clinical gadget firms that are confronting difficulties meeting creation objectives.

Content Marketing to Ugrade Business

As of now, social distancing is the new standard. Considerably after the emergency is contained, separating between individuals will remain with us. To handle the removing, numerous individuals go to the web to learn. Likewise, individuals despite everything need to explore items and administrations online before they contact an organization. Another incredible promoting technique guide to endure this emergency is to put more in teaching clients. It will offer an extraordinary open door for organizations to associate with clients and manufacture solid relations. The following are a couple of methods of instructing your clients; . Neil Patel's Ubersuggest is a prime case of an online device that creates catchphrase thoughts for customers. Likewise, HubSpot exceeds expectations in making on the web apparatuses for its clients. Its free Blog Ideas Generator gives clients various blog entry thoughts like a flash.

Virtual Events

We are dubious when genuine occasions will be back in our lives. Nonetheless, because of innovation, you can have a virtual occasion. Virtual occasions happen on the web and are not confined to a solitary territory. With web network, you can take an interest in a virtual occasion from anyplace around the world. Virtual occasions are priceless for organizations during this emergency for a few reasons. To begin with, you contact a more extensive crowd since individuals can participate from anyplace on the planet. Second, virtual occasions are less expensive to hold – you don't need to acquire the expenses of booking a scene and employing an occasion organizer [7]. Third, these occasions are quantifiable – you can decide what number of individuals joined in, their living arrangement, which meetings were well known, and how the participants paid for their tickets.

Industry Trends

The COVID-19 emergency has influenced numerous businesses. These businesses need to rehash themselves for what's to come. The travel industry, for instance, can investigate alternatives like virtual visits or 3D visuals of traveler places. Organizations that neglect to rehash themselves will be expelled from the market. To develop victors in this emergency, endeavors must consolidate flexibility and nimbleness. They should figure out where they ought to be solid, and where to be adaptable. Along these lines, a decent advertising technique model is to analyze your industry to distinguish the new agonies your clients might be encountering [8]. It will offer rewarding open doors for your business to use. Here is a viewpoint of how organizations are benefiting from new client torments in the wake of the crisis and successful showcasing techniques models .Quasar Medical, a clinical gadget producer, saw that there was an expanded interest for clinical gadgets, and numerous makers were closing down because of the pandemic. The organization was completely worked and looked for customers who were searching for new producers to fulfill their need. Game producers and dealers are winning large in the pandemic. With such a great amount of time in their grasp, individuals are going to customary table games and riddles. The interest for tabletop games and riddles has expanded altogether. Craftsmen and handcrafts: specialists are coming out conspicuously

as basic experts in the hour of emergency. They are utilizing workmanship to join individuals just as help the majority adapt and mend despite the pandemic. Craftsmen and handcrafts are taking their works on the web and receiving broad viewership consequently.

Conclusion

Based on the above analysis, it has been concluded that COVID-19 has been created a direct impact to the entire world as especially in the business and supply chain. COVID-19 has sent organizations turning, with many attempting to endure. Fortunately, everything isn't lost. At the point when an emergency occurs, it is the perfect time for intense and innovative business visionaries. A worldwide emergency can either incapacitate a promoting group or arouse it to flourish. In the wake of the COVID-19 pandemic, that is actually what we're seeing: a few organizations are decreasing showcasing (in certain cases, lying off the whole advertising group), while others are as a rule more dexterous and concocting intriguing methods of connecting with their crowd during these troublesome occasions. Truth be told, long business examines show that the correct methodology during financial vulnerability is to increment for each of the showcasing spend. The exact opposite thing you need is to be gotten level footed and end up slacking your rivals when the economy fires up once more. Generally, purchasers are open to some advertising right now. An ongoing report from the American Association of Advertising Agencies found that 43% of purchasers think that it’s consoling to get notification from brands. Also, 56% said they like figuring out how brands are helping their networks during the pandemic. Just 15% said they'd preferably not get notification from organizations.

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CHAPTER-20

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CHAPTER-20

IMPACT OF COVID 19 ON THE GLOBAL ECONOMY

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ABSTRACT

The chapter envisions the impact of COVID-19 on Global economy which has greatly influenced and disturbed owing to the sudden outbreak. This has suddenly fluctuated the economic flow across the globe with large number of companies are partial administrating and most of them are temporarily shut down. This economic crisis is one of the major global crisis of recent times. Based on these facts the present chapter is executed and briefly provides the information related to economy and its co relation to COVID-19.

1. Introduction

The human and health toll is on the rise as the economic damages are already more than evident. COVID-19 has delivered the biggest shock to the economy ever experienced by the world within decades of time [1]. As per the June 2020 edition of the Global Economic Prospects both the near-term and intermediate outlook in regards to the pandemic and its impact along with the long-wearing damages have stunted the growth prospects and this is being known as a massive setback already. The forecast of the baseline shows that there is a 5.2 per cent of contraction in regards to the global Gross Domestic Product or GDP as of 2020. The Governments are trying to salvage the immense mess by ways of monetary and fiscal policies for support however the crisis has

used up the rate weights of a market exchange bringing forth the deepest of the global recession that has seen in decades. Over the horizon that is longer, this deep recession is triggered by that of the pandemic and is expected to be leaving lasting scars through that of lower investment. This is the erosion of capital that is human through that of loss of schooling and work, fragmentation of supply linkages and global trade. For the developing countries with emerging markets, they are being faced with daunting vulnerabilities and it is become critical to be strengthening the systems of public health, addressing the challenges being forced upon by informality along with the implementation of reforms which will be supporting sustainable and strong growth after the crisis in regards to health is abated. The economies that are advanced have been projected to be shrinking by that of 7 per cent. This kind of weakness will be spilling over for the outlook in emerging markets and economies which are developing. The developing economies have been forecasted to be contracted by that of 2.5 per cent as they are also coping with the outbreak of the virus that is domestic.

This has been representing the weakest showing by the group of economies within the last 60 years of time. Each of the regions is subject to growth downgrades that have been known to be substantial. The growth of the Pacific and East Asia is predicted to be as less as that of 0.5 per cent. It has also been foretold that South Asia should be contracting by that of 2.7 per cent, Sub-Saharan Africa at the rate of 2.8 per cent, North Africa and the Middle East by that of 4.2 per cent, Central Asia and Europe by 4.7 per cent along with that of Latin America at the rate of 7.2 per cent. This kind of downturn is expected to be reversing years of fulfilling progress towards the goals of development along with the tipping of the teeming millions back into that of extreme poverty [2]. An emergent market within a developing economy will be storm-tossed by that of economic headwinds coming from multiple areas such as pressures on a health care system that is weak, losses in tourism and trade, remittances being dwindled, capital flows that are hindered along with mounting debt and financial conditions which are bound to be tight.

The energy exporters or commodities of the industries are mainly hit very hard. The demand for metal along with that of commodities that are transport-related like

platinum and rubber that are used for parts of vehicles have also tumbled [3]. As the markets for agriculture have been supplied well globally, the disruptions in supply chain and restrictions on trading may raise issues of food security in a few places. This outlook which is very bleak is subjected to that of risks of having a significant downside along with that of greater uncertainty. The forecast has assumed that this pandemic will be receding in such ways that measures of domestic mitigation may be lifted by the middle of the year in economies that are advanced along with later in countries which are developed. The adverse spillovers globally might ease as one comes to see the latter half of the year 2020 along with the worldwide financial crisis being avoided. This is the kind of scenario that would be envisioning revival of growth globally which will be at modest rates that is up to 4.2 per cent in 2021. This view has however been deemed as too optimistic. The businesses may be finding it very hard to be servicing debt and an increase in risk aversion can lead to the climbing of borrowing costs with that of defaults and bankruptcies resulting in a financial crisis within many of the countries of the world.

This scenario of downside in growth that is affecting countries globally may be shrinking by about 8 per cent in the year 2020. By looking at the rate at which the pandemic crisis has taken over the worldwide economy one may be provided with a clue in regards to that of the depth of the recession. The fast pace of forecast of global growth patterns has downgraded points towards the possibility of revisions that are further downwards along with the requirement for that of additional actions by the policymakers within the months to come so as to support the economic activity. A very concerning side of this outlook is that the economic and humanitarian toll from the worldwide recession will be taking on the economies with sectors that are extensively informal which are making up an assumed 33.33 per cent of Gross Domestic Product and about 70 per cent of the total employment in regards to developing economies and emerging markets. The policymakers must be considering measures which are innovative for the delivery of support of incomes to the workers along with that of credit support to the businesses. The Global Economic Prospects of June 2020 is looking beyond the outlook that is

near-term to the things that may be indicative of lingering repercussions as pertains to the global recession that is severe [4,5].

There have been made setbacks to that of potential output and the output level is receding in an economy and may achieve full employment and capacity with labour productivity. Any efforts made to contain the pandemic in developing end emerging countries are including economies that are low in income having a limited capacity for health care which could be precipitating into longer and deeper recessions setting off a trend that will cross multi-decades, consisting of slow productivity and slower potential growth. An important feature in regards to the present landscape is a historic collapse of oil pricing and oil demands. Lower oil pricing is likely to be provided at its best a temporary support which is basic for the growth as soon as the restrictions to economic activities have been lifted. Even after the demand has recovered the negative impacts on exporters of energy may be outweighing any of the benefits to that of energy importers and their activities. Additionally, the recent oil pricing plunging may be providing even further momentum to be undertaking reforms of energy subsidies by deepening them as the present situation of health crisis has subsided. As one looks at the outlook which is disquieting, the ongoing priority for that of policymakers is in the addressing of the health crisis along with the containment of the short-term damage that is economic.

Over the longest term, there are authorities who are needing to be undertaking reform programs so as to be improving fundamental drivers in regards to the economic growth as the crisis will lift itself. This includes support for that of the sector which is private along with getting the money to people directly. During the period of mitigation, the countries should be focusing on the economic activities to be sustained with the support for that of firms, essential services and households. Global cooperation and coordination of the kinds of measures which are needed to be slowing of the spreading of this pandemic along with the economic measures that are needed to be alleviating economic damages. This includes any kind of international support providing a greater chance for the achievement of goals of public health which will help in the enabling of a global recovery which is robust. According to leading newspapers in India and the IMF or

the International Monetary Fund, the worldwide economy will be expected to be shrinking by more than 3 per cent within the span of 2020 itself. This has been the steepest of the slowdowns post the Great Depression affecting the 1930s as being reported.

Within that of America which is a first-world continent, the pandemic has led to disruptions causing millions to be filing for benefits for unemployment. As of April itself, the figures showed to be 20.5 million which is expected to be rising as the aftereffect of this pandemic as the labour market in the U.S is dwindling. According to the report of the Reuters after March 21, there have been greater than 36 million who have filed for the benefits of unemployment and that is spanning almost 25 per cent of the population who have acquired the age of working. There is further early analysis by the IMF revealing that manufacturing of outputs within many countries has recorded a fall, depicting the receding figures of falling external demands along with that of growth expectations in the fall of domestic demand. The estimation of IMF is that worldwide economy is growing at a negative 3 per cent as of 2020 which is an outcome that is much worse than the financial crisis of 2009 that affected countries worldwide as well. The economies of Spain, Italy, France, Germany and the UK will be expected to be contracting in 2020 by 8, 9.1, 7.2, 6.5, 5.2 and 5.9 per cent in the first to last order as mentioned.

The advanced economies are being hit the hardest and they are together expected to be growing by that of a negative 6 per cent all within the year 2020. The emergent markets along with that of developing economies will be expected to be contracting by a negative 1 per cent. China alone being kept as separate will be having a growth rate of a negative 2.2 per cent in the year 2020. The GDP of China has fallen by that of 36.6 per cent within the first 3 months of 2020 and the output of South Korea has fallen by that of 5.5 per cent. This happened since South Korea did not take the path of imposing a lockdown but followed the path, rather the strategy of quarantining, contact tracing and aggressive testing. Within that of Europe, the Gross Domestic Product of that of Italy, Spain and France had fallen by that of 17.5, 19.2 and 21.3 per cent in order from first to last as mentioned. There has been a fall in the travel rates massively and the worldwide industrial activities have been affected. The prices of oil fell further as of March 2020 since

the section of transport accounting for that of 60 per cent in the demand for oil has been hit while many countries have imposed a lockdown. Not just that of oils, early in the year of 2020 China due to their Coronavirus measures of containment, saw the fall in demand for that of natural gas which is the result of many of the Chinese buyers of LNG halting their imports by filling of storage tanks [4,5].

2. Conclusion

Amidst the worldwide pandemic, there are many countries all over the world that have resorted to putting the system under lockdown so as to flatten the infection curve. The lockdowns mean confinement of a million citizens inside their homes, shutting down of businesses along with a cessation of most of the economic activities. However, as some of the countries have lifted restrictions and are gradually restarting their economies there are many ways in which the economy has been hit very hard. This pandemic has been pushing the global economic condition into that of a recession and it means that the economy will start to shrink as the growth will stop.

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CHAPTER-21

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CHAPTER-21

MANAGEMENT STRATEGIES OF COVID-19

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ABSTRACT

In this present chapter, management strategies are discussed owing to COVID-19. The chapter insights on the industries which are grappling to stay afloat in different sectors such as automotive and industrial sector, energy and utility sector, technology sector, fashion and retail sector coupled with banking sector, transport sector, hospitality, travel and tourism Sector. This reflects the impact and global crisis shutting all the activities and section of industrial experts believe that counting on immediate return to business as usual is not a feasible strategy during the global pandemic situation.

1. Introduction

The world is changing all thanks to coronavirus. It is a pandemic that has gripped the entire globe. Since March 2020, we have seen countries go into lockdown in various stages. The industries have seen a rise in loss of revenue and job cuts. Companies across industries must put on their thinking caps and devise strategies on how to adapt to the new normal as there seems to be no end to the pandemic. Let us take a look at some of the industries to understand the impact the pandemic has had or will have in the coming future. Companies will have to think how to survive this crisis beyond the next fiscal quarter. They have to think of the long term strategy. To do so, they will have to rethink and curb spending on miscellaneous and frivolous activities, furlough workers and

probably suspend certain production facilities. Government lockdowns reduced auto sales to 10 percent of the pre-crisis forecast for current year [1].

As consumer sentiment is less volatile in the European union, sales will not see a recovery of 90 percent of the pre-crisis forecast until later this year. Up until now, close to 5 million unit sales which represents nearly 25 to 30 percent of the pre-crisis forecast, has been marked as losses. Owing to economic pressures, they will have to quickly step up and take care of the near-term cash management challenges. The experts will have to carefully plan an approach to supply chain, do a volume and actual demand analysis and lay maximum emphasis on protecting their workers. Ramping up factories will be mission critical. A shift in inclinations will likely occur as the expectations of workers and leaders change. Significant societal changes loom large in the near future. To avoid this crisis, the industry will have to address some likely issues. The industry will need to adopt digital and analytical tools to gain maximum benefit of predictive monitoring and demand vs supply matching [2]. Industrial companies will have to re imagine with the following strategies

- Mergers and acquisitions. Companies tend to make these deals when market capitalization is at an all-time low.
- Collaborations and associations. To reduce the funding burden, working together to endorse technology innovation.
- Floor employees' job profile. Businesses will further strengthen the digital imprint each of its processes have.
- Costs. Shifting from fixed to variable cost will permit a lower breakeven volume in these uncertain times.

In the new normal, we expect to see the human resources change the employment letter to include clauses on work hour flexibility and work from home which will allow the companies to utilise global talent pool to its best ability.

2. Energy and Utilities Sector

As the lockdown lifts and companies begin production, many will have to rethink their supply chain. The risk of sourcing material from afar will have to be evaluated, given the gravity of the situation. We may see sourcing of raw materials becoming more of a

local affair. To reduce transportation costs, keeping the supply chain short (sourcing, production, supplying to markets and consumption) might work out to be a good option. The demand for electricity has plunged drastically. As air travel has been restricted, the demand for fuel has gone down too. In the oil and gas sector, for example, high cost producers that have been left exposed by the collapse in the oil price may need to turn to collaborative partnerships or consolidation as way of bringing costs down. As the days' pass, scenario evaluations and strategizing will have to be a regular affair. Companies who had already invested into their processes being digitized, felt a lesser adverse impact of the pandemic. Companies who were resistant to digitization, will have to adopt this strategy as quickly as they can or face falling off the radar. Management will have to evaluate supply chains, operations, customer management and other processes and make investments to maximize digitization. Many businesses dependant on business travel and personnel movement for revenue generation, will have to rethink their game plan. This will have subsequent impact on demand for transportation fuel [1-3].

3. Technology Industry

This seems to be the best time for this industry. It is going to be a big wave for businesses and banks following the pandemic. As companies across sectors digitize their processes, the digital world will need to come up with better and personalized products, to cater to the demand. There has been great demand for developing new or novel based concept or device which can aid in managing the COVID-19 situation across the globe. One such technology was recently developed by Nadikattu et al., 2020 who were capable of developing novel device which can monitor and detect the infected person in outdoor environment which was well applauded in among the different scientific communities [4].

4. Fashion and Retail Industry

An industry famous for its fashion weeks and trade shows, it is showing signs of being affected by the pandemic. Industry players are rising up to the occasion and putting humanity first and certainly changing their game plan to stay in the business French luxury conglomerate, LVMH, has announced that it will now manufacture hand gel sanitisers in its beauty and perfume factories. It will also supply 40 million surgical face masks to France.

H&M, Gucci and Kering are also supplying masks to people. The Della Valle family which owns Tod's has announced a project in which they will be aiding the families of healthcare professionals with a €5 million donation. Primark created factory worker wages fund to take care of the wages component of orders that have been cancelled (countries include Bangladesh, Cambodia, India, Myanmar, Pakistan, Sri Lanka, and Vietnam). The external stakeholders and Primark's ethical trade team will join hands to ensure that this money reaches the workers. The Fashion Design Council of India (FDCI) and Lakme Fashion Week (LFW), launched a COVID-19 fund to help small businesses and fashion entrepreneurs around the world during this pandemic. Anita Dongre, a celebrated fashion designer, is taking adequate measures to ensure safety of her workers. Apart from the existing medical insurance, support will be provided to the workers in case an emergency arises given the current circumstances. Her current employee strength is 2,700 and thousands are indirectly connected to her company from across factories and villages located in India. She has started a project called A D Torchbearers, which will showcase their stories and highlight the brand's core . Crocs, Inc. will donate 10,000 pairs of footwear to healthcare professionals for all day comfort. Burberry will continue to maintain base pay for all its employees who are unable to continue work due to store or site closures [3].

5. Banking Industry

This is the best time for small and medium enterprises (SMEs) to get into the global supply chain as more companies seek to diversify sourcing inputs. The businesses should go digital to help banks serve them better. Going digital will ensure that the banks assess their creditworthiness faster and more effectively. A significant shift in the way the customer behaves in terms of physical branch visits, day to day transactions, etc. can be expected to take place for years to come. Physical money transactions have given rise to increase in online transactions in the form of e-wallet payments, online account transfers, etc. The onus is now on the banks to step up to the demand. Certain banking products are seeing a surge in demand. Example being, mortgage refinancing in the U.S. People will be more dependent on banks for their financing and insurance needs. Digitizing essential

services like deposits, credit payments, etc. will help minimize the adverse effect on people [5].

6. Here are 3 key findings from PWC's financial service technology report:

- Currently 89% of people use mobile banking. It is a significant increase from 83% as of 2017.
- Nearly 44% people who fall under the salary bracket of less than $ 75,000 (annual) and 68% of people who fall under the salary bracket of more than $1,00,000 (annual) say they would consider innovative payment alternatives to traditional banking.
- Insurance shoppers come across at least one digital channel through their buyer journey. The percentage of such shoppers is more than 80%.

Marketing in banking sector should concentrate on customizing better customer engagement and socially responsible messages. Banks should ensure that they provide smooth digital experience to their customers and proactively update them about important information. They should regularly update them about:

- Safety measures being taken at their premises
- Special sections for the senior citizens
- Any COVID related phishing emails, etc.

7. Transport sector

It is only during the pandemic, that we all realized the significance of essential goods and its transportation. People always need a steady supply of medical equipment and food. Mobility service providers' response during this pandemic has shown how mobility options and public-private partnerships have come together to provide a smooth experience to the consumers. When we are in crisis we tend to become more inventive about how to get customers and things where they need to go. Converting buses to supply food to a remote location, using e-bikes to reach hospitals (by the medical professionals) are just a few examples of how we have been re-inventing. Efficiency of our mobility system is dependent on how united the system is.

8. Hospitality, Travel and Tourism

According to The World Economic Forum, the travel and tourism industry brings in $8.8 trillion per year. Spain, France, Germany, Japan, United States, United Kingdom, Australia, Italy, Canada, and Switzerland are the top countries as of 2019 in the travel and tourism list. Not only do they have natural resources, infrastructure and capacity to welcome a huge influx of tourists but what they also have to offer is their dynamic. Once the pandemic struck, air travel was banned and borders closed. As lockdown lifts slowly, the question is – Will travel and tourism be the same again? According to a report by the World Travel and Tourism Council (WTTC), 50 million jobs related to this sector are under threat around the globe because of this pandemic. A few industry experts believe that this sector is expected to make a full recovery by 2023.

Transportation, accommodation, food and beverage, entertainment, and connected industries (travel agents, tour operators, etc.) are part of this sector. The U.S Congress passed a $2 trillion stimulus to help support unemployed and businesses large and small. Question is: Will this aid package be enough as the country slips into a recession and what is in it for travellers? The industry's financial strategy was built under the premise of a hassle free future and high tourism demand and that no highs and lows could hamper their growth. Airlines might benefit from the provisions provided by the aid package. $ 75 billion in loans, $25 billion in direct grants and the government taking a stake in the businesses. There are a few conditions too- they cannot use it to buy back stock; this practice led to many companies being short on cash. Huge upscale hotels, which hold conferences, were majorly hit. Hotels and resorts in big cities have also seen a large drop. These have been the recipient of the bailout. Cruise companies aren't eligible for the $500 billion aid package since they don't come under the wing of American enterprises. They have their headquarters located overseas. What this means is that they pay almost nil federal taxes and avoid multiple U.S regulation. As the lockdown lifts, there might a glimmer of hope. Experts believe that people's love for travel will get this industry back on track pretty soon [6-14].

Conclusion

The vaccine is still under development stages and the prediction is that it might be made available only in 2021. Continuous monitoring of all parameters inside a company, such as- social distancing, hygiene, shift scheduling, etc will have to be maintained and fine-tuned according to the situation. High degree of flexibility and toughness is the key mantra that needs to be practised by both the industry bodies and companies respectively when it comes to short and long-term strategies. Companies will need to have an early warning system to warn them about such future pandemics. This will help them prepare better. We have seen some resilient companies create detailed plans to get back on their feet.

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CHAPTER-22

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CHAPTER-22

EMERGENCE OF ONLINE LEARNING ON COVID-19

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ABSTRACT

The COVID-19 pandemic has diseased the world. It was emerged in China and is now spreading everywhere. The disease caused COVID-19 in the problem of daily living. Countries are trying to find a way to prepare the medicine of COVID-19. To promote social distancing, the World Organization insisted on the lockdown in many countries. Due to the pandemic, schools and colleges have been closed. It disrupts the whole educational structure. Big institutions face many challenges in creating a particular way of handling this outbreak. Due to this change in the presentation of online education, professionals, teachers, and educators are faced with many problems. This journal examines the results of COVID-19 and its impact on education.

1. Introduction

Many countries have decided to close schools and colleges. The most crucial position is that the manufacturer's algorithm plans to close schools (reduce letters and chances of survival) and open them (between job abuse and protecting the economy). Many families worldwide are experiencing the worst effects of a real change problem: despite the unique elements of youth and learning, self-education is not just a real shock for authorities. The rules are not tried online and are attractive. Students' perceptions travel online, and everyone has a new understanding and impact. To a large extent, these

interventions are a brief problem; they can have broader implications for the partners involved and produce different features [1-5].

2. Emerge of online education on the pandemic outbreak:

The COVID-19 dangerous effect has returned worldwide. Most governments around the world immediately shut down their university to control the spread of the disease COVID-19 [5,6]. Many institutions' CEOs defended each educational institution as a critical element of national choice, influencing students in everything from school to diplomas for young people. UNESCO is working to reduce the immediate impact of the exams, including helping people with disabilities and educating everyone. The UNESCO report estimates that coronavirus affects more than 290 million students in 22 countries. UNESCO has figured out how to grow about 32 million students and refers to Indian schools and universities [7]. In light of this, the Council examines the e-learning program. Many e-learning institutions have tried to make the most of this open door by offering free or attractive online courses to online learning areas. These measures have received a promising response from students at some new institutions, who have seen a 25% increase in online learning. Personal learning now seems to be a valid option because it offers students productive, diversified, and shared access to academic learning files. Online learning becomes a very deliberate decision of self-education.

The COVID-19 urged experts to rethink the framework of traditional education. Higher education seems to change the way of filling a room that has not been in place for three to four months while reducing the risk of illness until the end of the product. In particular, it has reached the inner world about to bleed from the educational framework [8]. In this case, higher education will be integrated with potential education. It will allow the use of inclusive education by promoting learning in different geographic areas of India. It will allow students to reproduce academic cooperation in each activity. All opposition has been accomplished as we are today. Each course inspires education around the world, and it is not difficult to provide a formal education system in white chalk and image. This new learning is excellent, personalized, and vital. Open Monster Course (MOOC) is an online course based on unrestricted movement and open web [9]. Online learning programs provide an excellent opportunity to enjoy great learning using the web.

There is no point in the physical decline of digital learning because we have a better understanding of the pedagogical assumptions of mainstream learning, and we learn essential data and from students within the limits of their usual data. However, digital learning is not unlimited and irritating because private correspondence is generally considered to be the most logical of the distance learning movements [8]. Online education has made progress everywhere. At the expense of India, digital education must be reduced before it can be considered primary education, as students living in urban areas have an evolving workplace for digital education, but there is no full and restricted base for students nearby. It is difficult to misinterpret important points for digital education. The absence of a monetary arrangement established by the Digital Education Foundation to manage global education seems troubling. Distance higher education brings the Global Association's resilience and credibility, an imaginative course for urban residents' levels 2 and 3 in India.

Another test is that online learning is somewhat confusing and impairs the understanding of personality. The lack of intelligent air will lead to higher learning rates for online learning. Students may be attracted to change via game consoles and home life and may not feel the law when exercising online [7]. Likewise, it would be wrong to say that learning at the tertiary level and the nursery/school level is different. Digital education cannot be equal at all levels. Without additional lighting on the material provided, digital learning will have a specific objective and coincide with the physical parts and the work done in the university environment. It undermines the credibility of educational materials. Online learning will continue to provide students with different data in different ways. In this way, educational materials should be reviewed before being distributed to students. Create relevant content, documents, and articles. Mixed education must be consistently and strongly transformed, and distance education today must take place without hindrance. Online educational information must be appropriately guaranteed. These digital courses will undoubtedly lead engineers and developers to access computers, Digital security testing throughout education.

Because of the pandemic, the WFH lifestyle is practiced in India. By describing social rejection as the best way to control the spread of COVID-19, associations are

increasingly motivated to make people express positive words, whether they act at a distance or not. In this sense, they have chosen new online associations such as Global Health Professionals or Zoom App, which allows them to stay in contact with employees under private licenses, and educational institutions have chosen different levels to advance their students [6]. Thus, only educational institutions in urban areas can offer these workplaces. Students are often asked about their progress in open terrain and educational settings and regions.

Many colleges and mentoring programs have started to take advantage of various ways to bridge the conflict between online learning and successful learning programs under these learning conditions. With apps, for example, Zoom, various colleges, especially construction and design schools, sent materials to students via video conference in Pune. Using the type of reinforcement, various colleges, especially the colleges of Pune, were responsible for clarifying the students for sharing videos. These video conferencing applications can address the security that these applications are commonly used and discontinued for various communication purposes. There is clarity of sound and useful image for the investigator and the experimenter.

3. Review of the current situation and online education:

Closing schools and colleges are not just about showing students around the world; this option was corrected with a specified evaluation period, and some start-up skills were postponed or canceled. Internal reviews are smaller and more budgetary. However, they are also vulnerable to providing data on young people and the empowerment of families and teachers [6]. Losing this data will delay recognizing cognitive abilities and complex problems and have real implications for young people. From that moment, some young people did not rush during the evaluation. Decision-makers estimated that interest in testing increased the effects of participation in standard deviation testing by 9% two years after the real world, and the results were almost identical to the assessment. These recommendations are ideal for those close to a disabled social organization.

In particular, the closure of institutions does not only affect properties within the institute. For example, in the UK, all significant tests expected from all partners - GCSE

and A - have been canceled. Depending on the level of security, we will consider comparative measures at distant levels. One possible route to canceled diplomas is to use "expected diplomas," but these diplomas are sophisticated and that actions that do not meet the expectations of students are not very fortunate foundations [9]. Another improvement is to replace injury testing with coaching assessments. Since the best approach to rock climbing depends on the fact that a young person usually has space for a swimming pool, data from different links show beneficial gaps between dream and their assessments. For example, if young women exceed all expectations, the young man's independent assessment can isolate him. Since these assessments are used as the essential ability to access higher education, there can be significant changes in how the scores are used to assess the fantastic outcomes [10-13].

Similarly, some students may benefit from petitions. For example, in Norway, it was decided that ten students would receive confirmation from the school. The abandonment of the traditional evaluation of training in France in 1968 (after the preparation for the uprising) prompted positive long-term activity to reveal an overview of the union in question.

Many colleges and higher education institutions are replacing traditional tests with online assessment tools. It is another area for teachers and students, which is a more significant mistake than expected [3]. The evaluation revealed that the school uses credits to select competitors, for example, to understand the path's nature and the path. Second, the hassle and length of applicants can be reduced enough to integrate new graduates into job openings, which would be suitable for slow growth in wages and job sharing rates. It can be expensive to order for people and worldwide.

4. Impact on graduation:

The former students for the current year could be affected by COVID-19 disease. In the last part of the test, they face massive gaps, considerable gaps in their estimates, and they are helpless in the face of graduation at the start of a significant global crisis. The fact is that managing budget contractions for people with disabilities means that workers have low-paid jobs, which can affect some unions. The graduates from highly profitable programs can compensate for the waste of new businesses with net internal and external

benefits, while graduates from different programs find it challenging to change benefits after graduation.

5. Summary and recommendations:

The global shutdown of training establishments can lead to a great disturbance (and contradiction) in learning ideas; Stop internal assessments; Uninstall or replace with lower quality. Schools need assets to rethink the educational disaster. One of the best ways to use these assets is to open up, especially for young people with disabilities. Because assessments are essential for learning, schools should also consider delaying rather than being misled by internal assessments. For new graduates, the educational program should increase traffic in the labor market to maintain the main routes to long-term unemployment [12-16].

Conclusion

Even before the COVID-19 pandemic, the world was faced with an emergency. Before the pandemic, there were 258 million primary school adolescents. Furthermore, the wrong idea of education seems to be overlooked by many teachers. In low-wage countries and groups, educational interest is 53%, which means that every ten-year-old child is not always willing to look and understand the appropriate age. Young people deprived of their rights are generally afraid of compulsory education, high dropout rates, and massive learning problems. It means that the world is far from progressing towards the achievement of education, which has an alternative focal point for all countries: COVID-19 examines how to reject the framework of infection options. When an emergency becomes a deep global merger, the damage cannot be humorous. However, dealing with these challenges can turn an emergency into a normal one. The first step is to appropriately transform the development of education by ensuring prosperity, security, and to provide the best to avoid disruptions in learning. At the same time, countries need to start learning to rebuild schools. It means the faster recovery of learning in critical areas after school is restored to a better understanding of school conditions and the application of new developments.

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CHAPTER-23

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CHAPTER-23

ROLE OF HEALTHCARE PROFESSIONALS IN COVID-19 SITUATION

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ABSTRACT

COVID-19 came as unseen and unknown invisible enemy through which humans are fighting throughout the world. COVID-19 that is coronavirus is spreading everywhere and taking many lives away. Nobody is able to find out exact what is it and how it is curable. Started from Wuhan market of China and spreading in almost every countries of the world. This is the very new pandemic on which very few scientific materials are available. In this paper, we will discuss and highlight role of healthcare professionals during this pandemic, how healthcare people are giving their life to save others life and facing this serious virus daily. Many of doctors, workers and nurses lost their life because of COVID-19.

1. Introduction

COVID-19 that is Coronavirus disease is an infectious disease caused by newly discovered virus coronavirus. People who are found ill because of this disease found moderate respiratory problems and not require special treatment for recover. Only who are old and who have some medicals problems like diabetes, cancer, chronic respiratory disease and cardiovascular disease are likely to have serious and special treatment else

they will fall into serious illness. To protect yourself and your family from getting affected from this COVID-19 virus then you have to avoid going out as far as possible. Going out not only puts you in danger of getting the disease but also puts your family in the trouble of getting affected, especially old people and kids in your family. Be smart enough to save your family from such terrible issues as if you get affected by this or anyone of your family member gets affected then you must not be able to look patients till cured. Even you don't know that either you be able to see them again or not so better to save yourself and your family [1-5]. One should take following precautions while moving outside or buy anything-

- Wear mask properly, sanitise and wash your hand regularly. When you come home must wash hand and feet and keep your sleeper outside.
- Properly wash or sanitize the things you bought from market.
- Wash your clothes which you wear during any visit outside.
- Keep social distancing.

You never know who is suffering from COVID-19 as sometimes it doesn't show any symptoms. Stay away from people like your milkman, servants, vegetable vendors and try not to allow anyone outsider as you don't know from where they are coming from or any customized area where chance of spreading virus is high, do the following measures if you are buying vegetables from a vegetable vendor or anything from shop vendor:

- Wash the vegetables with mild hot salt water
- Wash the closed packet with detergent water after purchasing
- Try to transfer the item in the container as soon you brought them home and throw the packet outside

2. HOW CORONA IS AFFECTING

Corona is spreading like fire. Started from Wuhan market of China spread all over the world and no one is feeling safe and secure. Still his proper medicine unknown. People are not much aware of the fact that how worst the situation is getting and how difficult it is to get protected from this disease especially for the kids and old age people.

As Corona reached its third stage which is local transmission it can easily affect the people with a low immune system. Number of cases are increasing as it's in a local transmission stage where the spread is fastest and the virus multiple into twenty times in a second. It take only few days to spread the cases , so we can guess how bad the situation is. People who have illness like asthma, liver disease, cancer, kidney problems, heart issues and other severe diseases. As it directly attacks the lungs, if you have a weak chest then mind you are at a high risk to get affected by Coronavirus. If you want to protect yourself from COVID-19 your need to make your immune strong so you don't affect from such disease [6-9].

3. ROLE OF HOSPITALS & HEALTHCARE PROFESSIONALS

World Health Organisation (WHO) an organisation of health who looks after world health declared COVID-19 a Pandemic. The Government, researchers and healthcare professional are doing their best to deal with this and putting equal efforts to find out its prevention, treatment, remedy and how to stop it for further expansions in human body. India has acknowledged the effect of feared viral infection & has inveterate few cases throughout the country. Highest of the cases have history of latest travel abroad. Indian Medical Association is doing their professional work that is guiding the situations. IMA announced the well developed instructions for peoples of the country. IMA team is continuously monitoring the rapidly changing COVID-19 situation in the country. They have also started 24*7 helpline for people. IMA doctors are the devoted specialists in the field of medicine & are up-to-date on developments and management guidelines. They are ready to face any challenges and very united. They are maintaining safety and well-being of community and our country. While every people of nation are advised to stay home and take precaution but the doctors are always on the field fighting for it and saving life's. They are serving above themselves and always ready serve the country and protecting people. IMA is very proud of doctors and hospitals who are standing together and fighting against these viruses [10-15].

4. The roles for the hospitals are-

- All hospitals and clinics will be opened and cater their normal services
- Reception area of hospitals must be open and take all precautions related to COVID-19 as wear mark, use sanitizer, follow social distance.
- Whosoever will come on reception must ask the following things-
    - International travel if done any in last 14 days to countries with unremitting community transmission.
    - Symptoms of any respiratory infection like fever, cough, and sore throat.
    - In contact with anyone who went under investigation for COVID-19 or have any respiratory illness in last 14 days.

5. The roles for the healthcare professionals-

- Doctors and medical staff have important role treating COVID-19.
- Doctors and staff must look after every patients
- Doctors and staff must follow hand hygiene and prevention measure while in hospital or addressing any patients.
- Doctors and staff must wear PPE kit while addressing any patients.
- Oncologists must look after emergency cases of cancer patients.
- Psychiatrist need to manage to distressed COVID-19 patients as well as the public.
- IMs and FMs step into work in hospitals when admitted any opportunities.
- Neurologists have to follow the step of IMs and FMs to manage their patients.
- Gastro have to pay attention to severe COVID-19 cases who are experiencing gas distress.

6. The roles for the Out Patient Department (OPD)

- One person will come with patient in OPD
- Reduce visiting person in OPD
- Any person who is found any respiratory problem like coughing etc. will asked to leave.

- Visitors must follow al protective measures like mask, sanitizer, social distancing and personal protection.
- OPD areas must display informative posters related to protection and hygiene.
- One staff as a primary contact to look after them and channelize the people who visit.
- Hospital staff must be informed about the epidemic
- If any person found any symptoms of COVID-19 they must contact to doctors on immediate basis.
- If any staff or colleague found any symptoms of COVID-19 they must contact to doctors on immediate basis.
- Quick detection and isolation of potential infected patient is must to prevent any unnecessary exposure of it to the other patients or person who visit and staff.
- Hospital staff must be attentive in identifying any possible infected person.
- Hospital Staff should monitor admitted patients on daily basis and visitors or attended for expansion of any symptoms.
- Hospitals who are experiencing number increased of respiratory illness among patients should contact their local health department for guidance on immediate basis.
- Hospital staff must follow strict infection control protocols in all areas of the hospital by sanitizing whole hospital on daily basis.
- The equipment who are contaminated should undergo sterilization as per guidelines before using it again on other patients.
- Conduct screening of staff on daily basis for fever and respiratory symptoms.
- Suitable distance between the hospitals beds must and if not, kindly follow the norms on immediate effect.
- Admitted patients and serving staff must follow hand hygiene and serving staff.
- Assign staff as main contact to attend relatives phone calls with recording facility.

7. The roles for the Visitors

- Hospitals must restrict visits of people who are not important except in certain situations like end of life situation.
- The health of all patients and visitors should be top priority of hospital.
- All visitors must be 18+ years old.
- Visitors must be screened and follow all precaution before entering patient areas.
- The visitor's numbers must be limited and it may have imposed if any illness found or any symptoms.
- No visitors are allowed in IPD sections if the COVID-19 patient is admitted.
- Relatives of patient avoid visit unless warranted.
- Visitors for counselling must have separate access and rooms where strict infection control prevention will be followed.
- Children are avoided for visit and in case they visit must be followed by an adult in the hospitals and wards.
- Victors must register with reception and provide government photo identification for record.
- Visitors badge should be compulsory for identification of visitors.
- Visitors should practice hand hygiene and prevention measures.
- Before entering patient room, visitors must wash hand with soap or use alcohol based hand sanitizer.
- Already ill people are not allowed to visit hospital to avoid cross infections.
- One or two visitors are allowed to visit the patients.
- Children below 12 years of age is not allowed to visit patient or hospitals.
- Visitors have restrictions when the patient is unstable or going under any procedure or supervision.

8. The roles for the Attendants

- There are not any attendants are allowed for COVID-19 Patients

- Other attendants must be aware of distancing, hand hygiene and personal protective measure for protection.

9. The roles of healthcare Transport

- Transport vehicles and ambulances must have strict infection control guidelines.
- Attendants in the ambulance effectively protect themselves.
- Ambulance from inside and outside and its each equipment must be cleaned and disinfectants.
- Nasal oxygen should be disposed every time.
- Disposables should not be reused in any condition.
- Maintain record of equipment use in an ambulance.

10. The roles of healthcare Pharmacy

- The necessary medicines, injection and emergency disposables must be available in sufficient quantity.
- Do not replace and reuse the products during this Pandemic.
- Follow social distancing, hand hygiene and all protective measures followed in medical stores or in hospital pharmacy.

Conclusion

COVID-19 that is coronavirus declared as pandemic which is very serious and harmful virus spreading like fire all over the world. Started from Wuhan market of China and spreads everywhere and harmed many lives. People are scared and taking prevention measures. Hospitals and healthcare professionals are in front to fight this virus and save lives. They are our superheroes who are spending their lives to save else lives. Their roles and responsibilities is crucial and important. It's our duty to understand it and take prevention measures for our safety as well as surroundings. Everyone is aware of this situation and it is very dangerous and have to fight with it. We must follow all safety measure and make sure to make others as well to spread this virus. All instructions and guidelines must be followed to cure yourself and save yourself from this issue. Try to stay

at home as much as you and avoid to contacts any outsider. It is the best thing you can easily do and suggest your love ones not to go out for any work until and unless it is not so much important. Make sure that you have all your protection while going out and while buying the things as you have to take all the precautionary measures like washing and sanitizing the things.

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CHAPTER-24

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Dr. Sharavan, is a Sport Physiotherapist who has been working with sport personnel. He is currently working with NCA-India and Royal Challengers Bangalore and he also owns Hands On Sports Injury Clinic. He has provided his valuable inputs on the role of physical exercise to maintain the physical health of individual during the COVID-19 Pandemic situation.

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CHAPTER-24

ROLE OF PHYSICAL EXERCISE AND PHYSIOTHERAPY TO BOOST IMMUNITY DURING COVID-19

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ABSTRACT

COVID-19 is the recently developed virus in the family of coronavirus which in incurable once get infected by it. As there is no vaccine developed as of today July,2020. It is first found in Wuhan, China and spreads in all over the world like fire. Impact of coronavirus on human is very dangerous and harmful. Government and professionals are doing their best to fight with it. Scientist are busy in developing vaccine for this virus. In this paper, we will discuss about physical exercise and physiotherapy to boost immunity to face and fight with COVID-19 coronavirus. Apart from prevention measures what else activity we can do to improve our health and immune system. As people who have strong immune system, impact of coronavirus on them is very less.

1. Introduction

The COVID-19 pandemic came as something like bad dream in our life and it is exceptional time all across the world. Government and healthcare has declared guideline to prevent from this life threatening virus by taking various prevention measures and following social distancing everywhere. Governments and doctors are asking to be at home to stay safe and stay at home. And that makes everyone to be lockdown at their homes. People who are found ill because of this disease found moderate respiratory

problems and not require special treatment for recover. Only who are old and who have some medicals problems like diabetes, cancer, chronic respiratory disease and cardiovascular disease are likely to have serious and special treatment else they will fall into serious illness. It is proved people who have strong immune system is less affected and high changes of recovering from COVID-19 if get infected. Physical exercise and physiotherapy is the one which make your immune system boost. But most of the activities are restricted during COVID-19 like walking, jogging, walking the dog, going to gym and all other activities which make you to move outside. The impact has shown all across the globe on the health of people and social care. People started feeling depressed, mental stressed and no social gathering which make them to feel low. Lockdown has badly impacted on many lives according to recent study. Therefore, physical activity and physiotherapy is important and badly needed in this time as of now, to our bodies and minds to get much benefits from this [1-9].

2. What is physical activity

Physical activity is any activity which involves body movement produced by skeletal muscles that require energy outflow. There are basically two components of physical activity that need to considered-

1. Aerobic Exercise- Aerobics is exercise that includes moderate to strong activity that make you warm and increase breathing rate, breathing profundity and heart rate.
2. Strength and Balance- This is forgotten part of physical activity but have many benefits and essential part of physical activity.

3. Physical activity comprises

- Walking
- Cycling
- Playing games
- Dancing
- Gardening
- House cleaning
- Shopping
- Sports
- Active exercise

COVID-19 has brought may challenges and people are facing lot of problems. No vaccine is invented yet. So it's very important for all people to get physically active. Can do small activities like stretching on our desk during break itself is activity This will help in ease muscle strain, relief from mental tension, improve blood circulation, improve muscle activity and develop some daily routine for activities. It will definitely help you in immunity boost and relaxation.

4. BENEFITS FROM PHYSICAL ACTIVITY

There are many benefits from physical activity. Few are as follows-

- Help in strengthening and maintain immune system
- Reduce high blood pressure
- Help in weight management
- Reduce risk of heart disease, diabetes, cancer and stroke.
- Gives bone and muscle strength
- Improve balance, flexibility, mental health, depression, fitness etc.
- It helps in overall performance of body

5. BENEFIT TO CHILDREN FROM PHYSICAL ACTIVITY

- Help in growth and development
- Reduce risk of disease
- Improve immune system
- Help in overall development and moment skills

6. GUIDELINES FOR PHYSICAL ACTIVITY

WHO Guidelines for Physical Activity include-

- Infant below 1 year need to physically active for several times in a day.
- Children below 5 years should spend minimum 180 minutes a day in physical activities and 3-4 years of children must do moderately or vigorously active for an hour per day.
- All children between 5-17 years should do 60 minutes of physical activity moderately or vigorously per day including strengthen muscle and bone activity for 3 days per week.

- Adults between the age of 18-64 years should involve themselves in 150 minutes of moderate intensity of physical activity throughout a week or 75 minutes vigorous-intensity physical activity throughout a week and also include muscle – strengthening activities for 2 or more days per week.
- Adults aged of 65 years must do 150 minutes of moderate physical activity or 75 minute of vigorous activity throughout the week and include muscle-strengthening activities for 2 or more days a week.
- Older adults with poor flexibility can do physical activity to improve balance and prevent falls for 3 or more days per week.

7. IMPORTANCE OF PHYSICAL ACTIVITY DURING COVID-19

The physical activity during COVID-19 will be benefits in the following way-

- It will help in enhancing immune function and will reduce inflammation therefore it can help in reducing the severity of infections.
- It will improve common chronic conditions that increase the risk of severity in COVID-19
- It will help in managing stress by reducing symptoms of anxiety and depression.
- It will help in to bring cortisol levels in balance as stress and distress create imbalance in cortisol which tend towards negativity to influence immune function and inflammation.

8. ROLE OF PHYSIOTHERAPY DURING COVID-19

Physiotherapists are the one who are in direct contact with the patients who give physical therapists to them and make them vulnerable to the diffusion of infectious diseases. They are the one who make them aware and guide to take responsibility for the early identification of infectious disease and how physical activity will improvised the disease and whole immune system during COVID-19. Physiotherapist must know the situation of COVID-19 and understand how they can plan workforce and involve others. They must be professional to decide where and how to provide care with their understanding. They play crucial role in the health sector to communicate with the people whose health are knowingly impacted by disorders to care.

The physiotherapists must consider the following points during COVID-19.

1. Stay present- Must have knowledge about current situation and know the guideline of WHO and the CDC and the local authority.
2. Stay calm- As they need to take care of situation and patient, they must handle everything very clam in this weird situation.
3. Minimum exposure- As guidelines guides for social distancing to prevent from infection, they must follow it and avoid all non-urgent cases. They must practice it to protect the others.
4. Educated- Physiotherapists also have all knowledge of COVID-19 and its prevention measures so that they can guide others too.

Physiotherapists contribute their work in two ways. First, they serve in primary care like private clinics, GP practices that emphasis for early identification of cases. Secondly, they serve for community care like home to help in educating patients and care takers. Thirdly, in acute care that is hospital to emphasis on the management of respiratory symptoms.

9. **Physiotherapy Role in Primary care that is for clinic care.** They have to consider two primary care

a) **AVOID TRANSMISSION**- Physiotherapists must adopt following to handle COVID-19 situation

- **Follow basic protective measures all time**

1. Perform hand hygiene precaution by applying alcohol based sanitizer and washing hand with soap regularly.
2. Avoid touching face specially eyes, mouth and nose.
3. Don't sneeze and cough in an open area, use tissue or bent elbow immediately and through tissue in dustbin immediate after use.
4. Wear a good medical mask if you have respiratory symptoms and do hand hygiene always.
5. Maintain social distancing everywhere.
6. If you suffering from respiratory symptoms, take medical care immediate.

- **ENDORSE RESPIRATORY, HAND AND CLINIC HYGIENE**

1. Physiotherapists must have written prevention measures and control protocols in their daily practice and communicated the same to all staff.
2. Put signage around the clinic to encourage regular hand hygiene.
3. Put alcohol based sanitizer and have hand wash station available at clinics.
4. Regular sanitize and clean clinic and equipment.

- **AVOID UNNECESSARY CONTACTS**

1. Don't perform physical assessments who have respiratory symptoms.
2. Encourage people to stay at home.

10. FOR BOOKING AN APPOINTMENT

1. Must check recent travel history
2. Must check if any recent contact with positive COVID-19 cases
3. Recent work or visited to a place where patients is confirmed and treated COVID-19

If answer is NO, you can give appointment and if answer Yes, then you have to check the symptoms like fever, cough, or any other related issue to respiratory and if have any symptoms they you should not take any appointment and must advised about local authority guidelines.

11. ON ATTENDING CLINIC

If someone coming on reception, then also checked the same questions and confirmed about any travel history or places visit to near the red zone area, recent contact with positive cases, recent visit to healthcare etc. and if anyone finds symptoms of COVID-19 during consultation then they must follow the followings-

- Isolate the patients from the other patients
- Wear PPE while consulting them
- Provide tissue, mask and sanitizer
- Arrange COVID-19 assessment as per local authority guidelines.
- If patient return to home, guide him to quarantine themselves for 14 days minimum in home.
- Follow clinic and equipment full sanitizer protocols once patient left the clinic.

b) PROVIDE EDUCATION

It is the responsibility of Physiotherapists to share knowledge and guide people on prevention measures and take care of them on preventing transmission of COVID-19.

This can be done in clinic, online platform or through a digital consultation. They must share health preservation strategies like-

- Guide people for physical activity to improve immune system to fight with infection.
- Guide people to take good nutrition to boost immune system.
- Guide people to take proper sleep to keep immune system strong and also hygiene sleep importance.
- Guide people to improve their mental health through physical activity like yoga, meditation, exercise at home to keep mental health strong.

12. ROLE OF PHYSIOTHERAPY FOR HOME CARE

Physiotherapists can promote in a following way to promote physical activity to boost immunity power at home-

1. Guide people and broadcast videos related to physical activity like exercise, yoga and fitness mantra.
2. Motivate people to break their periods of inactivity.
3. Encourage people to engage them on daily activity like aerobics or any exercise which are moderate or vigorous intense to boost overall blood circulation to boost immune system.
4. Guide them for balance exercise
5. Focus on muscle building exercise.
6. Guide them importance of exercises and how it can help in improve mental health.
7. Help in changing their sleep pattern which make them feel better and important for immune system.
8. How physical activity help them to reduce demand on health and systems.
9. Guide them for proper diet and foods which help to build immune system.
10. Guide them for medicines, kaadha which increase immunity.

CONCLUSION

COVID-19 that is coronavirus declared as pandemic which is very serious and harmful virus spreading like fire all over the world. Started from Wuhan market of China and spreads everywhere and harmed many lives. People are scared and taking prevention measures. Physical activity and physiotherapy plays an important role in COVID-19 by boosting overall immune system which is important to fight with infection. We must engage ourselves daily for an hour physical activity to protect from infection by boosting our immune system and to get mental health. Physiotherapists are helping patient and other people by guiding and informing how one can improve overall health from physical activity. It is found that the people who have strong immune system is less affected by COVID-19 virus and can control over it if get infected. So we must involve and follow physical activity.

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CHAPTER-25

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CHAPTER-25

THE WORLD AFTER COVID-19

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ABSTRACT

The present means living in the now and the future, most certainly uncertain. There are businesses all over the world that have come to a grinding halt and there are cases when they are operating with capacity that is limited. The plans which people had been making before Corona made everything come to a standstill are currently on hold. There is also an unknown length of a recession that is looming ahead and it adds up to the entire predicament of being uncertain. The ways in which people collaborate and work together have been changed forever.

1. Introduction

Most of the people in the world are having to be working as remotely as possible during and after COVID-19 times. This is helping the businesses realise that there is a lot to be gained if people are working in the following way that is remotely [1]. It has made it absolutely clear that people spend a lot of time in meetings that are completely unnecessary since there are things and issues that can be resolved online as well [2]. The time taken while in commute from one place to another has also been felt to be unnecessarily overwhelming. There are a lot of hours that have to be wasted sitting in an office chair trying to add to the hours of work [3]. The result of such realisations is that as per 74 per cent of companies are showing to be reducing their space for offices after the

pandemic is in the past. This has been indicated by a Gartner survey done recently [4]. This is what makes people adopt a different working structure than what one is used to be seeing. This is happening since more and more companies are adopting remotely-working as a solution that is full-time. This shall be bringing about a change in all of the processes aligned with the same. Hiring online across time zones and continents to be finding the correct set of skills is getting to be even more important. This system will be something that will be a little less centralised and a little more reliant on that of technical solutions that are empowered by online communication that is crystal clear. Living in a crisis having no access to data whatsoever is a crisis on top of a crisis. There are many businesses however which are going through the aforementioned situation [5]. This is true especially during times of uncertainty like that of the pandemic. This is the time when marketers are in the requirement of ability that is real-time for the tracking of social trends, web trends etc so that they can read the people through situations. This is a problem for many of the marketers who have solely relied on data that is supplied by third parties and they are also slow to be analysed along with being unreliable.

A transition has been seen to be set in already before the pandemic of novel coronavirus however the crisis can most likely accelerate the transformation that is digital in such areas. It is being reconsidered as to how reliable the channels of communication that are accessible to audiences really are. The channels online are the lifelines of an audience caught amidst a pandemic. The companies will have to be reassessing what the channels of distribution for content are as of now. It means that they either pay up to be reaching audiences or go about reaching them even after the marketing budgets have been slashed. This will bring to light a prioritisation of the access that is organic, towards the audiences, which will mean that companies are more than ever focussed on content marketing. The goals for that of a marketer is to be able to build reliable and robust ways for marketing their content to a consumer. This is not just a change in the models of content marketing but it may mean the reevaluation of revenue models as well. Many businesses have ceased to operate as the demands for any services or products they were offering have completely disappeared.

However, if the airline, retailer or restaurant is able to survive this then they will also be pleased to be acquainted with what may have been practised to be diversifying the streams of company revenue. As a result of the same, earring the next crisis will be easier.

There are consumer behaviours that have already changed and that is probably for the long term. Many of the emerging technical innovations which drag on forever to be coming around have finally been materialised. The growing reliance on e-commerce has been unprecedented since people are ordering whatever they need online. However, e-commerce is more or less straightforward as compared to other technologies that require novel sets of skills. The pandemic has fast-tracked other technologies that are emerging as well starting from voice searches since people do not want to be touching things around unnecessarily along with the people starting to use VR. The business is to be preparing for being party to a new wave in the transformation which is digital and had been set forth by Coronavirus. It will be a time to be returning to customers that have been most loyal to a company. There is a very good reason as to why they had to stop shopping from a particular brand due to the crisis. Brands will be facing even more pressure to be reaching out to consumers to sell their wares.

They will also have to consider rebranding since the brand popularity will be at stake after the pandemic is over and competition surges in. Loyalty has always helped a brand and if they had to cancel shipping due to the pandemic the audience is most likely to understand why and not lose faith in the brand itself. The world can still be reconstructed with respect to the ideas of management and work. The protection of employee safety and health, management of digital workflow, making of business models to be more resilient to that of shocks along with managers being more responsible and central to that of agents of response due to the Coronavirus (Reinventing the world of work after Coronavirus - CEC European Managers, 2020). On the other side, they are employees too who are in need of protection. The managers are facing more pressure than ever for getting work done on time. Job stability is questionable as of now however the psychical and emotional demands towards the managers are on a steady rise. The managers of Europe have been able to conclude that the current models of management are outdated and therefore not sustainable.

Countries are in the need for the development of new standards of management for the safeguarding of managers, workers along with the health that is relevant to socio-economic issues. The risks of mental health problems like stress and burnout are becoming more mainstream. The next teaching is the one that very well accompanies the digitisation of business. Along with the participation of the negotiation of social partners in Europe on that of a framework agreement over digitisation has led to the publishing of a guide or manual that will come in handy for managers. The present situation is creating newer challenges like the loss of having direct contact with colleagues, issues related to data privacy, the level of distance shared between workers who are blue-collar and white-collar [6]. It is very important that managers have the right kind of skills so that digitalisation can be a success. This however also involves workers along with employers in dialogue that is social. It is, after all, a common solution and dialogues that can avoid resistance that is strong [7]. Most important of all the Coronavirus crisis has evoked an opportunity for the transformation of the world of jobs purposefully and sustainably. More and more companies are embracing the guidelines for sustainable leadership and starting projects on the same. One also has to be thinking beyond that of the market ideologically being pitted opposite to state dynamics along with consideration of boundaries that are planetary and needs that are societal and can help in legitimising of business models. Social dialogue being more mainstream can help in such situations. Speaking of societal needs the importance of female labour have to be realised as well in a big way.

There are many experts and commentators who also seem to think that the virus pandemic is not enough to change the underpinnings of the orders of the world even though it is seriously affecting the international economy along with world politics. People have countered statements saying that the world is changing stating that this is just a superficial shock that will be forgotten in time [8]. The pandemic has made people aware that even the most advanced countries can be the most vulnerable to attacks however the more restive and lesser prosperous parts of the world are less tormented by it. It has come to light that the curve of mortality in the year 2020 is mostly the same as had been the case in 2019.

It has been noted that the pandemic is not here to be cardinally changing the parameters of living and it acts only as that of a catalyst for accelerating current processes. There quite a number of analysts who are stating that China will declare its supremacy in the world after Corona is a thing of the past. They have responded effectively and quickly too as the crisis spread making them a leader in the world [9]. There is already an increasing pressure that is strategic coming from the Americans and other individual Western countries in regards to China's leadership since they think that they are the ones to spread the disease leading to the unintentional erasure of political leaders and citizens by dying. There is a situation of development regarding Russia as well [10]. America's decline will have to be more understood by the rest of the world since they have always promoted hegemonic diplomacy outside their own countries along with a lacking of practical reforms that were required within America itself. There is a pattern of polarisation that is emerging as per the scholars of the U.S since the total gross domestic product of U.S and China are exceeding 40 per cent of the total made by the rest of the world [11]. The total military expenses of the two global superpowers have exceeded more than 45 per cent in relation to global spending. They are accounting for greater than 65 per cent of that of the total R&D investment of the world. There is also a prospect that is being explored in regards to the return of the Cold War where the United States had to fight the Soviet Union. China is, however, informing the world that it is the least of what they want along with the rest of the world. As the conflicts increase in the future, finding a bright-side to all of the same will be a serious dilemma. Yet in future, the technological advances must be affirmed developed in order to combat such pandemic situation as of COVID-19 [12].

Conclusion

The main takeaways from the situation described above are that the pandemic has to be among the most tragic of the events to have happened in people's lives. The crisis is not yet over and it is taking control of people and their lives however everything has a lesson hidden in it somehow so it will be somehow shocking if one did not learn anything from it. This is the time when people will be learning to prioritise whether they want to or not. It is something that has set forth a chain of events that have to be borne and

survived together with the world and not alone. The world is waiting to be reinvented after the crisis is resolved. The companies need to be practising more of the same so that they are able to bear crises and attacks with aplomb.

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CHAPTER-26

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CHAPTER-26

THE GLOBAL RACE FOR MOST AWAITED VACCINE AGAINST COVID-19

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ABSTRACT

The report is based on the currently developed vaccination for COVID-19. Due to COVID-19, the whole world is facing problems. The situation is going to be pathetic day by day. It attacks the aged people heavily and they are going to die. There was no availability of medicine. In medical science also there was no such kind of description of medicine. Only by increasing the immunity power, doctors are trying to save the life of patients. The descriptions of the development of medicine are discussed throughout the report.

1. Introduction

A COVID-19 vaccine is biotechnology aimed for providing immunity in opposition to COVID-19 in 2019. At first, vaccines were developed by 218 vaccine candidates in July 2020. But no one candidate till now has accomplished clinical trials to confirm its efficacy and safety. Vaccine candidates were declared around 24 that they were going for trials in clinic, two candidates are starting Phase three, and also seven candidates are in Phase one to two. Formers are trying to improve a vaccine at odds with coronavirus SARS, with it

also MERS asserted significant knowledge of learning regarding the function and structure of coronaviruses which developed rapidly in this current year 2020, based on different platforms of technology for coronavirus vaccine but the former vaccine candidates are being failed in the first stage of trials in clinic, without any advancement of approveness. The Coalition for Epidemic Preparedness Innovations (CEPI) that is forming 2 US billion dollars universal funds to accelerate dedication, and also improvement of vaccine candidates that pointed out in April. Vaccines are maybe obtainable under emergency for applying in fewer amounts by early 2021. The WHO established a telethon that accepted around 8.1 US billion dollars in undertaking from forty countries for providing the help in the rapid improvement of vaccines to confine COVID-19 infections on 4 May in this year. The WHO also declared at that time expansion of international "Solidarity trail" for contemporaneous estimation of more vaccine candidates coming at Phase two-three trials in clinic.

2. The pandemic of COVID-19:

From the last six months, the speed of COVID-19 is increasing in such a manner that 6 million people have infected. And 380,000 people have killed by the effect of this COVID-19. It became the biggest challenge for all over the world. A vaccine is urgently required to stop this condition. All counties over the world are trying their level best to invent the vaccine. Many companies are contesting to make a COVID-19 vaccine. On 12th May 2020, the USA government announced that this vaccine of COVID-19 could be available by the end of this year. The World Health Organization expects that in between 1.5-2 years, the COVID-19 vaccine will be available. A quick recovery from biology revives us about the immunity induced by the common viruses and immunization. Microorganisms cause many human diseases. When a body contacts these microbes includes the viruses, bacteria, fungi, or parasites, its immune system plays a vital role. It protects our bodies from these pathogens. As our immune system will run smoothly, you won't notice any diseases [1]. The immune system of our body responds against the pathogen. The immune system provides antimicrobial peptides to stimulate the cells of the body. The white blood cells of our blood also detect whether a substance does belong to our body

or not. The immune system provides an antibody to protect our bodies. To make this antibody, it takes 2-8 weeks. It is very naturalistic to fall in sick or recovering from an infection, but the only thing is to acquire immunity to it. If we expose to the same pathogen frequently, our body spots the pathogens and give a quick response to it. The necessity of a vaccine is to develop the immunity power. It helps to terminate the severity of the disease. It can accelerate the immune system to respond to the pathogens by creating antibodies. Scientists have already succeeded by inventing vaccine to prevent the disease such as smallpox, chickenpox, polio, measles, and recently Ebola disease. To create a vaccine is not as easy as we think. In realism, the task of creating a vaccine is a very complicated and sky-high task with unpredictable results. If one could establish a vaccine, to initiate with that, the person has must be tested in experimental animals to assure that it is not poison in any way. Usually, the developer of the vaccine goes along with some specific steps. The number of factors is studied here. The main factor that is involved:

- **Safety and Security:**

First of all, it is essential to more that the vaccine is safe to use or not. Vaccines are must be tested if there are any other risks involved with it.

- **Cost:**

Before initiating, the cost of raw material should have considered for a vaccine. We have to consider how many skilled professionals are required to act on it.

- **Efficiency:**

Once a vaccine has developed, it needs to determine whether it works well or not. By organizing the clinical trials, efficiency can ensure.

- **The timespan of the immunity:**

The most important determinant is how much longer the vaccine persists. The developer needs to so strong that their vaccine is healthy and vigorous enough to keep on providing immune power.

3. Globally Accelerated Improvement:

After detecting the pneumonia of novel coronavirus in December 2019, genetic series of coronavirus was revealed on January 11 in next year, set off a serious response

internationally to ready for the prevalence, with it also precipitate the improvement of the preventative vaccine [2]. Instantaneously, the increasing infection rate of coronavirus globally at the time of early 2020 sharpened international alliances, also government exertions for arranging the resources urgently to create several vaccines during a very short time, with only four vaccine aspirants entering human rating on March. A vaccine for a contagious disease has not been made in less than more years, and also no vaccine outflows to stop the disease of coronavirus. On April CEPI allows that six of 115 vaccine aspirants against this novel coronavirus would be selected by international coalitions for improvement depending on Phase two-three trials, along with also three must be lined through governing and also undertaking the quality for ultimate approving at a total expenditure of minimum 2 US billion dollars [3]. Ten candidates simultaneously will require for improvement initially before an elect few are selected for the ultimate way for licensing. The vaccine exertion is being set up with the speed of evaluation of harsh clinical for efficacy and safety, planning and financing for generating billions of doses, also consequent global expansion and unprejudiced portal among advanced and untrained countries [4]. CEPI, WHO are pledging money, and also organizational sources for the expectation of those different vaccines, will be required for destroying this continuing coronavirus infection. Custom production of the vaccines will need with packaging, transportation, also storage in a total of 200 countries with transited citizens. The WHO organization allots the total price of 8 billion US dollars for developing three or more than three vaccines that have uses the various technologies and try to prevent the infections of COVID-19 worldwide.

4. International Organizations

International alliances have been formed by organizations for the expedition of development and preparation of the vaccine. Finally, the vaccine needs to be distributed. The WHO is included among the organizations that are providing collaboration, accelerating research, facilitating international communication on a scale that is unknown in history [5]. For helping in vaccine development globally, the WHO has implemented and procedure that is providing acceleration to developed COVID -19 tools. The WHO

declared in July 2020 that, 165 countries represent about 60% of the world population, will be provided the equal distribution of the licensed vaccine. Also WHO makes it guaranteed that by the end of the year 2021, around 20 percent of the population of each country belongs to those 165 countries, will be vaccinated. The CEPI stands for Coalition for Epidemic Preparedness Innovations that are working with international health authorities also with the developers of vaccine for creating another 8 billion of US dollars with the help of partnership in globally. In the month of May the United Kingdom, Belgium, Canada, Norway, and some other countries already pay around 195 billion US dollars to CEPI. For research of COVID-19 Vaccine, one charitable organization also donates around 250 billion US dollars to the CEPI. The GLoPID is also helping WHO for research purposes in a number of stages.

5. National Governments

For international and national research of vaccines, the national governments are also dedicating the resources. Also, the governments are investing money in the manufacturing of the vaccine in 2020 [6]. The governments already invested in 96 research projects of COVID-19 in Canadian companies. Another investment is related to the clinical trials in Canada that are cost around CA$1.1 billion. The Canadian government is also provided $850 million to the WHO for research and vaccine development purposes. The China government is providing loans in low-interest rates with the help of the Central bank for the development of the vaccine. In the month of June in 2020, from the twelve vaccines, the six vaccines are in their early stage of human testing produced with the help of the Chinese Organization. So the governments are supporting the Chinese companies of vaccines for early research and development of the vaccine.

6. The Vaccines of COVID-19:

In an excellent effort to address this danger, some of the institutions have struggled. For clinical trials, ten separate vaccine applicants are now present. In Cambridge, Moderna is a biotech company where candidates of COVID-19 based on the mRNA platform [7]. The mRNAs are the mediators to take genetic information collected in the DNA for making the protein in the cell that reads the encoded instructions and

forms proteins. With the help of these proteins, various functions of these cells in our bodies are performing. The applicant of vaccine mRNA-1273 stocks the guide to creating the SARS-CoV-2 S protein, which is decoded by this method for exciting the immune system. Here 45 healthy volunteers were managed before this animal trial accomplish. On 12th May, Moderna declared that to accelerate its development, it had to accept the fast track designation of the US FDA. In a single week, the Moderna declared that mRNA-1273 was harmless, safe, well-performed, and provoked immunizer responses similar to those sufferers who had already recovered from COVID-19. On 18th may, in this announcement, this Company declared that its applicants protected from the virus. Oxford University vaccines depend on some common harmless viruses. For forming the S protein, it is transforming to carry the genetic instructions. Also, this formation is known for ChAdOx1nCoV-19. In the last week of April, this vaccine is already inscribed for human trials to recruit more than 1100 healthy adults. On 13th May, the outcomes of treating monkeys with this vaccine have posted as an article, applicant of vaccines has protected some specific monkeys from pneumonia. In the time when the monkeys experimented with a nasal swab in the presence of SARS-CoV-2, there is no notable variation between immunized and unimmunized monkeys. In this way, the effects of this vaccine are in the same way in humans. Oxford Institute is initiating to planning the trials of stage 2 and stage 3 [8]. Not only, The Moderna has been innovated a successful vaccine for the disease, but The Oxford Institute has also innovated its vaccine for some other bugs. Instead of this, in clinical trials, there are also eight more applicants are present. Among the eight applicants, five from China and some are from the USA. Another vaccine is Mynvax. Bengaluru based health care provider announced work on the COVID-19 vaccine. It is the same research that has already completed in the Indian Institute of Science. The Ahmedabad-based pharmaceutical startup announced the testing process of vaccine applicant marked ZyCOV-D in last week. In the same research for the extensive process was completed in collaboration with the laboratories in the USA. Other vaccine makers in India advertised the progress of vaccines by a partnership with the Griffith University of Australia. Here pre-clinical experiments are still running on. Indian Medical

Association has asserted a vaccine for coronavirus, after 2020, due to the improvement, and retailing can lead to the proper stage. Further, technological advances should be look into along the side to combat COVID-19 [9].

Conclusion

Throughout the discussion, we come to this conclusion that a reliable, efficient, and low-priced vaccine is required. It is most important to stop this pandemic situation. It is not possible to avoid this situation at once. It is expected that a vaccine could work for some, but not for all. Such a vaccine is becoming a requirement for all. It may not be equally affordable to all the countries, so the world needs to learn to manage it. If one country also could not get the vaccine, the SARS-Cov-2 virus will continue to persist. So we should join our hands together and should aware to free from this daredevil.

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CHAPTER-27

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CHAPTER-27

THE GLOBAL COUNTRY WISE STATISTICS ON COVID-19

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ABSTRACT

This chapter is based on the country wise statistics of the COVID-19 outbreak and the major exploration of the chapter which are more affected in the timeframe since the first report of COVID-19. The COVID-19 pandemic drove economies into a Great Lockdown, which contained the infection and spare carries on with, yet additionally set off the most exceedingly terrible downturn. Throughout this chapter a details evaluation has been made about countrywide statistics for COVID-19 pandemic attack and negative impact to the world economy

1. Introduction

COVID-19 has contaminated more than 11 million individuals worldwide and guaranteed in excess of 5,00,000 lives with Europe and the United States surpassing China where the pandemic began last December. World Health Organization usually known as WHO has been announced that the corona virus is appear is in the form of pandemic , this is because of far reaching size of the flare-up and has cautioned that the most exceedingly terrible of COVID-19 is yet to come. The United Nations said the corona virus pandemic is the most noticeably awful worldwide emergency since World War II. As

far as the quantity of affirmed corona virus cases, the US, Brazil, India, Russia and Peru are the five most-influenced nations.

2. The Pandemic Attack in United States

The United States has the most noteworthy number of COVID-19 cases and passing of any nation around the world. Each U.S. state has announced instances of COVID-19, with New York one of the hardest hit states. Overview information shows that worry about the COVID-19 pandemic has expanded in the United States, with 32 percent of U.S. grown-ups in January expressing they were extremely worried about the episode and this number ascending to 57 percent as of June 29 [1]. Toward the finish of March, it was evaluated that more than 90 % for the inhabitants in US was under a stay-at-home request, with numerous states shutting schools, cafés and other amusement settings, dropping open occasions, and encouraging social separating. As case numbers diminished states anxious to restart the economy started lifting lockdown limitations which has brought about an expansion of new cases in numerous states. The United States government has been condemned for at first making light of the reality of the pandemic, its moderate reaction as cases rose in the U.S., and for an overall absence of direction [2]. An overview from the industry, which ran from March to the furthest limit of May, found that U.S. grown-ups were reliably more averse to be happy with their national government's reaction to the COVID-19 pandemic than their partners in UK or Germany.

As of August 3, 2020, there had been around 692,851 passing because of the infection, with the United States revealing the most elevated number of passing of any nation around the world, trailed by Brazil and Mexico. In any case, it is currently felt that the death rate is doubtlessly lower than this gauge, in spite of the fact that the genuine death rate is hard to decide as of this time. In any case, this rate is higher than that of occasional flu, typically well beneath. 1 percent, yet lower than paces of other late infection episodes. For instance, the governing body (MERS-CoV), first announced in quite a while, a casualty pace of 34.4 percent, while extreme intense respiratory condition related corona virus (SARS) has a pace of 9.6 percent [3]. Numerous associations around

the globe are at present chipping away at an antibody for COVID-19, however it is hard to tell exactly how long it will take until one is accessible to the general population [4]. Up to that point, the World Health Organization (WHO) has supported those living in locales with diseases to take fundamental prudent steps, for example, consistently washing hands, covering the mouth and nose with a bowed elbow when hacking and wheezing, and evading contact with individuals who might be tainted. The corona virus is a particular kind of infection which influences the respiratory parcels. On the day of March 11, 2020, the WHO formally announced corona virus has created the pandemic situation, as infection spread in excess of a hundred nations, causing more than 4,000 passing.

3. COVID-19 circumstance in the Italy

As of June 29, 2020, Italy recorded 240 thousand instances of corona virus (COVID-19), speaking to one of the most influenced nations around the world. At present, the locales with the most noteworthy number of cases are Lombardy, Emilia-Romagna, and Piedmont, situated in the north of the nation. Segment information on the tainted patients show that COVID-19 in Italy hit for the most part individuals matured 50 years and more seasoned. Moreover, Italy checked right around 190 thousand individuals recuperated from corona virus or released from medical clinics as of June 29, 2020. Because of the episode of the novel corona virus, the (GDP) in Italy is assessed to diminish [5]. Since the episode of corona virus, various appraisals on the GDP development dependent on various situations have been discharged. As indicated by a gauge from May, by 2020, the Italian GDP may diminish by 9.6 percent. All things considered, the effect of corona virus on the Italian economy may differ as indicated by the division. For example, the utilization esteem in the food, wellbeing, and media segments is required to increment. On the other hand, the divisions of material, transport, lodgings, cafés, and diversion are evaluated to record the most elevated drop. In this sense, it is gauge that the travel industry in Italy will be profoundly influenced by the spread of COVID-19. A viewpoint distributed in March 2020 shows that the nation is relied upon to enroll a diminishing of around 4.7 million universal vacationer appearances. In this regard, the most noteworthy drop in appearances identifies with Chinese, German,

and U.S. voyagers. Additionally, a gauge from March 2020 assessed that incomes of inns, travel services and other touristic offices are relied upon to diminish altogether.

4. COVID-19 Outbreak in India

A half year after the province of Kerala recorded India's first instance of SARS-CoV-2, the nation despite everything remains solidly in the holds of the pandemic. The account of the episode in India has had various exciting bends in the road with Maharashtra, and the country's money related capital Mumbai, specifically, at first developing as the country's focal point. The pace of disease in the nation's capital stayed low at the beginning phases of the flare-up yet then took off driving wellbeing authorities to become worried over the state's waning medicinal services foundation. Kerala's response was at first commended universally with the state's related knowledge in taking care of the Nipah infection demonstrating vital [6]. Be that as it may, following the commencement of repatriation flights and resumption of between states travels, Kerala has likewise attempted to contain what might be contended was its subsequent wave. The across the country lockdown executed by the Center in late-March did, surely, seem to slow the development of the disease in the nation yet a few wellbeing specialists are in understanding that it didn't help in smoothing the bend. India's COVID-19 development has not copied the exponential development saw in other seriously hit nations around the globe like the United States, Spain, Italy and Germany [7]. The drawback to this however, is the movement of the flare-up is probably going to be more slow inside the nation, with its end just showing up belatedly. As the chart underneath shows, India's week on week development since April 30 onwards has not demonstrated any recognizable pattern downwards, to a great extent, floating somewhere in the range of 20 and 30 percent. Notwithstanding, a more granular look uncovers that a few states have fared essentially superior to other people. Haryana, and in later weeks Tamil Nadu, Delhi and Maharashtra have figured out how to keep their week-on-week development beneath or close to the national normal. States like Andhra Pradesh, Karnataka, and West Bengal however, have battled in the course of the most recent couple of weeks.

5. COVID-19 Outbreak in China

When the pandemic attack of corona virus episode at first surfaced in the Chinese city of Wuhan, little did the world realize that it would unleash extraordinary destruction around the world? December 31, 2019, when the Chinese detailed their first corona virus case, the term 'COVID-19' had not been authored. Roughly around 5 months after the fact, a large portion of the world is under a lockdown which would have been impossible not many months back [8]. The other portion of the world has quite recently come out of that lockdown and is managing an exceptional loss of financial solidness and all the more significantly - lives. Over 8.7 million individuals over the globe have been tainted by COVID-19 up to this point, among these, 462,519 individuals surrendered to the ailment. Furthermore, the numbers are rising each moment. "Grouping changes happen as often as possible in corona viruses, which can, step by step after some time, produce another receptor restricting area (RBD) structure fit for transmission between various creatures or among creatures and people [9]. It may, exactly when the world idea that China had disposed of the corona virus, bunches of cases have developed, and this time in the Chinese capital city of Beijing.

6. The impact of COVID-19 to World Economy

More than 75 percent of nations are currently reviving simultaneously as the pandemic is increasing in many developing business sector and creating economies. A few nations have begun to recoup. Be that as it may, without a clinical arrangement, the quality of the recuperation is profoundly dubious and the effect on certain parts of the nations that has collapsed. There are three different ways in which the country can advance a comprehensive worldwide financial recuperation, as per the IMF. World Bank: COVID-19 downturn is relied upon to be twice as terrible as the 2009 money related emergency Contrasted with our April World Economic Outlook gauge; we are presently anticipating a more profound downturn in 2020 and a more slow recuperation in 2021. Worldwide yield is anticipated to decay by 4.9 percent in 2020, 1.9 rates focuses beneath our April figure, trailed by a fractional recuperation, with development at 5.4 percent in 2021. Notwithstanding stuns to the travel industry, utilization, venture, and exchange and

creation linkages canvassed in the ADO 2020 evaluations, the new report incorporates transmission channels, for example, the expansion in exchange costs influencing versatility, the travel industry, and different businesses; gracefully side disturbances that unfavorably influence yield and speculation; and government strategy reactions that relieve the impacts of COVID-19's worldwide financial effect [10]. Financial aspects IMF cash gross domestic product account downturn recuperation development negative Corona virus china infection wellbeing human services who world wellbeing association malady passing pandemic scourge stresses concerns Health infection infectious virus infections sicknesses ailment lab specialist wellbeing and nurture clinical medication drugs antibodies immunizations vaccinations innovation testing test therapeutic biotechnology biotech science material science magnifying lens research flu influenza cold regular virus bug hazard symptoms respiratory china Iran Italy Europe Asia America south America. These projections infer a total misfortune to the worldwide economy more than two years (2020–21) of over $12 trillion from this emergency. The downsize from April reflects more regrettable than foreseen results in the principal half of this current year, a desire for more diligent social removing into the second 50% of this current year, and harm to gracefully potential. A serious extent of vulnerability encompasses this gauge, with both upside and drawback dangers to the viewpoint. On the upside, better news on antibodies and medicines, and extra approach backing can prompt a speedier resumption of monetary movement. On the drawback, further floods of diseases can turn around expanded versatility and spending, and quickly fix budgetary conditions, activating obligation trouble. The World Bank is anticipated a 3.2 percent withdrawal in India's economy during the current monetary year. In its most recent Global Economic Prospects report, the World Bank said that the worldwide economy is required to decrease by 5.2 percent because of the COVID-19 pandemic. This will be the most profound downturn in worldwide economy since the subsequent World War, the World Bank additionally said.

Conclusion

Based on the above analysis, it concluded that the outbreak of COVID19 pandemic attack has been created a negative impact to the world economy and it can associate with

the slowdown of the entire economy. Spread of the corona virus is causing a worldwide crisis. It has been portrayed as a "pandemic attack" by the US Centers for Disease Control and Prevention (CDC) and the WHO has quite recently raised the status to that of a "pandemic" an irresistible illness that can taint individuals effectively and spread from "individual to individual in a productive and continued manner," as indicated by the CDC.

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CHAPTER-28

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CHAPTER-28

ADMINISTRATION OF CURRENT MEDICINE AGAINST COVID-19

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ABSTRACT

The emergence of novel corona virus (COVID-19) has resulted a state of emergency across the globe. The situation has hampered the global health care sector with limited or no choice of drugs to combat the current scenario. WHO and other governing agencies are tapping the scientific resources to come up with best possible solution and medication. Based on which the present chapter has been executed to highlight the drugs and therapeutics as first line of defense against the COVID-19. The chapter also highlights on the attempts of developing vaccine against this pandemic crisis.

1. Introduction

The COVID-19 or coronavirus pandemic is defining the world health crisis of this time and the biggest challenge population has faced since world war 2. Since its disclosure in Asia late last year, the virus has outspread to every continent except Antarctica. But pandemic is more than a health crisis, it is also an unprecedented socio-economic crisis. Everyone is stressing and the country touches, it can create destructive social, political effects, and economics which will leave huge and long-standing scars. First human cases of COVID-19, the disease caused through the novel Coronavirus causing COVID-19, called

SARS-CoV-2 were firstly found out officially in Wuhan city, China, in the year December 2019 [1]. The symptoms of COVID-19 are myriad. Most infected people will develop themselves mild to moderate illness and get recovery without any treatment or hospitalization. Some of the common symptoms includes Dry cough, Fever, Tiredness, Sore throat, Diarrhea, Headache, Aches and pains, , Conjunctivitis, Not getting the test or smell or rash on the skin, or discoloration of the fingers or toes. During serious implications patients have witnessed difficulty in breathing or breath shortness, Chest pain or pressure loss of the speech or movement. The symptoms may vary depending upon the degree of infection. Once you encounter the infection, within 14 days you are expected to get symptoms depending upon the immune response of the individual.

2. Medicine used during COVID-19

Till date, there is no exact medication available for the COVID-19 infection, as there is alarming rate of mortality and morbidity, the WHO and the governing agencies have come up with the administration of approved drugs which may suppress the infection and act in management of this pandemic situation. As of now, there are temporary/interm approval of reported drugs for immediate use which are being discussed in the following section. The FDA has been granted immediate utilization of the antiviral drug remdesivir to treat the COVID-19. The US national institutes of the health just now recommended the corticosteroid dexamethasone for the persons with severe COVID-19 and need supplemental mechanical ventilation or oxygen. Currently, no medicine or vaccine is available for the treatment of the COVID-19 and no cure is available. Antibiotics aren't impacting against viral infections like COVID-19. Doctors or researchers are testing many possible treatments [1]. Encouraging care is aimed at mitigating symptoms and also may include Pain relievers (ibuprofen or acetaminophen), Cough syrup or medication, Fluid intake . But there is no proof that ibuprofen or other nonsteroidal anti-inflammatory drugs (NSAIDs) require to be ignored. The first coronavirus vaccine in china is expected to ready for the clinical trials by the last of the April month, according to the Xu Nanping, vice-minister of science and technology of china. Inovio pharmaceuticals plan to start the clinical trials on the vaccine of the coronavirus in the April month this year. Health officials

from the WHO have been noted that Gilead's remdesivir has been exhibited effectiveness in treating coronavirus infection.

3. US FDA approved chloroquine for emergency use for COVID-19

The US food and drug administration (FDA), has been approved bounded emergency utilization of the chloroquine and hydroxychloroquine as the treatment of the COVID-19. US President Donald Trump had announced on 19th March, that hydroxychloroquine/Plaquenil and chloroquine utilized to treat arthritis and malaria were accepted through FDA to be tested as the COVID-19 treatment. Chloroquine is also being tested in different clinical trials that are done by government agencies and academic institutions. Other types of antivirals drugs are also made to be fast-tracked for the testing for the COVID-19.

4. The drug used in china Faviliar

In China, the national medical products administration has been approved the utilization of the Favilavir, which is an antiviral drug, as a drug for the treatment of coronavirus. This drug has been reportedly seen efficacy for treating the disease with the minimum side effects in clinical trials including 70 patients. This clinical trial is being done in Shenzhen, Guangdong province.

5. Pharmaceutical organizations involved in making COVID-19 vaccines/drugs

Here is a list of main coronavirus drugs that pharmaceutical companies over the world are making that have been possible to become the main coronavirus vaccine or antivirals for treating communicable coronavirus infections. Vaccines are listed below are the coronavirus vaccines in different stages of the development, over the world.

- ***Fusogenix DNA vaccine through Entos pharmaceuticals***

  Entos pharmaceuticals are making Fusogenix DNA vaccine made utilizing the Fusogenix drug transportation platform to avert COVID-19 infections. Its delivery platform is the proteolipid vehicle which addresses genetic payload straightly into human cells. Entos is performing on making a developed payload holding many protein epitopes that are derived from SARS-COV-2 proteins, this will stimulate an immune response in the body to stop COVID-19 infection [2].

- ***ChAdOx1 nCoV-19 through the university of oxford***

  Oxford university ChAdOx1 nCoV-19 is an adenovirus vaccine vector made by Jenner's institute university. University is a testing vaccine in the clinical trial and planned to be conducted in the Thames Valley Region. And Approximately 510 participants their age is between 18 to 55 years will be selected fro the vaccine trial or future study.

- ***Gimsilumab through Roivant sciences***

  Roivant Sciences is providing development of the Gimsilumab at a clinical-stage, human monoclonal antibody. The drug targets granilocyte-macrophage colony factor is related to stimulating (GM-CSF), this is a pro-inflammatory cytokine that got at a high level in serum of the COVID-19 patients. Targeting GM-CSF is also expected to remove the damage of the lung and also reduce the mortality rate in COVID-19 patients.

- ***AdCOVID through Altimmune***

  Altimmune has cooperated with the University of Alabama at Birmingham (UAB) to make a single dose of an intranasal vaccine to COVID-19 called AdCOVID. The organization is presently bringing out immunogenicity after the studies, that stage one clinical trial material will be made. UAB and Altimmune will work and researchers conduct a preclinical study of animal and stage one clinical trial in the year of the third quarter of the 2020 [2].

- ***TJM2 through the 1-MAB biopharma***

  1-Mab biopharma is made TJM2, this is a neutralizing antibody, and a treatment for cytokine storm in the patients who are suffering from a serious case of coronavirus infections. This medicine targets human granulocyte-macrophage colony-stimulating factor (GM-CSF), this is responsible for acute and chronic inflammation. The organization will begin development after getting approval of the investigational new drug (IND) applications from the US FDA (Food and drug administration).

- ***The vaccine of coronavirus by Medicago***

  Medicago is making drug candidates against COVID-19. After producing virus-like particles (VLP) of the coronavirus. The organization has been making cooperation with the Laval university's infectious disease research center to develop antibodies at odds with the SARS-CoV-2. Organizations' research activity is being partially capitalized by the Canadian institutes to health research (CIHR).

- ***AT-100 through airway therapeutics***

  Airway Therapeutics is traversing its noble human recombinant protein called AT-100 (rhSP-D) for coronavirus treatment. The organization has also announced a filling with respiratory disease branch for the national institute of health to assess drugs. AT-100 has been seen efficacy in the preclinical study in removing infection and inflammation in the lungs when also developing an immune response against the different respiratory diseases.

- ***TZLS-501 through Tiziana life sciences***

  Tiziana life sciences are developing their monoclonal antibody called TZLS-501 to the treatment of the COVID-19. TZLS-501 is a human anti-interleukin-6 receptor (IL-6R), that helps to stop the damage of lungs and raised levels of IL-6. The medicine works through combined with the IL-6R and consuming the amount of IL-^ circulating in the body thus removing chronic lung swelling.

- ***OYA1 by OyaGen***

  OYA1 OyaGen's has been providing strong efficacy against COVID-19 patients in laboratory essays. And it was more effective than the chlorpromazine HCl in the inhibiting SARS-CoV-2 from the copying in the human cell culture. OYA1 was approved earlier as a new investigational drug for cancer treatment however forsaken due to the lack of efficacy. And OYAGEN conducts further research on medicine to fix the efficacy of coronavirus treatment.

- ***BPI-002 through BeyondSpring***

  BPI-002 BeyondSpring is a tiny molecule agent designated for the treatment of different infections involving COVID-19. This can activate in body CD4+ helper T

cells and CD8+ cytotoxic T cells and developing an immune system in the human body. If this combined with the other COVID-19 vaccine, this medicine can create long-duration protection against viral infections. This has filed US patent from the protection for drug treatment from the viral infections.

- ***Altimmune intranasal corona virus vaccine***

  Altimmune is the US-based company developed an intranasal COVID-19 vaccine by the biopharmaceutical company. Synthesis and design of a single dose vaccine have been made complete and will follow animal testing. The vaccine of the coronavirus is being made which is based on the vaccine technology platform which is the same as the NasoVAX, and this an influenza vaccine that is made by the Altimmune.

- ***INO-4800 through Inovio pharmaceutical and Beijing Advaccine biotechnology***

  Inovio pharmaceutical has cooperated with the Beijing Advaccine biotechnology organization to innovative development of former's vaccine, INO-4800, which is a novel vaccine for the coronavirus. The organization has been beginning preclinical testing for the manufacturing clinical product. This vaccine development is kept up a $ 9 mallow from Coalition for the preparedness innovations (CEPI). The company announced an advanced timeline for the development of vaccines on 3rd march. Trails are running and design for the human clinical trial has been done. The organization has been also made 3000 doses for the human clinical trials that are planned to be done over the US, South Korea, and China. Plans are developed for large scale manufacturing [3]. Human-based clinical trials are in the 30 healthy participants are expected to start in April 2020 in the US, South Korea, and China. A stage of one clinical trial is done to be n parallel china, through Beijing Advaccine. outcomes from clinical trials are awaited to be accessible in 2020 September. Inovio purposes to develop 1 million vaccine doses through the last of 2020 to done additional emergency use or clinical trials.

- ***NP-120 through Algernon pharmaceuticals (Ifenprodil)***

  Algernon pharmaceutical has been announced which is traversing its NP-120 (Ifeprodil) as a possible COVID-19 treatment. Ifenprodil is an N-methyl-d-aspartate (NDMA) contact glutamate contact antagonist sold under the name of brand Cerocal. It has been displayed efficacy for increasing stamina in the mice infected with the H5N1.

- ***APNO1 through the university of the British Columbia and APEIRON biologics***

  A medicine candidate made by the APEIRON biologics called APNO1 is being tested in China in a stage 1 pilot trial as the COVID- 19 treatment. APNO1 is researched by the professor at the University of British Columbia for the treatment of SARS. Research is disclosed in which the ACE2 protein was the main contact for the SARS virus. Clinical trials will be tested medicine's efficacy in removing viral load in patients. Data on the trail will be utilized to fix if more clinical trials are needed to be done in a huge number of patients.

- ***mRNA-1273 vaccine through Moderna and vaccine research center***

  A unit of the national institute of the allergy and infectious diseases (NIAID), Moderna, and vaccine research center, have been cooperated to make a vaccine for the treatment of the coronavirus. This vaccine target spike (S) protein for the coronavirus. First trials of vaccines have been made at the Moderna's Massachusetts manufacturing plant and shipped to NIAID for the stage 1 human trial. The trail started on the 16th March at the Kaiser Permanente Washington health research institute in Seattle, Washington. Approximate 45 males and females, they're aged between 18 to 455 have been selected fro the trial. The volunteers will be partitioned into 3 units those will be administered 25 mCG, 100 mcg, or 250 mcg (microgram) dose for 28 days.

- ***Avian Coronavirus infectious bronchitis virus(IBV) vaccine through MIGAI research institute***

  MIGAL research institute in Israel told that an infectious bronchitis virus (IBV) vaccine is made to provide treatment avian coronavirus has been changed to treat COVID-19. The vaccine has been displayed efficacy in the pre-clinical trials done by

Volcani institute [3]. The IBV vaccine was made after 4 years of the research and has a higher genetic similarity for the human coronavirus. And the institute has been genetically changed vaccine for treatment COVID-19 and will be in the market in oral form.

6. The future prospective

The world is in race of coming up with novel vaccine, technology and drugs to combat COVID-19 but as of now, no concrete evidence is available to elucidate the exact drug or medication against this pandemic crisis. May be in near future, scientific communities are hoping to give positive response in controlling the spread of COVID-19 [4].

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CHAPTER-29

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CHAPTER-29

DEVELOPMENT OF VACCINATION DURING COVID-19

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ABSTRACT

The outbreak of COVID-19, has created huge impact. There has been different management strategies implemented by WHO as there is minimal drug choices and lack of vaccination process. In order to combat COVID-19, different scientific groups are associated and started clinical trials to come up with the first successful vaccine. The present chapter provides brief note on the different stages on the development of vaccination process. The information provided in the chapter is based on the information available across the media and WHO, the conclusive vaccination process can be only finalized with concrete clinical trials and sufficient scientific documentation in near future and we hope to see the first vaccination soon.

1. Introduction

The chapter starts with the natural process of vaccination in ecosystem for instance every springtime, thousands of crabs that are of the horseshoe type climb on to beaches in the mid-Atlantic portion of the U.S as they are being guided by that of the full moon. That is good news as far as sea-birds are concerned who feed on them and as for companies manufacturing drugs, it is a very critical resource for the creation of safe human medicines [1]. The secret is the creature's blood that is milky blue in colour and is known

to be the only natural source for that of limulus amebocyte lysate. This is the kind of substance which detects the contaminant known as endotoxin. Even in the tiniest of amounts, an endotoxin that is a kind of toxin that is bacterial making their ways into that of vaccines, other sterile pharmaceuticals like that of artificial hips and knees or injectable drugs can turn to be deadly. Many of the pharmaceutical companies have relied on these creatures around the world [2]. Each and every year as it passes by, drug manufacturing companies use about 0.5 million of the horseshoe crabs found in the Atlantic ocean. Their idea is to bleed them for a while and let them crawl back into the sea however many of the horseshoe crabs are found to be dying as a result of the same. The practice in combination with overharvesting of horseshoe crabs to be used as bait for fishes is causing a decline within that of the species pertaining to the U.S over the past years.

The beginning of July 2020 indicated that, an U.S based company Lonzais manufacturing vaccines for Coronavirus and send them for a human clinical trial. It is found that the lysate a very important component of the drug to be released and to be sold in the U.S markets. Lonza is giving a written statement stating that by testing the vaccine it will require about greater than a day's production of lysate from horseshoe crabs coming from 3 manufacturers in the U.S. The Charles River Laboratories have accepted the above to be true as John Dubczak, who is a representer of the company has explained via an email stating that in order to be able to make doses that are 5 billion in number a total of 600,000 tests shall have to be performed that can be using the same amount of lysate extracted in a day's time. As per Dubczak that will not threaten or endanger the population of horseshoe crabs or their supply chain. As the pandemic has put the world in a mode of panic news is that there are about 140 different vaccines that are being developed in order to combat Coronavirus. However, one does not know which will be effective or safe enough for people to take. As in a typical case of vaccines they can be taking years to be declared as safe and effective. However, this could be developed and considered in order to combat the pandemic with short time. There is at least a single candidate like that of Moderna which is a Biotech company is heading into the third phase of trials in the month of July [3]. As of in May 2020, The Government of

America launched its Operation Warp Seed that is out there to put dollars by the billion for the acceleration, tests and designing of virus vaccines that could be potentially effective. The scientists are however not so sure that they should be happy with the outcome of the first vaccine that passes its trial. It is turning out to be a balancing act for that of the officials of public health who have to be deciding as to when it is ready for being rolled out to the masses or the public. As an example, it can be taken into consideration that the production can be scaled up for the vaccines having limited effectiveness by promoting it heavily. However this might discourage the developers of vaccines from striving for making progress to cater the needs of the market.

The above situation has already been warned against by Roland Sutter who has been acting as the coordinator for that of containment of polio, product development, policies and research as a part of WHO or World Health Organisation located within Geneva in Switzerland. He is however slated to be retired in December of 2020. The scientists and pharmaceutical companies cannot afford to make the same mistake they made in the year 1976 lest the public withdraw their confidence in them. It may be demanded fast as of now but the development of the vaccine has to be taking place in stages. It starts with the trials of phase one. The clinical trials are aimed at assessment of the primary safety of drugs amongst a small and definite number of the population. About 50 or more people are recruited for the trial though numbers can vary pertaining to the case. The trials of phase two leave a clue in relation to the efficiency of the virus vaccine. This is being gauged by the analysis of the blood samples of people to be able to see as immunity sentinels like antibodies or anything else are present which can cause the pathogen that is targeted to be neutralised. The trials of phase 3 make an attempt to measure in a better way if the vaccine is able to protect people intended for by the scaling up and including thousands of people. They also typically compare protection that has been conferred to the ones who underwent an immunisation against the ones receiving just a placebo. The test becomes more sensible and real as the drugs are rolled out for mass usage as per scientists. The vaccine for Coronavirus is undergoing a clinical trial under the most controlled of environments as per Charlie Weller for the program of

vaccines at London based funding body Wellcome of biomedical research. People who participate or advert themselves to the vaccine test are more conscientious in regards to their actions by taking fewer risks which may be exposing them to the virus as they are kept a watch on and followed by medical practitioners such as doctors [4-6].

Even though, the vaccine has been through all necessary steps, the chances are there that it may not be as effective as expected and also the reasons behind the same may not be clear as well. This may be due the intrinsic factors with regard to the targeted virus and its propensity for mutating and propagating within bodies along with the ways in which our system of immunity interacts with it naturally. There are vaccines that are said to be extremely effective like the polio vaccine that is inactivated and is one of the successes of the scientific world. Three doses as a course being administered of the same are almost a hundred per cent effective in case somebody contracts polio. It has also been known that the vaccine for measles is almost as effective as 96 per cent post taking a single dose of the same. There are more such immunisations which are administered though they have lower chances of success in protection against diseases. The strains of the virus for flu changes from one year to another and that is the reason as to why they are administered every year with an improvement that guarantees that patients are protected by 40-60 per cent. The vaccine that came up against malaria being known to be as RTS, brings down the probability of the disease by only 33.33 per cent although it is still explored to be a fruitful option for the underdeveloped areas worldwide. In case of the development of the vaccine against COVID-19, finding an ideal candidate is necessary to establish immunity within at least a majority of the population (atleast up to 70 per cent) which will include the elderly going by the outline made in April under WHO. Anthony Fauci is a current director of the U.S National Institute of Allergy has stated that people will settle for vaccine that is about 70-75 per cent effective as of June 28 2020. WHO has also said that they will be accepting a vaccine that is at least 50 per cent successful or effective. Subsequently, the Food and Drug Administration of the U.S has mirrored the aforementioned guidance by releasing documents setting the same target at their baseline of 30th June 2020 [7-9].

Researchers are mainly not convinced and they have already spoken against the 50 per cent success rate is being terrible for the mass. One of the speaker Byram Bridle working as viral immunologist at University of Guelph's Ontario Veterinary College has stated against the 50 per cent success rate as being acceptable. It has been also said that for the pandemic to come to an end, herd immunity is necessary so that a vaccine is only 50 per cent successful falls short of achieving goals. A vaccine is after all just a multifaceted approach for the reduction in the spreading of the dreaded COVID-19 virus. This is reduced to being just a precautionary measure like wearing of masks along with that of social distancing. Scientists have further said that one has to look at the entire value of public health with regard to vaccine. The immunologists are forever vigilant about administering of vaccines since there have been some medically unpleasant surprises in past times. As of now, since the clinical trial is being conducted within a small group of people and the reactions or responses noticed have not found to be that adverse or extreme. This has been stated official by Wayne Koff,CEO and the president of the Human Vaccines Project. Human vaccine Project is a partnership and a public-private, Which seeks to act as a catalyst in the development of an effective vaccine for COVID-19. A case has been reported that, a man on whom the vaccine made by Moderna against COVID-19 had been tested, seemed to have a running fever after it followed by fainting. Similarly amongst 45 people, three other people who received the vaccination had a medically significant reaction which was negative. The researchers had already come to an agreement about the fact that the vaccine mRNA had over stimulated immune systems of patients as 3 out of 45 people had a side effect after being on the highest dosage all within the course of a single trial [10-12]. The world is waiting for technological oriented process as well to come up in management of COVID-19 situation [13].

Conclusion

The truth remains a bitter pill since one might assume that the vaccine against that of COVID-19 will be meeting the benchmarks of WHO by the outweighing of safety risks over benefits and yet the public may not be 100 per cent sure about the fact that it will be working on them. They might still need a lot of convincing for taking a shot of the vaccine

that has been come up with. It has already been made public that 50 per cent of the population will be taking the vaccine as it becomes available by The Associated Press-NORC Center for Public Affairs Research. This indicates matching of data percentage with that of the Pew Research Center Poll in regards to the taking of the vaccine against flu. Both were interestingly conducted at a similar time. There had been a larger chunk of the population which will not be settling for that of immunisation that fights against Coronavirus or COVID-19 as compared to the population that refused the flu vaccine which is also a seminal aspect of research.

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CHAPTER-30

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CHAPTER-30

THE UNTAPPED ROLE OF AYURVEDA AND INDIAN MEDICINE TO COMBAT COVID 19

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ABSTRACT

The present chapter is based on the role of ayurveda and Indian medicine for combating the pandemic situation of COVID-19. From exploratory drugs to substitute treatments, all types of medicines are being contemplated. This chapter has been exploring each and every details of how Ayurvedic medicine and Indian medicine provide a successive way for COVID-19 outbreak. The first part of the chapter has been associated with the impact of Ashwagandha for COVID-19. Then the chapter follows different products evaluated for boosting immune response in order to strengthen the body to fight the infections.

1. Introduction

As the world's driving gathering of researchers and analysts race to discover an antitoxin to battle the novel corona virus, which has contaminated more than 4 million individuals comprehensively, there's a squeezing requirement for a workaround to beat the infection. Many scientists have discovered the core idea of Indian medicine whether it

ought to be viewed as a proto-science, an informal, or trans-science framework. An audit for the utilization of Ayurveda for cardiovascular ailment presumed that the proof isn't persuading for the utilization of any Ayurvedic home grown treatment for coronary illness or hypertension, yet that numerous spices utilized by Ayurvedic professionals could be proper for additional examination. Examination into ayurveda has been portrayed as pseudoscience. Both the absence of logical adequacy in the hypothetical establishments of ayurveda and the nature of exploration has been scrutinized [1-3].

2. The impact of Ashwagandha for COVID-19 Prevention

Ashwagandha is an incredible Ayurvedic ailment that has the capability to mitigate the diseases from spreading to the human. Customary medication framework, Ayurveda is among one of them, and now the top gathering of researchers from Indian Institute of Technology (IIT) Delhi, in a joint effort with AIST, Japan, have discovered that one of the most powerful and broadly utilized Ayurvedic spices, of which ashwagandha may hold solid potential in battling COVID-19. There are different new examination discovers hostile to viral properties in Ashwagandha. A consolidated report from IIT Delhi's DAILAB made the disclosure that ashwagandha can end up being the critical medication in battling coronavirus and can be even utilized in the improvement of an antibody [2]. There are different types of Ayurveda clinical preliminaries that are taken into consideration while we are going to discuss in this section. Just as of late, India's Ministry of AYUSH and CSIR declared a huge number of measures and clinical preliminaries planned for examining the utilization of ashwagandha, alongside other Ayurvedic spices as a preventive treatment to cutting edge laborers and contaminated patients in a huge report which is to begin soon. Different medications under examination incorporate ashwagandha, Guduchi, Yasthimadhu, Peepli and another figured medication, 'Ayush 64', which will be tried on near 50,000 individuals. The investigation, which is destined to be distributed, discovered that ashwagandha, specifically, contains some regular biochemical mixes which can work a similar path as other enemy of coronavirus drugs.

The utilization of ayurvedic prescriptions now and again is likewise being read for its prophylactic use and subsequently, has been named as an enemy of viral cure. The

findings of the proper examination has helped different types of scientist around the globe to get associated with the detail discover process and finding a way in this new types of technique to mitigate the pandemic attack of COVID-19 to the human body Subsequently, whenever utilized in the creation of a COVID-19 battling immunization, in the correct amount and measurement, ashwagandha can be useful in managing and may even be halting the spread of coronavirus [3]. Thus the Ashwagandha is the enemy of viral medication for coronavirus. While investigates are as yet being continued, we do know that ashwagandha is viewed as one of the most predominant and ground-breaking Ayurvedic cures, utilized for some reasons and advantages. It is very compelling in battling basic afflictions like cold and hack and some respiratory sicknesses, which make it a powerful cure in battling some popular maladies too. It is useful for the individuals invulnerability too and creates a positive throughout the human body.Routinely expending Ashwagandha can likewise supercharge your invulnerability. Specialists really state that expanding the dose of ashwagandha during an unexpected spike or beginning of a virus can work truly well in recuperating the body. The spice's characteristic immuno-boosting properties can likewise assist you with managing incessant pressure and exhaustion which can accompany viral contaminations. It is otherwise called an ayurvedic vitalizer which is useful for the heart and the body. Ashwagandha has the capability for lowering down feelings of anxiety to the mind of human being. There's another way ashwagandha benefits you [4]. Ordinary utilization of ashwagandha has been found to drop down or control pressure and cortisol creation in the body and lessen the irritation. In view of this the present section has been discussed to ensure the intake of ashwagandha consumption for a stipulated time/ period. The intake capability of Ashwagandha among the individuals is the main consideration that can develop a discovery for the COVID-19 pandemic situation for millions of people across the globe. Individuals of any age ought to be in a perfect world devouring ashwagandha and it completely sheltered. The contingent use of ashwagandha is about 250-300 mg every day, for a month's time can do a lot of advantages for wellbeing and good health.

3. The innovation of Patanjali Product

When the world is leaving no stone unfurled elusive a potential remedy for the coronavirus, Patanjali Ayurvedic organization has asserted Ayurvedic medication that can fix COVID-19 patients within 5 to 14 days. It is advisable to perform Yoga routinely and legitimate eating supports the invulnerable framework to combat the pandemic. The Chief Executive Officer (CEO) and fellow benefactor, Acharya Balkrishna guaranteed that the path of the medication was directed on several patients and it has created "100 percent ideal outcomes" and designated a group of researchers after COVID-19 episode [5]. Initially, the reenactment was done and mixes were recognized which can battle the infection and stop its spread in the body. At that point, we directed a clinical contextual analysis on several positive patients and we have 100 percent good outcomes," Balkrishna was cited as saying by news organization ANI. "Subsequent to taking our medication, COVID-19 patients recuperated in 5-14 days and afterward tried negative. Along these lines, one can assume that Ayurveda is potential remedy in battling COVID-19. A controlled clinical preliminaries is being performed, in the 4-5 days, proof and information will be discharged" . Balkrishna said that the organization will share the preliminary consequent effects of clinical trials according to the administration guidelines. The main consideration part is about the how manifestation of medication and it functions relies on? With respect to medication, Balkrishna said that *Tinospora Cordifolia*, *Ocimum tenuiflorum* and *Shvasari* juice have been utilized in the medication. He said that Ashwagandha doesn't permit COVID-19's Receptor binding domain to blend in with the ACE of the human body which keeps it from entering the solid cells of the patient. Further, Giloyfuntions similar to that of ashwagandha and in addition to this the *Tulsi* is being utilized in the medication compels the pace of coronavirus' expansion in the tainted body by assaulting the RNA-polymerases by assaulting the RNA of the contamination. Interestingly the Shvasari juice, the Patanjali CEO said that it forestalls the development of thick bodily fluid and lessens aggravation of the lungs by taking out spit [6]. The announcement from the Patanjali CEO comes when the entire world is attempting to discover a solution for the destructive coronavirus which has unleashed ruin over the globe. Up until this point, more than 100

likely immunizations for the novel contamination are in different phases of improvement around the globe. Be that as it may, none of them has had the option to accomplish the ideal outcomes.

4. Discovery of Ayurveda Medicine

As on July 9, India's scientist gave an account of an ongoing virtual gathering concentrated on Ayurvedic medication as a possible and potential COVID-19 treatment. A gathering of famous Indian-American researchers and specialists met with the Indian Ambassador to the US, Taranjit Singh Sandhu, to examine joint Indian and US preliminaries of Ayurveda details for COVID-19. Sandhu, "said the huge system of institutional commitment have brought established researchers between the two nations together in the battle against COVID-19 [7]. " He additionally noticed that, "Indian pharmaceutical organizations are worldwide pioneers in creating moderate minimal effort drugs and antibodies and will assume a significant job in the battle against this pandemic." Major Newspaper likewise said something July 10 with, "US Joins India in Clinical Trials for Ayurveda Formulations against COVID-19." They contend that these drugs have a noteworthy record in treating different ailments and note that it "is considered to help treat COVID-19 as well." They note that clinical preliminaries are expected to "dispose of the considerable number of questions" around its adequacy.

Diplomat Sandhu is again referred to as saying that India and the US are together arranging such work. "According to the Indian agent, an enormous system of institutional commitment has at long last brought mainstream researchers between the two nations together in the battle against the novel coronavirus." Researchers from IIT-Delhi are referred to for the possibility that Ashwagandha, an Ayurvedic medication, "can treat COVID-19." The plant contains withanone which can, "sway the COVID-19's protein liable for replication, whenever utilized alongside a functioning element of propolis called Caffeic Acid Phenethyl Ester (CAPE).Offering plentiful realities and subtleties, the NIH comes up with the fact that there is no proof that these medicines work however that there is proof of metal defilement (for example mercury and lead) in a significant number of these items. Despite the fact that lab tests propose it is conceivable that a few

substances in Ayurveda may be formed into successful medicines, there is no proof that any are compelling in themselves Despite these facts the lab tests proposed to be conceivable with a few substances in Ayurveda may be formed into successful medicines, there is no proof that any of them are compelling in themselves. According to sources from United Kingdom, there is no proof that ayurvedic medication helps treat disease in individuals, albeit a few perspectives, for example, back rub and unwinding can assist with assuaging side effects. Some Ayurvedic medications may contain poisonous substances or interface with authentic disease drugs in a destructive manner. Today, ayurvedic medication is viewed as pseudoscientific because of its disarray among the real world and otherworldly ideas [8]. The role of Indian medicine for preventing COVID-19 pandemic attack

Clinical preliminaries of the plant-inferred medicate, ACQH, to treat COVID-19 patients that started in India has been hailed by the Council of Scientific and Industrial Research (CSIR) as "memorable in current medication. By this Dr Shekhar Mande, Director General, CSIR stated, CSIR is satisfied to advise that ACQH clinical preliminary has started yesterday, by Sun Pharmaceutical in a joint effort with ICGEB New Delhi and CSIR IIIM Jammu with help by CSIR and DBT. We are going to endeavor to battle COVID-19 and we do trust that it is fruitful [9]. India's top medication controller Drugs Controller General of India (DGCI) permitted Sun Pharmaceutical to direct clinical preliminary for the first phytopharmaceutical or plant-based medication AQCH to treat COVID-19 patients. As per the organization, the clinical preliminaries will be directed across 12 focuses in India in 210 patients. Recently Sun pharmaceutical started the clinical preliminary for this phytopharmaceutical called AQCH. It's a recorded day in current medication particularly in India now we have opportunity to tap our conventional information framework that has been utilized to treat illnesses. The Director-General of CSIR said that the Mumbai-based organization Sun Pharmaceutical had begun a clinical preliminary for ACQH for COVID-19 after the plant-based medication, which is being created for dengue, demonstrated wide antiviral impact in contemplates. “Stage I clinical preliminaries went well overall and dependent on empowering result we concluded we

should attempt it against COVID-19," said Dr Mande. "Regularly a clinical preliminary takes quite a while, we are expecting ACQH clinical preliminary will be done in a quarter of a year or it may require some investment [9]. This is a multicentric clinical preliminary so Delhi as well as a few spots in India will take patients for the preliminary," he included. Mande said that the imprints a banner day in India's history of present day medication. He said the advanced medications and pharmaceuticals worldview has developed in the course of the most recent 100 years. As per this worldview, any ailment happens because of a reason, which can be amended by remotely giving a concoction which can stifle that cause. This outside concoction is the thing that we call as a "medication" or "medication". The viability of the "tranquilize" against the malady is regularly settled by leading Randomized Controlled Trials (RCT) with every single fitting control. Throughout the years, in excess of 2500 prescriptions have been affirmed everywhere throughout the world to treat various ailments. While the worldview has advanced recognizing one reason for an illness, and one compound substance to address that cause, the customary framework in numerous nations/societies which has utilized concentrates from characteristic sources has all things considered been overlooked, said Dr Mande. In this way, the customary arrangement of drugs which utilized different common sources and their concentrates has not discovered use in present day medication. Because of expanding discussions and worries throughout the years, the US FDA in 2005 at long last perceived a class of drugs named as "botanicals", which are plant-determined common concentrates and complex blend of mixes.

Plant drugs are not really filtered concoction elements to treat a sickness. A similar class of medications was additionally received in India as "phytopharmaceuticals" in 2015. However, till date, no clinical preliminary (RCT) of any phytopharmaceutical has been attempted in India. Today, the circumstance has changed. The clinical preliminary of concentrates from *Cocculus hirustus* (in Hindi called as Patalgarudi) led by Sun Pharma has started to relieve COVID-19 [10]. This is driven by the ICGEB, Delhi and CSIR-IIIM, Jammu on the scholastic side. In this way, CSIR is by and by assuming a heavenly job in current medication by endeavoring to change the standards," said Dr Mande. Further he

included that the whole ancestral belt in India beginning from Gujarat Maharashtra, Chhattisgarh and Jharkhand has been utilizing separates from this plant for treating different diseases.

5. Therapeutics and drugs aids in combating COVID-19

- **Azithromycin**

Azithromycin, likewise provide great functionality for every single types of anti-infection, doesn't work in viral contaminations. who have enough proof for the optional bacterial contamination as some hospitalized patients have been closely examined for their in later phases of their sickness. Aimless use with certain expectation that the Indian medicine should degraded bacterial contamination just exacerbates anti-microbial obstruction, by that India found a position of successive discovery [11].

- **Blood Thinners**

Hospitalized COVID-19 patients have seen for having an extremely high rate of blood clumps. There has been a current worldwide accord in which entire hospitalized patients of the COVID-19 would profit by the blood thinners infused every day simply under their skin (like insulin infusions). In spite of the fact that there is sound robotic thinking, randomized controlled preliminaries are anticipated.

- **BCG Immunizations**

When entire globe energetically anticipates another types of SARS-CoV-2-explicit antibody, then utilization for the existing antibodies such as (BCG and MMR immunizations) has create the major expectation that they are provide the best medicine towards nation. Preliminaries are in progress for checking whether it can support inborn insusceptibility. Thus the scientist has realized BCG has just given during childbirth for all of the individuals and provides a successive factor to the disease from its spreading across the globe.

- **Favipiravir**

Favipiravir is the main oral based antiviral medication that can optimize by IDC but it isn’t yet affirmed in the EU or US. Its utilization ought to be limited to mellow or direct

diseases as it were. Accessible information to help its utilization is inadequate however Indian preliminaries have recently been finished and the outcomes are anticipated [12].

- **Miscellaneous Cure**

The state machinery have utilized for circulating doubtful home grown as well as Ayurvedic elixirs (Ukalo), homeopathic related drops (Arsenicum collection), and "medicines" hawked by god-men. Stories as well as perceptions don't establish logical proof. Without proof created from thoroughly considered clinical preliminaries, the conveyance of these substances must be censured. Pushing problematic and as far as anyone knows innocuous "medicines" and conveying them to several thousand isn't just guileful, however gives individuals bogus expectation, and dangers them bringing down their gatekeeper. There are no enchantment pills to help invulnerability to fix long stretches of lack of healthy sustenance, hindering, weight.

- **Steroids**

One of the most important medications that can appear to strikingly affect mortality is an old and reasonable one. Current proof shows that dexamethasone can decrease passing by 33% in patients with extreme COVID-19 contamination who need oxygen treatment or ventilators. Their utilization should, in any case, be limited to hospitalized patients. On the off chance that they are given too early over the span of a disease, or given to somebody with just a mellow contamination, they could keep the body's own resistant framework from battling the infection adequately.

- **Zinc**

This mineral is additionally regularly recommended, in spite of there being no proof that it is successful. Taking everything into account, a half year into the pandemic, we should accordingly recognize four realities: There are not many demonstrated medicines for COVID-19 to date, and most will support more debilitated patients. Dexamethasone, remdesevir, and blood thinners are on the whole demonstrating useful: each under quite certain conditions. Most of patients will get well all alone with no treatment. In most, a solid resistant framework will mount its own protection against the infection and conquer the malady. It is, nonetheless, said that doctors in India have

consistently felt constrained to endorse drugs to their patients, since patients anticipate it. This is an unavoidable outcome. Similarly as with other unfortunate propensities during the pandemic, presently is a decent an ideal opportunity to break it, for the last time. Most ebb and flow COVID-19 tranquilize examines are episodic reports or observational examinations, which are not equivalent to, and second rate compared to, randomized controlled preliminaries (RCTs) where sway on the malady is concentrated in two practically identical gatherings with and without mediation. The simple declaration of a preliminary, anyplace on the planet, regardless of whether a RCT, is anything but a green light for us to begin endorsing these drugs in the edgy expectation that they will work.

Conclusion

Based on the above analysis, it has been concluded that ayurvedic and Indian medicine has create a major setback to the pandemic situation of COVID-19 outbreak. Specialists utilized the properties of Ashwagandha to focus on a portion of the primary disease causing catalysts in the body and split proteins, Mpro (Main protease) which help in replication and spread. The main question in this particular case scenario is how ashwagandha can help to provide better solution to human being across the globe.It was seen that one of the mixes present in ashwagandha, called, Withanone (Wi-N) and another characteristic medication, New Zealand Propolis are very viable and valuable in blocking and debilitating the structure of Mpro.

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CHAPTER-31

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CHAPTER-31

HOW LOCKDOWN HAS CHANGED THE WORLD AND YOUR LIFE

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ABSTRACT

Self-isolation, Isolation, Solitude, Seclusion or Quarantine, all of the words have interconnection that is definitely inevitable but there is a prominent yet valuable difference between the change, 'the changed world' and 'the changed life of mine.' When it is the changed world because of Lockdown- "Isolation and loneliness are central causes of depression and despair."— Bell Hooks, All About Love: New Visions. And the changed 'my life 'and to emphasize on it- "Isolation is a way to know ourselves."--- Frantz Kafka. In short, the lockdown capsized the world thoroughly whereas the same lockdown gave me huge gratification to know myself.

1. Introduction

"Lockdown and its upliftments, Lockdown and the pitfalls, Run together like Sun followed by a ray Maybe good or bad, worst or best, altogether everything's rainfall". The mentioned impersonal lines I penned down, roar the different angles of "Lockdown" started from December 2019 because of the deadly and dreadful "Corona Virus" and China is the father of the awe-inspiring creation who coined the fact that "Death is hilariously inevitable" and there's no certainty of Human's Lives, at any point, at any age, at any situation, anywhere and anytime you can die, I can die, We

can die. A pretty bitter truth, isn't it? . Many researchers, researched for so many things, and those were relevant to all the topics. For instance, Death, the topic itself has ample of diversified corners. Out of all the corners ever far-reaching was the 'inevitability of death' as always yet the 'present Lockdown and its evolvement's involvements' made one thing so sure that "In Life, Death is only important, more than a Life we all breathe for". This unavoidable death and the topic truly created a mountain-like 'Changes'. Changes in mind; human's psychology; Changes in human's lifestyle; human's behavior; changes in human's ways; human's communication; financial condition; relations between family, lovers, siblings, cousins; human's timings; human's freedom; human's thoughts; human's tastes, human's mentality and many more.

What is Lockdown? - Lockdown is where things and entities are locked wholly for maybe safety, for maybe protection, for maybe other purposes. Why Lockdown? – Lockdown can be for attacking purpose, can be for safety measurements, can be for imprisonment, can be for defending purpose, can be for protection, can be for good, can be for punishment, can be for so many reasons. Is there any specific audience for Lockdown? – Based on the incidents and convenient and occurred phenomenon the audience is taken for the purpose. Who decides for Lockdown? – Formally or officially the higher positioned persons or legally appointed persons take it; informally or Non-officially the head of a troop or leader of some place's group, the normal group take it. What happens in Lockdown? – When normal things are closed like working places either private or government officials; different shops; entertainment places; business; playing grounds and stadiums; artistic things like movies, theaters; any festivals; altogether everyday's things or materials to run a city, a state, a place, an area, a country, etc. What is the difference between Lockdown and unlock? – Lockdown locks everything down, slowly and steadily whereas Unlock 'unlocks one after the other things around us'. To talk about recent past Lockdown (March 2020) that turned out as Unlock 2.0 after four months (July 2020) took place because of story or movie like a reality that happened in real named as a "Virus", specifically, "Corona Virus". What is this about suddenly!! The virus is connected to RNA viruses (cold, hepatitis, influenza, fever, polio, etc.) which cause diseases to animals like mammals, birds so on so forth and even to Human Beings attacking mainly

respiratory tracts creating immense pain and problems in breathing system so as in blood circulation that stops all normal system of human's body followed by death eventually. The virus broke out in China's Scientific Lab to solve some personal and simultaneously political problems in China while experimenting with the virus inside the lab. The deaths commenced in China from the lab scientist cum doctor who died so badly and who captured a video before his death to the audience to unravel certain things about the virus named "Covid-19" also. It says the virus is been created by Humans for their selfish life's measurements and vengeance including power, money, politics, and whatnot. The way we say self-made or self-taught, equally self (humans) created which could have been prevented. The source is not China only but another 2003's virus i.e. SARS or 'Severe Acute Respiratory Syndrome', said as an animal virus, spreads from animal to animal and finally affects the humans and the world abominably. There is interrelatedness between SARS and Coronavirus as the animal 'Bat' is common here to transmit both the virus and originates numerous disasters and disasters like deaths. Disasters come in disparate ways. For example, Disaster can be a devastating storm, Tsunami, Fighting, murders, deaths, incidents, losses, etc. However, losing people exceedingly, without any full stop or small stop, worse than animals, uplift the biggest ever disaster in anywhere. As far as changes concerned, something huge, like 'Lockdown' creates a drastic change or multiple changes. Even Changes can happen individually as well as overalls.When it comes to "World" and evolvements in it because of Lockdown, there are not just bits and pieces to be talked to rather there's critical appreciation like long discussion all together on it.

The World is full of Homo sapiens that is Humans all over like insects, like worms and changing that monster like artifact is a big deal, to be frank. Well either 'the world' that includes trillion things and especially different kinds of sapiens or an 'Individual' maybe you and your life, Lockdown undoubtedly has immense effects on everything. Metaphorically, Lockdown is about 'Isolation' or 'Solitude' or 'seclusion' or 'quarantine'. The lockdown or quarantine mode changed the world acutely in every way, all at once. In respect to this, "Isolation and loneliness are central causes of depression and despair."- Bell Hooks, All About Love: New Visions [1]. The line chides potent detail like Lockdown causes isolation which indicates loneliness and surely the

serene situation fabricates the large difficulty, the pain of being alone, being without friends around, being confined to home all the time, having no entertainment outside, being without gatherings in this context, having no luxury and materialistic contrivances, having no school or college life, existence without outdoor games, living with a non-living daily life that has no dailiness in it, most significant is "deaths" for the virus, suicides out of untakable reality - all these written points indicate 'depression' unitedly; having no food to eat sometimes or 'most of the time' for 'below poverty line human beings'; losing jobs specifically migrants; suicide out of poverty et cetera which bear witness to excruciating existence of humans and survival of the fittest and the illusion of lives that has no painless deaths either. The Mind is the fastest, faster than light and wind, depicts 'Stream of Consciousness' that keeps flowing without any single break in the particular river and in that river flows (Emotions) the deepest wound or scar albeit your business or work occupation besides the mind. This discrete effortless flow intertwines 'Past-Present-Future' thoughts taking together and mingles appallingly.

The mingling of it debars daily normal life as the mingling easily happens without vocations. In total, the world is upside down thoroughly because of Lockdown, a massive change, far and wide. But as it says, there are always two sides to a coin, in specie, advantages, and disadvantages. As the world lost its serenity, simultaneously it gathered certain advantageous spectacles viz. pollution-free (air, water, sound) atmosphere; crimeless nation; savings of money so as a vast number of things; safety; strong laws; fear in humans and so on. In consequent, solitary confinement remodeled the whole nine yards, to a great extent. As the book says- "Emotions evolved for one specific purpose: to help us live and reproduce a little bit better. That's it. They're feedback mechanisms telling us that something is either likely right or likely wrong for us—nothing more, nothing less. Much as the pain of touching a hot stove teaches you not to touch it again, the sadness of being alone teaches you not to do the things that made you feel so alone again. Emotions are simply biological signals designed to nudge you in the direction of beneficial change." - ("The subtle art of not giving a f*ck, by Mark Manson) [2]. 'My life or an individual's life in the shape of me' alters the entire 'changes' demonstrated for the world, hitherto. "Isolation is a way to know ourselves."- Frantz Kafka [4]. The line vocalizes solitude and how the solitude pushes

forward one to oneself slowly yet steadily. To start from the beginning that is the month of March, the feeling was pretty much strong and sure that I needed the much-needed break with glee and peaceful mind within me. That was a definite feeling, much known that I wanted to feel long back, as if. Happiness departed from the station called "daily life" and the train who took me was "peace", the journey joyfulness began. The happiness journey dropped me first to another happiness destination called my native place, my family where I wanted to stop the watch. The house, my room, my work from home and myself, my books, my colleagues, my sibling, my cousins, my parents, relatives, academy, writing, singing, my YouTube channel, some programs online, webinars, phone calls, social media, SMS, posts, creativity, cooking, dieting, workout and on and on, helped me to be confined to home to get rid of a horrible death for coronavirus. 'March April, May' took flight and completed them quickly and so easily.

These initial three months succored me or an individual to learn things, to know the incomplete, disturbed, stressed, confused, little immature 'self' bit by bit and at last completeness, amazing growth in mind, improvement of health if proper diet and workout are followed consistently. Knowing yourself is a big shot, easily can't be earned or learned, takes a great deal of time, unquestionably. The confined to home state literally and poignantly let me know myself as time slithered slow and fast, together. Exploration of the known me a bit in this connection, delving deep into everything I knew about myself and grew with. Knowing me emulates knowing who you are, not what your name is; knowing what's new with you, not flaunting new things; knowing what is your real instinct, not being ignorant here; knowing gifted objects in you, not misusing gifts; knowing the rate of your knowledge you gained based on your experience, observation and study, not imposing on others through opinions; knowing the egoistic you and how to get rid of it, not making it more strong; knowing the sole growth, not having self-obsession; knowing the outlay of empathy, not mere sympathy; knowing what creativity or originality you possess, not copying something blindly; knowing what within you is worth telling or paying; knowing your negative sides and improve gradually; knowing your hard work and smart work capability; knowing your patience estimate; knowing things that one needs to know to live; knowing your responsibility and its level as always; knowing your ability to shine in

your life; knowing certain facets that might be your weaknesses to hide and brush up, gently; knowing moral and ethics somewhat; knowing to calm your mind, not making it scream in most instances; knowing all the slants of your individual self day-to-day.

Well the book expresses:

"I am part of the load
not rightly balanced.
I drop off in the grass,
like the old cave-sleepers, to browse
wherever I fall.
for hundreds of thousands of years I have been dust grains
floating and flying in the will of the air,
often forgetting ever being
in that state, but in sleep
I migrate back. I spring loose
from the four-branched, time-and-space cross,
this waiting room.
I walk into a huge pasture.
I nurse the milk of millennia.
everyone does this in different ways.
knowing that conscious decisions
and personal memory
are much too small a place to live,
every human being streams at night
into the loving nowhere, or during the day,
in some absorbing work."

- ("Selected Poems" by Rumi) [3]

Correspondingly, My Lockdown vibe rose from March to May more or less energetically. Every day I started with myself and a bit of pessimism on all sides of life. Articulation (my mind utters):

In the morning, the lukewarm water softly, I hold
Some almond nuts inside my mouth I pour
Diet food, light food – breakfast to unfold,
Maybe sugar-free tea after that and beginning of day's shore.

Thereafter, the whole day passes by with the changed life of mine- knowing self, exploring the "me" within me more, accepting the reality of 'I am imprisoned', understanding that Death is so inevitable and important among everything, feeling the cruel actuality that 'it's you who is valuable and you need to think of yourself first to be alive in the era of breathlessness', the inkling of hard survival attire that we all wearing so on and so forth. Ultimately, the changed life of mine gives me much heebie-jeebies and roller coaster rides as it changed not just in a positive way but in a negative way too.

"If you believe that the world is conspiring against you, it will just do that."

— Bangambiki Habyarimana, Book of Wisdom [5]

Whatsoever, positivity surrounds me can be gone within seconds if my thinking turns out to be overthinking to know the 'self' so intensely, isn't it? That's what happens when you have a brain that holds the logical side and so as an emotional side together. Although the individual change was or is for good or upliftments purposes, it can have another face for keeping the perfect potency around the clock. Thus, the two parts (Changed world and changed me or an individual) can be vice versa which is a definite thing. The flustered and depressed world can be creative and can look into oneself. Just like that, the innovative and ingenious individual (me) can be agitated and dejected as everything's possible, continually. Although mixed feelings taking both sides, nevertheless, the lockdown effect to a certain extent also to a great extent capsized the world in so many ways and unlike that the same effect helped the

individual me to explore myself in an inventive way. "Great art is clear thinking about mixed feelings"- W.H. Auden [6].

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