Overview of Coronavirus, Epidemiology Symptoms, Control, Virology, Vaccines, Treatment and New Findings to Save The People and Global Economy and Some Important Recommendations for The Future

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***Abstract*— In the present study, everything that researchers need in the field of virology and especially the Coronavirus and the unknown aspects of this virus, along with new scientific findings and its effects on the world from various aspects have been thoroughly discussed. This investigation has described the first origin of the Coronavirus, the types of virus mutations all over the world, the types of symptoms, the transmission, various methods of prevention, and quarantine-free control, as well as various treatments such as drugs and vaccines. Moreover, Important mathematical modeling results, new findings and methods for saving the people of the world, and prominent points are also stated in this article, which is very useful for scientists. This research also reviews and summarizes various events since the outbreak of the virus, successful countries for the virus control without quarantine and with low casualties, and appropriate methods to reduce virus transmission and reduce mortality. Moreover, this paper investigates some important features of virus structure, which helps to find better ways to control and prevention of other pandemic and viral crises in the future. Finally, some important predictions and recommendations in this article will be very useful for researchers and specialists all over the world medical community and governments to control and prevent the Coronavirus or possible viruses in the future.**

***Keywords*— Coronavirus, Epidemiology, Virology, Quarantine, Vaccination, Mutation, Symptoms, Treatment, Nanotechnology, GDP.**

1. Introduction

The Coronavirus illness (COVID-19) far-reaching has led to a sudden critical increase in hospitalizations for pneumonia with the multiorgan illness. New serious intense respiratory disorder Coronavirus 2 (SARS-Cov-2) has caused COVID-19. SARS-Cov-2 defilement may be asymptomatic or it can lead to a wide range of signs, such as delicate signs of upper respiratory tract disease and life-threatening sepsis. COVID-19 first discovered in December 2019, when a group of patients with pneumonia of cloud cause was found in Wuhan, China. Since July 2020, SARS-Cov-2 has influenced numerous nations, coming about in millions of distinguished cases with more than around 3 million affirmed deaths within the World [1].

1.1 Background

On December 31, 2019, the China Wellbeing Specialist with a long delay, and mystery almost the sort and beginning of this dangerous and perilous infection alarmed the World Wellbeing Organization (WHO) to a few cases of pneumonia of obscure aetiology in Wuhan City in Hubei Territory in central China. The cases had been detained since December 8, 2019, and numerous patients worked at or lived around the neighborhood Huanan Seafood Wholesale Market in spite of the fact that other early cases had no exposure to this market [2]. On January 7, a novel Coronavirus, initially truncated as 2019-nCoV by WHO, was recognized from the throat swab test of a patient [3]. This pathogen was afterward renamed as extreme intense respiratory disorder (SARS-CoV-2) by the Coronavirus Think about Gather [4] and the illness was named Coronavirus illness 2019 (COVID-19) by the WHO. As of January 30, 7736 affirmed and 12,167 suspected cases had been detailed in China and 82 affirmed cases had been identified in 18 other nations [5]. In the same day, WHO declared the SARS-CoV-2 outbreak as a Public Health Emergency of International Concern (PHEIC) [6].

1.2 COVID-19-2019 confirmed cases report (date and country wise)

Spreading History of 2019-nCoV on 31 Dec. 2019, China, East Asia, the most populated nation within the world was informed to WHO with respect to pneumonia cases with obscure etiology. Till 3 Jan. 2020, a add up to 44 pneumonia cases were recognized and after that time, COVID-19 spread quickly and made the world pandemic and worldwide crisis.

Fig. 1. *Spreading history of COVID-19 in the first month [1].*

According to the National Health Commission of China, the mortality rate among affirmed cases in China had been 2.1% on February 4 [7] and the mortality rate was 0.2% among cases exterior China [8]. Among patients had admitted to clinics, the mortality rate extended between 11% and 15% [1, 9]. COVID-19 is decently irresistible with a moderately tall mortality rate, but the data accessible in open reports and distributed writing was quickly expanding.

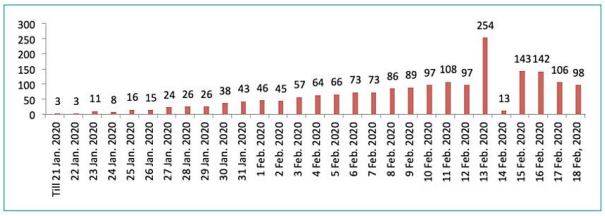

Fig. 2. *Date wise graphical representation of people death in early prevalence of COVID-19.*

1.3 History and origin of Various Coronaviruses

The first case of Coronavirus was informed as cold in 1960. Agreeing to the Canadian research in 2001, almost 500 patients were distinguished with a Flu-like framework. 17-18 cases of them were affirmed as tainted with Coronavirus strain by polymerase chain response. Corona was treated as a straightforward non-fatal infection until 2002. In 2003, different reports distributed with the confirmation of spreading the crown in numerous nations such as the Joined together States America, Hong Kong, Singapore, Thailand, Vietnam, and Taiwan. Some cases of a serious intense respiratory disorder caused by Corona and its mortally more than 1000 persistent was explained in 2003. This was the dark year for microbiologists. When microbiologists were begun concentrate to realize these issues. After a profound experiment, they conclude and detected the pathogenesis of the illness and found it as Coronavirus. But as a whole, 8096 patients were affirmed as infected with Coronavirus. So, in 2004, the World health organization (WHO) and centers for illness control and anticipation pronounced a “state emergency”. Another research report of Hong Kong has affirmed 50 patients with serious intense respiratory disorder whereas 30 of them were affirmed as Coronavirus infected. In 2012, Saudi Arabia reports were displayed on a few infected patients and deaths. COVID-19 was first detected and isolated from pneumonia patent related to Wuhan, China [1].

2. The Most Important Questions and Information About Coronavirus

2.1 How long does COVID-19 last?

COVID-19 has a hatching time of 2-5 days upon disease. It is evaluated that the middle time for COVID-19 to final within the body is 2 weeks when most individuals get on the way of improvement and see side effects vanish. Serious cases of COVID-19 can moreover spread for longer.

2.2 What are the symptoms of novel COVID?

A few of the most commonly detailed symptoms by patients around the world contain dry cough, fever, headache, back pain, loss of smell and taste, muscle pain, weakness, shortness of breath. Presently, restorative specialists have moreover included more current indications such as brain haze, perplexity, myalgia, weariness, tipsiness as signs of COVID-19 to be careful for. Other than the three most common side effects of COVID-19 such as fever, dry hack, and misfortune of sense of scent and taste, 7 other side effects have been related to the new strain of Coronavirus such as fatigue, loss of appetite, headache, diarrhea, mental confusion, and muscle pains.

2.3 How long does COVID-19 stay on surfaces?

Paper, glass, and humid surfaces can cover up the SARS-COV-2 infection for up to 28 days and cause disease. The surfaces touched by a contaminated individual can too act as conceivable conditions for disease transmission. The virus lives on metal and plastic surfaces for less than 24 hours and on wooden surfaces for more than 24 hours.

2.4 How does Coronavirus spread?

COVID-19 spreads usually through near contact (less than six feet or 1.8 meters distance), Indeed asymptomatic carriers of the

infection can spread the viral colony by indirect ways, such as talking, singing, or being in near contact with individuals. An individual can get contaminated in the event that the infection gets breathed in, or lands in their mouth, nose, eyes, or ears.

2.5 How long are you contagious with Corona?

In their 14-20 days-long improvement period, most individuals are accepted to be now not infectious after 10 days' time. In case an individual does not encounter fever, cough, or observes a continuous decrease within the side effects, he or she is certified to be healthy. Two negative COVID-19 tests, taken 24 hours separated can affirm the same.

2.6 Is diarrhoea a symptom of COVID-19?

A few individuals, particularly the ones who suffer from direct or serious forms of the infection or contaminated by mutant virus may endure from gastrointestinal side effects including diarrhoea, stomach torment, nausea, cramps, loss of appetite. There have moreover been reports which propose that the infection might spread through faecal things, but there's still not sufficient prove to recommend the same.

2.7 Is Coronavirus airborne?

It was authoritatively confirmed in October 2020 that COVID-19 was in truth, airborne. The airborne transmission implies that COVID-19 can remain on surfaces, be more infectious when suspended in the air for longer times. Transmission can take place through fine particles or aerosols, in indoor spaces and ineffectively ventilated zones.

2.8 Is sneezing a symptom of COVID-19?

Encountering a cold or sniffling is for the most part not considered a common COVID-19 sign, not similar to a dry cough. In any case, sneezing, accompanied by a runny or congested nose may be a plausible side effect of COVID-19, observed in over 4.8% cases around the world. Since the side effect of COVID-19 is for the most part related to the lower respiratory tract (lungs and trachea).

2.9 Is there a cure for Coronavirus?

So far, there's no appropriate remedy which has been recognized for COVID-19. Anti-viral, flu cures are moreover being utilized to control a few symptoms. COVID-19 vaccines, can ensure individuals from illness and masks remain to be the main form of preventable security against Coronavirus right presently.

2.10 Why COVID-19 Transmission Is Aggressive Than Viral Transmission?

Within the past 100 a long time, the globe did not confront a microbial widespread comparable in scale to (SARS-CoV2) COVID-19. Taken together, both past episodes of other types of the Coronavirus family (severe acute respiratory syndrome (SARS-CoV) and middle east respiratory syndrome (MERS-CoV)) did not cause even 1% of the global harm already created by COVID-19. Moreover, there are four other CoVs capable of infecting people (HCoVs), which circulate continuously within the human populace, but their phenotypes are by and large moderate, and these HCoVs gotten generally small consideration. Is it due to a few particular features of the viral structure? Are there a few particular humans (host) factors? Are there a few natural variables? [23].

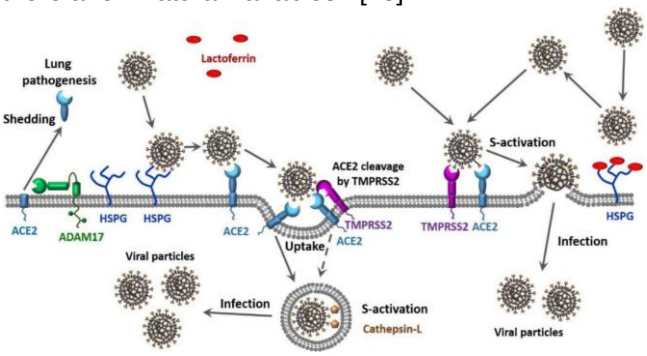

Fig. 3. *Suggested scenarios for severe acute respiratory syndrome Coronavirus-2 (SARS-CoV-2) cellular entry pathways and their potential effects on the viral load and transmission capability.*

Information collected in this research clearly demonstrate that SARS-CoV-2 uses different ways for effective transmission. It features a virion structure optimized for different environmental conditions, allowing this virus to utilize both respiratory and fecal-oral transmission modes. Its S protein has a modified structure for effective interaction with the ACE2 receptor and is optimized for furin cleavage. Besides, S protein can be prepared and activated by TMPRSS2, furin, and different non-furin proteases (e.g., plasmin) and can easily change and modify its spikes to survive in environment and replicate quickly to transmit faster after each mutation.

In addition to ACE2, SARS-CoV-2 can connect with other cellular peptidase receptors, such as ANPEP and DPP4, additionally can utilize non-peptidase receptors,
such as DC-SIGN1, CLEC4G, and CLEC4M. SARS-CoV-2 utilizes different ways for cellular entry (both non-endosomal and endosomal) and potentially uses different implies of epigenetic control to inhibit the start of the host natural immune reaction. Amid the course of the widespread, this CoV productively exposures genomic rearrangements, subsequently creating vital implies for the immunological escape. SARS-CoV-2 is engaged in complicated interaction with different host organs and pathways. It starts cytokine storm and promotes different cell death

programs, such as pyroptosis, apoptosis, and necrosis, that might contribute to the COVID-19 pathogenesis. This strikingly wide range of implies for the effective SARS-CoV-2 transmission shows that it is exceptionally improbable that COVID-19 can be cured by focusing on one section of this complex mosaic. A stronger understanding of different molecular mechanisms related with all stages of SARS-CoV-2 disease is required for finding the most suitable approaches for COVID-19 prevention and remedy [23].

3. How COVID-19 changed the world?

The Coronavirus has caused major changes in the international order in all parts of the world, including the economy, tourism, the environment, social customs, religious, educational, cultural, and political. There are important changes that have occurred as a result of the impact of the Coronavirus in different parts of the world, but in this section, we will briefly describe the main cases.

3.1 Economic change during Corona crisis

Most of the changes are visible in the economic field. With the outbreak of the Coronavirus, many businesses were shut down and the tourism and hotel industry in many countries suffered heavy losses. Also, with the closure of borders and the reduction of travel around the world, the global price of oil fell sharply, and consequently, small shops, restaurants, bars, discos, and various factories providing services in the field of travel and tourism equipment. And the car ran into a budget deficit and shut down. As a result, millions of people around the world lost their jobs in even developed countries such as the United States, Germany, Austria, Japan, and China, so the traditional trading system was destroyed and changed, and online commerce grew the most and food ordering apps were bought. Online, private cars and internet taxis as well as distance education flourished. In addition, during this period, many people around the world thought about entering and investing in virtual currencies such as Bitcoin, and the value of these currencies and shares of some vaccine and pharmaceutical companies increased sharply, and some professions such as nursing and computer programming and technology Information became very prosperous and grew rapidly. So, the first major blow of the virus was to the world economy. During the COVID-19 crisis, online businesses developed and flourished, paper banknotes were used less, and most global financial transactions were done online with credit cards.

The coronavirus (COVID-19) prevalence has caused a major health crisis in a few nations and to major disturbances of the worldwide economy. However, the circumstance is likely to become more awful in the next months and years, and the financial aftermath from the pandemic might express one of the greatest shocks of later decades. UNIDO's information appeared a reliable decrease in production growth, showing an overall financial slowdown already before the spread of

the COVID-19 crisis. Fabricating yield development fell underneath the milestone of 1% and remained at 0.7% in the fourth season of 2019. In the fourth season of 2019, only three businesses enrolled a positive year-over-year development rate in all nations, specifically essential pharmaceutical items, refreshments, and nourishment items. Whereas these three businesses express fundamental essential customer products and are likely to proceed to perform well over the coming months, other fabricating businesses are anticipated to endure an extreme blow due to the coronavirus prevalence and the resulting financial implications. Thus, world GDP development can be expected to decay in the next years.

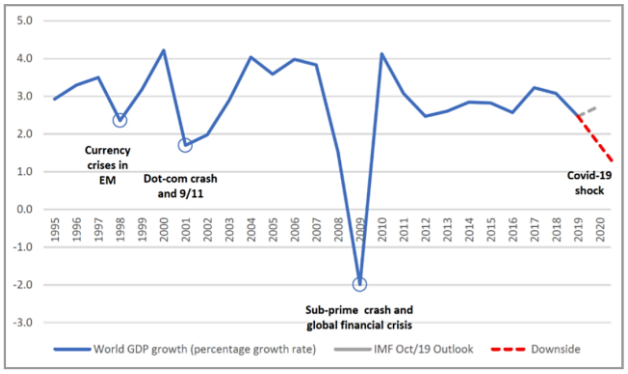

Fig. 4. *Global GDP growth, 1995–2020 [24].*

After the worldwide financial downturn and the economic crisis in 2007-2008 and the Extraordinary Depression that driven to a sharp decrease and serious recession in different financial markets such as the housing Bazar and large unemployment, the Corona crisis in 2020-2021 had the most prominent effect on reducing rates Financial and GDP in nations around the world. Three fundamental channels of the worldwide economy have disrupted, namely demand, supply, and finance. On the demand side, a combination of reduced income and fear of contagion will result in lower private investing.

In spite of the fact that a few of these impacts could be balanced by expanded government investing, the COVID-19 shock's net demand impact is anticipated to be negative within the short term. This might originate from negative supply-side effects, inferable to a sudden stop in fabricating activities within the most influenced areas and the coming about bottlenecks in worldwide value chains. In case cleared out unaddressed, such disturbances will in turn trigger far-reaching factory closures due to the need for mediator inputs, even in regions less influenced by the infection. In conclusion, expanded hazard abhorrence

and a flight-to-liquidity within the confront of vulnerability caused by the COVID-19 stun, the stress of the money-related markets will weigh intensely on the worldwide economy. Further fluctuations are anticipated within the foreign exchange Bazar.

3.2.1 Substantial increase in unemployment

A considerable increment in worldwide unemployment appears nearly certain. The ILO anticipates the widespread to disproportionally influence not as it were those specialists with fundamental health conditions but moreover youthful individuals who are more powerless to decreased labor demand, women, who are over-represented in those divisions that are likely to be influenced most (such as administrations or in occupations on the front lines of the widespread, e.g., medical caretakers), as well as unprotected laborers in the so-called 'gig economy' and migrants.

3.2.2 Capital flight

The pandemic has as of now activated capital flight and a sharp return of universal venture in rising markets. Though a bunch of 24 emerging markets including China, India, South Africa, and Brazil, had a net inflow of investments of US$79bn in 2019, US$70bn in ventures had as of now left those nations within the final two months alone according to the Institute of International Finance (New York Times, 2020). With this in intellect, the choice by the G20 governments to "do whatever it takes" to play down the social and financial fallout due to the Coronavirus and most imperatively, to guarantee cross-border streams of crucial medical supplies, agricultural products, and other merchandise and services were welcomed (The Guardian, 2020).

3.3 Political change during Corona crisis

Next, the virus caused political change around the world, and some countries faced widespread popular and partisan protests and rallies due to quarantine. Moreover, the Corona crisis caused the heavy defeat of the Republicans in the 2020 elections in the United States of America and the change of the president due to the lack of proper control of the Coronavirus and the start of the late vaccination in the United States. Also, the heavy defeat of the German Christian Democratic Party led by German Chancellor Angela Merkel. Demonstrations and clashes between people and police forces against the corona were sparked in various countries, leading to an unprecedented increase in violence in European countries such as the Netherlands, Austria, Germany, Spain, and France. Therefore, this virus has had great political consequences worldwide.

3.4 Social change during Corona crisis

The next effect of the virus was on social etiquette. Following the outbreak of the Coronavirus, public attendance at parties, celebrations, parties, and family relationships declined, causing depression among people and the younger generation in various countries. Older people could not visit their relatives, children, and family members for a long time, and most

importantly, with increasing morbidity and mortality, the fear of leaving home and visiting relatives and friends decreased, and in developed countries many anomalies Like unwanted pregnancies, fights between spouses, etc. took place, and with the closure of sex services in the city, sex trade and dangerous sex became secretly and dangerously out of control and out of government control. The news of the deaths of many celebrities, such as actors and athletes or politicians, due to Corona, caused depression and many mental illnesses in the society, which turned 2020 into a year of blackness and isolation around the world. Because man is a social creature and cannot live in isolation or alone.

Fig. 5. *Some important COVID-19 changes in the World.*

Unfortunately, some adult websites like Pornhub have sexual abuse in corona quarantine and widespread the virus by sexual relations. These adult websites must be limited all over the world in quarantine. That supposedly "wholesome Pornhub" attracts 3.5 billion visits a month, more than Netflix, Yahoo, or Amazon. Pornhub rakes in money from almost three billion ad impressions a day. One ranking lists Pornhub as the 10th-most-visited website in the world. Yet there's another side of the company that is infested with rape videos. It monetizes child rapes, revenge pornography, spycam videos of women showering, racist and misogynist content, and footage of women being asphyxiated in plastic bags. A search for "girls under18" (no space) or "14yo" leads in each case to more than 100,000 videos. Most aren't of children being assaulted, but too many are. Most new viral diseases in the world can be caused by uncontrolled sexual intercourse. Therefore, the World Health Organization (WHO) should consider the activities of adult sites and pornographic content. Moreover, there is no doubt that crime is a social phenomenon and without social interactions, there is basically no crime; During the outbreak of Coronavirus, when we all sit at home and do not go out, there is usually no news of the theft and street fights and clashes. Some results suggest that due to people staying at home, the

incidence of some crimes, including theft, has decreased.

3.5 Cultural change during Corona crisis

In the cultural field, with the closure of cinemas, concert halls, sports clubs, and theaters, young people and people became interested in online audio and video media and social networking applications, and this is the biggest damage in terms of culture and physical health. And it flooded the society and weakened the cultural and economic centers and the world of theater and music. Lack of mobility increased people's weight and excessive use of mobile phones and social networks reduced social abilities and physical and eye diseases for different people in society. During this period, some social habits changed in different societies, especially in developed European countries such as Germany and Austria. For example, people in European countries in the Corona crisis, due to declining incomes and unemployment and fear of the future, spent less on entertainment and buying luxury and unnecessary clothing and accessories, and saved more of their income.

The rapid spread of the Coronavirus in the world has affected all areas. One of them is social behaviors related to greeting and shaking hands. Hugging, rubbing, and shaking hands are habits that have given way to other ways. Elbowing instead of shaking hands? Punching instead of hugging and rubbing? Greeting habits have also changed dramatically. Following the firm advice of doctors and experts, people refrain from giving hands and physical contact as much as possible. This can be seen not only in everyday encounters but also in the political arena. German Interior Minister Horst Seehofer recently refused to lose a meeting with German Chancellor Angela Merkel. During the recent meeting of the EU health ministers, a number of EU officials, instead of shaking hands, put their hands on their chests to show their greetings and respect.

Humans these days are looking for different ways to greet and pay their respects. During one of his recent meetings, the British Crown Prince Charles held hands in Indian style on his chest and greeted the audience by shaking his head. People in different parts of the world, due to the rapid spread of the virus, have taken the creativity and initiative to maintain and show mutual respect for each other in the current situation. In China, where the outbreak of the Coronavirus began, people quickly dropped their robust and hands and waved their arms or legs while keeping their distance. Chinese officials have even advised their citizens to use the usual salute in martial arts in the country and place their fists in the palm of the other hand. In Iran, after the outbreak of Coronavirus, it became common to kick each other instead of greeting each other. France is a country where acquaintances and friends make rubbish and shake hands at work. In this country, even kissing the cheek on the first date is common. In recent months, however, the country's media has been

flooded with advice urging citizens to refrain from DOIng so without showing disrespect.

Fig. 6. *Changes in social customs during the Corona crisis.*

3.6 Educational and environmental changes during Corona crisis

In the field of education, with the closure of schools, universities, and colleges, especially language and music schools, distance education was upgraded and was beneficial in some ways and harmful in others. For example, online education reduced student attendance and online commerce, reduced congestion and urban traffic, and increased equity and equal educational facilities around the world. But in terms of online exams, it reduced the concentration of students and students and the weakness in learning, and the emergence of widespread fraud through the Internet and there is no suitable criterion for evaluating the semester online. In the field of personal and environmental health, Corona has increased the level of health in the world and reduced environmental pollution.

Due to Corona, detergent and disinfectant products increased sales, and handwashing and disinfection of service centers and workplaces increased significantly. Satellite images also showed a reduction in surface air pollution from cars and factories during quarantine. In addition, the data show that some social services have been reduced and people are using less public transport, which has reduced traffic and congestion on subways and buses. Also, during this period, the use of restaurants and coffee shops decreased, which contributes to the health of the body and personal health. In the field of environment and nature, during the Corona crisis, due to the calm and silence in the cities, some domestic animals such as horses, deer, or migratory birds entered the cities, and the animals in nature spent the quarantine without noise and air pollution.

3.7 Religious and Ethic changes during Corona crisis

In the field of religious issues, during the Corona outbreak, it can be said that with the closure of religious centers such as churches, shrines, mosques, and holy places, religious sentiments decreased.

Also, religious rites and rituals changed widely. For example, mourning ceremonies were held in small numbers or canceled, and followers of different religions attended fewer religious services, and even the world's major religious cities such as Mecca, Jerusalem, and the Vatican were left without pilgrims. For example, the spread of the Coronavirus prevented the implementation of one of the most important religious traditions in Spain. The citizens of this country are accustomed to kiss the feet of the statues of the Blessed Virgin (Saint Mary) in the week leading up to Easter. Poland, whose population is Catholic, is one of the most religious in Europe. In Poland, it is recommended that citizens do not throw their hands into the holy water when entering or leaving the church, but only cross themselves on their chests. One of the traditional customs in Romania is also limited these days. With the onset of spring, Romanians give a bouquet of flowers to friends, acquaintances, and relatives, and flowers are always donated by Robusti. Nelo Tataru, Romania's deputy health minister, called on Romanian citizens to exceptionally give only bouquets this year and turn a blind eye to Robusti.

One of the traditional ways to greet and pay homage in New Zealand is to rub your forehead and nose. New Zealanders refuse to use this method these days. In Australia, New South Wales Health Minister Brad Hazard has advised citizens to shake hands instead of shaking hands. Behavioral biology researcher Androw Gerke, considers the traditional practice in many Middle Eastern countries to be the most appropriate at this time: Laying hands on the chest as a sign of greeting and respect. In this way, the necessary distance can be maintained with the other party. In Iran, Iraq, and Saudi Arabia, Pakistan, Egypt, Syria, India, and most Islamic countries people and pilgrims were also forbidden from touching or kissing tombs and religious places.

3.8 Some interesting initiatives during the Corona crisis

Many religious festivals and celebrations (Easter or Easter, Passover or Jewish Passover, and Muslim Ramadan) and national and even religious gatherings and ceremonies such as the Lord's Supper or Muslim feeding during Ramadan are canceled in various countries. Or was broadcast via cyberspace as video or live images from social networks such as Instagram and YouTube. Some centers have also taken interesting initiatives to compensate for Corona's economic damage. For example, turning a nightclub into a restaurant with an entrance for cars or showing religious ceremonies or movies from inside the car. Worshiping online includes holding a small number of funerals and disinfection, and spreading smoke in religious places such as churches, mosques, and shrines of various religions, as well as praying and praying for the end of the global disease.

Fig. 7. *Some important initiatives and creativities during COVID-19 crisis.*

The Dalai Lama, the leader of Tibetan Buddhists, also called on his Buddhist followers to use the spell and chanting "Mantra Tara" to combat the new Coronavirus. The spell of Tara (mention of Tara) is one of the most famous Buddhist dhikrs associated with the saving goddess Tara. This goddess is one of the main goddesses in Buddhism who has achieved enlightenment. The mantra has Sanskrit roots and means liberation and is composed of two parts, man and terra, which means "man" and "terra" means liberation. Mantra is also used in meditation to have a positive effect on the body and soul. Also, many sports competitions and competitions, such as football and concerts, were canceled and their puppet photos were used instead of spectators.

4. Important Observations

4.1 Pathophysiology SARS-COV-2

Coronaviruses are huge, encompassed, single-stranded RNA viruses discovered in people and other mammals, such as monkeys, cows, dogs, cats, chickens, cattle, pigs, and birds. Normally, Coronaviruses can cause respiratory, gastrointestinal, and neurological illnesses. The foremost conventional Coronaviruses in clinical practice are 229E, OC43, NL63, and HKU1, which regularly lead to common cold side effects in immunocompetent people. SARS-CoV-2 is the third family of Coronavirus that has caused extreme infection in humans to outspread all over the World in the past 20 years.

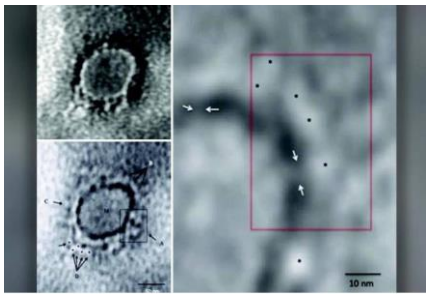

Fig. 8. *The first images of novel Coronavirus that has taken by Indian scientists [10].*

The primary Coronavirus that leaded to extreme illness was severe acute respiratory syndrome (SARS), which was supposed to begin in Foshan, China, and brought about within 2002-2003 SARS-CoV widespread. The second type was the Coronavirus that caused Middle East respiratory syndrome (MERS), which begun in Saudi Arabia in 2012 (Possibly has transferred through camels). The size of SARS-CoV-2 is almost 60 nm to 140 nm and various distinctive spikes, extending from 9 nm to 12 nm, giving the virions form of the sun-shaped or Corona (Fig. 8). Through genetic recombination and diversity, Coronaviruses can adapt and diversity new hosts. Bats are supposed to be a common source for SARS-CoV-2, but it has been proposed that people got to be contaminated with SARS-CoV-2 by means of the intermediate host, such as the pangolin (type of anteater) [1].

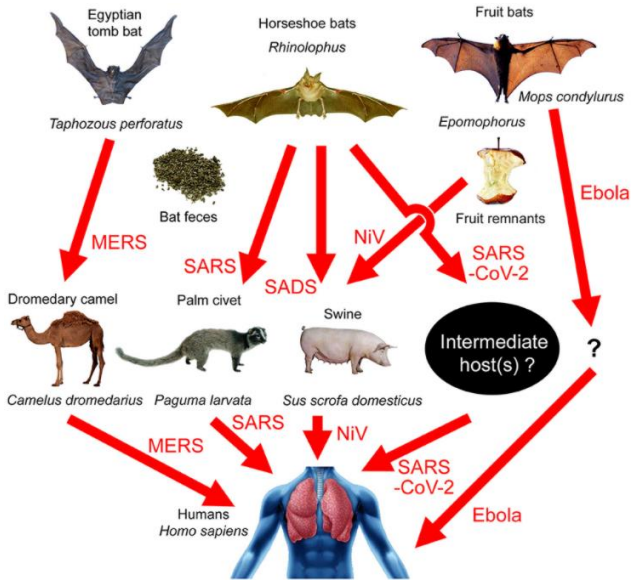

Fig. 9. *Analysis of possible intermediate hosts of the new Coronavirus SARS-COVID-19-2 [11].*

4.2 The host defense against SARS-CoV-2

Early in the disease, SARS-CoV-2 targets cells, such as the bronchial epithelial and nasal cells and pneumocytes, through the viral auxiliary spike (S) protein that connects to the angiotensin-converting enzyme 2 (ACE2) receptor (Fig.10). The type 2 transmembrane serine protease (TMPRSS2), display within the host cell, advances viral take-up by cleaving ACE2 and actuating the SARS-CoV-2 S protein, which mediates Coronavirus section into host cells. ACE2 and TMPRSS2 are represented in host target cells, especially alveolar epithelial type II cells. Comparable to other respiratory viral illnesses, such as flu, significant lymphopenia may happen in people with COVID-19 when SARS-CoV-2 infects and terminates T lymphocyte cells.

Moreover, the viral inflammatory reaction, comprising of both the intrinsic and the conformal immune reaction (consisting of humoral and cell-mediated immunity), impedes lymphopoiesis and increments lymphocyte apoptosis. In spite of the fact that upregulation of ACE2 receptors from ACE inhibitor and angiotensin receptor blocker medicines has been hypothesized to extend vulnerability to SARS-CoV-2 disease, huge observational groups have not found an affiliation between these solutions and the chance of disease or hospital fatality due to COVID-19. For instance, in
research, 4480 patients with COVID-19 from Denmark, past remedy with ACE inhibitors or angiotensin receptor blockers was not related to mortality [1, 12].
In the next steps of the disease, when viral replication quickens, epithelial-endothelial barrier integrity is compromised. Moreover, epithelial cells, SARS-CoV-2 infect pulmonary capillary endothelial cells, complementing the inflammatory reaction and activating a convergence of monocytes and neutrophils. Dissection research has appeared diffuse thickening of the alveolar barrier with mononuclear cells and macrophages invading airspaces besides endothelialitis [1].

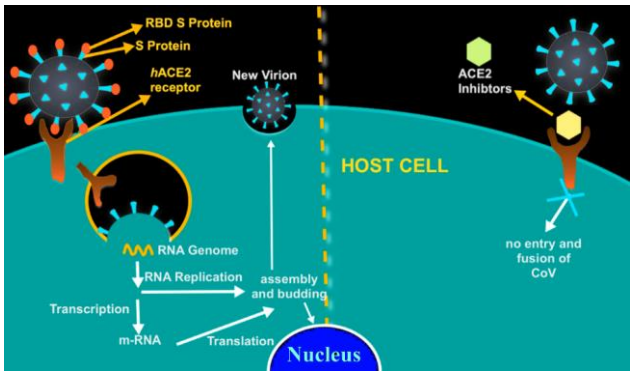

Fig. 10. *The life cycle of SARS-CoV. The spike (S) protein of SARS-CoV binds with the angiotensin-converting enzyme 2 (ACE2) receptor to enter host cells and release the RNA genome into the target cells. Structural and nonstructural proteins of CoV and the RNA genome assemble into virions, which are released from target cells [1].*

Interstitial mononuclear inflammatory infiltrates and edema creates and shows up as ground-glass opacities on calculated tomographic imaging. Pulmonary edema filling the alveolar spaces with hyaline membrane arrangement takes after, congruous with early-phase acute respiratory distress syndrome (ARDS). Bradykinin-dependent lung angioedema can contribute to infection. Collectively,

endothelial boundary disturbance, dysfunctional alveolar-capillary oxygen transmission, and disabled oxygen diffusion capacity are specification of COVID-19. In serious COVID-19, fulminant activation of coagulation and utilization of clotting variables happen. A report from Wuhan, China, shown that 71% of 183 people who died of COVID-19 met the criteria for diffuse intravascular coagulation.

Inflamed organ, like lung tissues and aspiratory endothelial cells may result in microthrombi arrangement and contribute to the high frequency of thrombotic consequences and complications, such as profound venous thrombosis, pneumonic embolism, and thrombotic blood vessel complications (eg, limb ischemia, ischemic stroke, myocardial infarction) in fundamentally sick patients. The improvement of viral sepsis, characterized as life-threatening organ dysfunction led to by a dysregulated host reaction to virus Infection, may advance contribute to multiorgan failure [1].

4.3 Microbiology analysis of Coronavirus

Coronavirus is round or pleomorphic, single stranded, wrapped RNA and covered with club shaped glycoprotein. Coronaviruses are classified sub sorts, such as alpha, beta, gamma and delta Coronavirus. Each of sub type, includes numerous serotypes. A few of them were under influence of humans and other affected animals such as pigs, birds, cats, mice and dogs [12].

5. Some of The Main Symptoms of COVID-19

Most common indications, are fever, dry cough, tiredness. Less common side effects, include aches and pains, sore throat, diarrhea, conjunctivitis, headache, loss of taste or smell a rash on skin, or discoloration of fingers or toes. whereas diarrhea and dyspnea were found to be as exceptional include. Numerous of them people have explained reciprocal abnormalities. sever symptoms, are Shortness of breath or difficulty breathing, chest pain or pressure loss of speech or movement, find Emergency medical assistance and immediate medical attention if you have serious symptoms.

Continuously call before going to your doctor or wellbeing office. Individuals with mild side effects oversee their symptoms at domestic. On normal it takes 5–6 days from when somebody is infected with the Coronavirus for symptoms to appear, and it may take up to 14 days. Coronavirus was separated from bronchoalveolar lavage fluid in china in 2020. It was also identified in blood samples. So far, Coronavirus was not confirmed in feces and urine sample of patent [12].

6. Transmission of SARS-CoV-2 Infection

Epidemiologic information recommends that drops beringed out during face-to-face exposure during speaking, coughing, or sneezing is the most conventional mode of transmission. Long exposure to a sick person (being within 1.82 m for at least 15 minutes) and briefer exposures to people who are symptomatic (eg, coughing) are related with higher chance for transmission, whereas short exposures to asymptomatic contacts are less presumably to result in infection transmission.

Contact area outbreak (when touching an area or surface with virus on it) is another feasible case of transmission. Infection Transmission may also take place via aerosols (smaller droplets that stay suspended in air). Also, in most reported cases, the mothers' infection with SARS-CoV-2 happened in the quarterly period of pregnancy, with no maternal deaths and a pleasant clinical course in the neonates [1, 12]. Viral load shows up to persist at higher levels on impermeable areas, such as metal and plastic, than porous surfaces, such as cardboard. Coronavirus has been distinguished on impermeable areas or surfaces for up to 3 to 4 days after immunization. Broad viral defilement of hospital rooms has been recorded. In any case, it is thought that the sum of virus recognized on surfaces decays quickly inside 48 to 72 hours. In spite of the fact that the location of infection on surfaces strengthens the possible for transmission through fomites (objects such as a fastening or doorknob, tableware, or clothing that will be infected with SARS-CoV-2) and the require for satisfactory environmental cleanness, droplet spread by means of face-to-face contact remains the essential and the foremost vital mode of transmission [1, 12].

Viral load within the upper respiratory tract shows up to peak around the time of symptom onset and viral shedding starts almost 2 to 3 days earlier to the onset of symptoms. Asymptomatic and presymptomatic carriers can transmit SARS-CoV-2. Presymptomatic transmission is thought to be a major donor to the spread of SARS-CoV-2. Modeling ponders from China and Singapore assessed the rate of contaminations transmitted from a presymptomatic person as 48% to 62%.

Pharyngeal shedding is high amid the primary week of infection at a time in which side effects are still mild, which might clarify the proficient transmission of SARS-CoV-2, since infected people can be irresistible some time recently, they realize they are sick. An orderly survey on this theme recommended that genuine asymptomatic infection is likely exceptional [1, 12].

In spite of the fact that viral nucleic acid can be perceptible in throat swabs for up to 1 month and a half after the onset of sickness, a few researches recommend that viral cultures are normally negative for SARS-CoV-2, about 1 week after symptom onset. Usually proved by epidemiological researches about that have appeared that transmission did not happen to contacts whose exposure to the file case begun

more than 5 days after the onset of side effects within the record case. The Centers for Illness Control and Anticipation, suggest confining for at least 10 days after symptom onset and 3 days after enhancement of symptoms. But more consideration ought to be paid to old patients or critically sick patients.

6.1 Mode of Spreading

Individuals can get the disease through near contact with a people who has symptoms from the infection incorporates cough and sneezing. Typically, Coronavirus was spread by means of airborne zoonotic droplets. Infection was replicated in ciliated epithelium that leaded to cellular harm and disease at infection location. Agreeing to a research published in 2019, Angiotensin changing over enzyme 2 (ACE.2), a membrane exopeptidase within the receptor utilized by Coronavirus in entry section to human cells. Virus transmission routes were shown to in Figs. 11 and 12 [12].

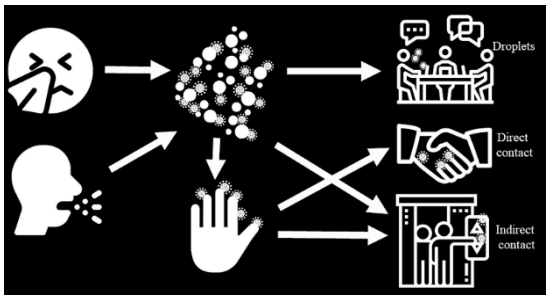

Fig. 11. *COVID-19 transmission routes: droplets, direct contact, and indirect contact.*

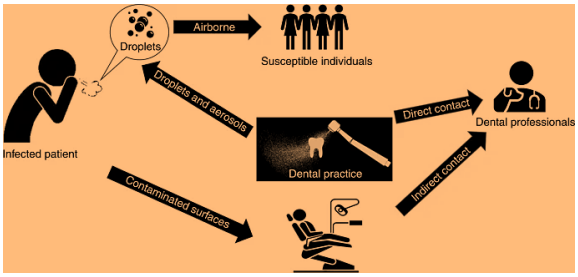

Fig. 12. *Illustration of transmission routes of 2019-nCoV in dental clinics and hospitals [13].*

The transmission ways of SARS-Cov-2 still stay debated about among different divisions. Confirmations compiled here unequivocally propose that the COVID-19 may be transmitted by means of air in insufficiently ventilated situations. Existing test information appeared that Coronavirus survival was adversely affected by ozone, high temperature and low humidity. One regression analysis determined that the spread of SARS-Cov-2 was decreased by expanding surrounding ozone concentration level from 48.83 to 94.67 μg/m3 (p-value = 0.039) and reducing relative humidity from 23.33 to 82.67% (p-value = 0.002) and temperature from -13.17 to 19 °C (p-value = 0.003) showed for Chinese cities from January to March 2020. Other than utilizing these environmental implications, social distancing and using a musk are strongly recommended to maximize the combat against the COVID-19 airborne transmission [14].

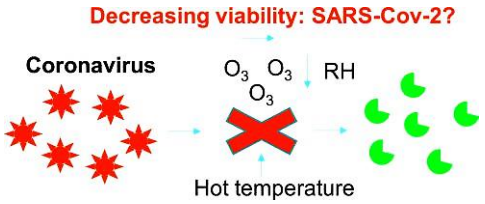

Fig. 13. *On airborne transmission and control of SARS-Cov-2 [14].*

7. Clinical Presentation

The time from exposure to side effect onset (the mean incubation period) for COVID-19 is generally 2-7 days. Around 97.5% of individuals who make side effects will do so interior 11.5 days of illness. The center (interquartile limit) interim from side impact onset to healing center or hospital confirmation is (3-9) days.

The normal age of hospitalized patients changes between 45 and 75 years, with most age groups having a male dominance of approximately 60%. Among people hospitalized with COVID-19, 75% to 85% are aged at smallest 50 years. It should be well known that side impacts and procedure of transportation for It changes in mutant species at certain ages. COVID-19 has different clinical appearances. In a research of 44 672 patients with COVID-19 in China, 81% of people had gentle appearances, 14% had serious appearances, and 5% had critical signs (characterized by respiratory failure, septic shock, and/or numerous organ dysfunction). A consider of 20 133 people hospitalized with COVID-19 within the UK detailed that 17.1% were conceded to high-dependency or intensive care units (ICUs). The foremost conventional comorbidities and coexisting conditions in hospitalized patients contain hypertension (show in 48%-57% of patients), diabetes (17%-34%), cardiovascular illness (21%-28%), chronic pneumonic illness (4%-10%), chronic kidney illness (3%-13%), malignancy (6%-8%), and chronic liver disease (<5%).

The foremost common indications in hospitalized people are fever (up to 90% of patients), dry cough (60%-86%), shortness of breath (53%-80%), weakness (38%), nausea/vomiting ordiarrhea (15%-39%), and myalgia (15%-44%). Patients can moreover show with nonclassical side effects, such as isolated gastrointestinal side effects. Olfactory and/or gustatory dysfunctions have been detailed about 65% to 80% of people. Anosmia or ageusia may be the sole presenting side effect in approximately 3% of patients [1, 12].

7.1 The main complications of COVID-19

Complications of COVID-19 contain impaired work of the heart, brain, lung, liver, kidney, and coagulation system. COVID-19 can cause myocarditis, cardiomyopathy, ventricular arrhythmias, and

hemodynamic instability. Intense cerebrovascular disease and encephalitis are watched with extreme sickness (in up to 8% of patients). Venous and blood vessel thromboembolic occasions happen in 10% to 25% in hospitalized patients with COVID-19. In the ICU, venous and blood vessel thromboembolic events may happen in up to 31% to 59% of patients with COVID-19. Around 17% to 35% of hospitalized patients with COVID-19, generally are cured in an ICU, most generally due to hypoxemic respiratory failure. Among patients in the ICU with COVID-19, 29% to 91% require intrusive mechanical ventilation. In expansion to respiratory failure, hospitalized patients may create intense kidney harm (9%), liver dysfunction (19%), bleeding and coagulation disorder (10%-25%), and septic shock (6%).

Nearly 2% to 5% of people with laboratory-confirmed COVID-19 are less than 18 years, with an average age of 11 years. Children with COVID-19 have more moderate symptoms that are predominantly constrained to the upper respiratory tract, and rarely need hospitalization. It is obscure why children are less susceptible to COVID-19 (It may be related to the thymus gland and the secretion of thymosin in the pediatric immune system and the health and strength of a child's organs.). Potential explanations include those children have less robust immune responses (ie, no cytokine storm), partial immunity from other viral exposures, and lower rates of exposure to SARS-CoV-2. Although most pediatric cases are mild, a small percentage (<7%) of children admitted to the hospital for COVID-19 develop severe disease requiring mechanical ventilation. A rare multisystem inflammatory syndrome similar to Kawasaki disease has recently been described in children in Europe and North America with SARS-CoV-2 infection.

Table. 1. Clinical symptoms of patients with 2019-nCoV infection.

Study	Chen et al. [9]	Hung et al. [8].	Chung et al. [1].
Patient count	99	41	21
Age (mean, year)	55.5	49	51
Fever	83%	98%	67%
Cough	81%	76%	43%
Shortness of breath	31%	55%	-
Myalgia	11%	44%	3%
Hemoptysis	-	5%	-
Sputum production	-	28%	-
Confusion	9%	-	-
Sore throat	5%	-	-
Rhinorrhoea	4%	-	-
Chest pain	2%	-	-
Diarrhoea	2%	1%	-

This multisystem inflammatory syndrome in children is uncommon (2 in 100 000 persons aged <21 years). Pregnant and non-pregnant women have similar characteristics. The common clinical presentation of 2019-nCoV infection are presented in Table1 [1, 12].

8. Diagnostic- RT-PCR Method

8.1 Polymerase Chain Reaction and Serology

Determination of COVID-19 is regularly made utilizing polymerase chain response testing by means of nasal swab. But, since of false-negative test result rates of SARS-CoV-2 PCR testing of nasal swabs, clinical, research facility (laboratory), and imaging discoveries may too be utilized to create a possible diagnosis. Reverse transcription polymerase chain reaction, based SARS-CoV-2 RNA detection from respiratory tests (eg, nasopharynx) is the normal and standard for diagnosis. In any case, the sensitivity of testing changes with the time of testing in proportional to exposure. One modeling research evaluated sensitivity at 62% on the day of symptom onset, 33% and four days after exposure, and 80% three days after side effect onset. Variables contributing to false-negative test contain the adequacy of the specimen collection strategy or technique, time of exposure, and example source. Lower respiratory tests, such as bronchoalveolar lavage liquid, are more sensitive than upper respiratory tests. Approximately, there are five vital steps to perform the test: sample gadering, RNA extraction, RT-qPCR set up, and test results, all of which can be customized to describe both this and other RT-qPCR diagnostic conventions. The steps for performing the RT-qPCR test are as takes after [83].

Nasopharyngeal swap < 15 min: Cotton swap is embedded into the nostril to absorb parts.
Collected specimen 0 – 72 hr specimen is retained at 2 – 8 ^{0} C for up to 3 days or proceed to RNA extraction.
RNA extraction ~ 45 min purified RNA is extracted from the deactivated virus.
RT-qPCR, ~1 hr per primer, set filtrated RNA is reverse transcribed to cDNA and fortified by qPCR.
Test results real-time positive SARS-CoV2 patients cross the threshold line within 40.00 cycles (<40.00 Ct).

This way help distinguish the nucleic acid in the nasal swab sampling or the respiratory tract utilizing the PCR prepare in real-time. Since the irresistible virus contaminates the host's respiratory system, the essential tests are taken from the lower and upper respiratory tract (throat and the nose of an individual). The inspecting of the nasal aspirates and lungs are performing by injection of saline solution into the nose, and after that, the test is collecting by suction. At last, in the event that it is fundamental to proceed with the inspecting, the lower respiratory tract, i.e, Bronchoalveolar lavage or chip desire, which is sputum sampling, is performing. The RT-PCR is broadly utilized in the demonstrative field, and the error percentage of the way is meager [83]. SARS-CoV-2 can besides be detected in feces, but not in pee. Some serological tests can offer assistance inside the assurance and estimation of responses to new vaccines. But, the presence of antibodies may not make immunity, since not all antibodies made in

response to infection are neutralizing. IgM antibodies are discernable amid 5 days of the disease, with higher IgM levels help weeks 2 to 3 of disease, while an IgG response is, to start with, seen approximately 14 days after side effect onset. More antibody agent titers happen with more genuine illnesses [1].

8.2 The Serological antibody blood Test

Serology test may be a diagnostic strategy for identifying antibody-mediated immune reactions against infectious agents. The European Center for Disease Control and Prevention (ECDC) has endorsed the COVID-19 serological test for epidemiological and observing purposes only because, it does not distinguish the early stages of infection. Quick serological testing can be considered an elective to molecular testing to distinguish COVID-19 patients when get to PCR testing is constrained or non-existent.

Application of serological tests with low predominance isn't suitable since this strategy is likely to have false-positive effects compared to the real positive. The steps for performing the serology test as follows [83].

1) Sample loading: add a droplet of blood or serum in the sample well (S).
2) Buffer loading: add dilution phosphate saline buffer to sample well.
3) Sample incubation: capillary action moves sample across lateral flow test.
4) Antibody-antigen recognition by antibodies with specificity for COVID-19 bind to gold COVID-19 antigen conjugates in the conjugate pad.
5) COVID-19 antibody detection: sample enters testing well (T), and COVID-19 antibody or antigen complex binds to immobilized anti-human lgG/IgM antibodies.
6) Control antibody detection: rabbit antibody-gold conjugate binds to immobilized anti-rabbit lgG antibodies.
7) Interpreting results: Positive: one strip each in C well and T well, Negative = one strip in C well.

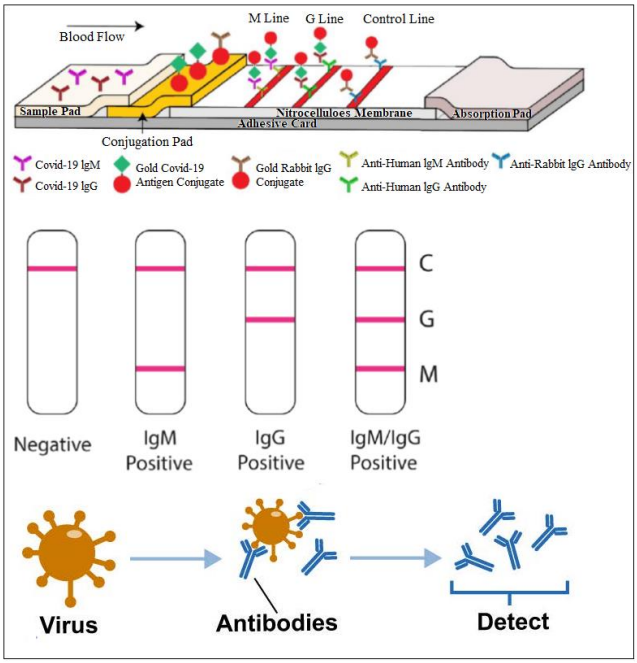

Fig. 14. *Graphical illustration of serological test developed by Li et al., 2020 [83].*

8.3 Laboratory Findings

An efficient investigation of 19 types of research of 2874 patients who were generally from China (average age, 52 years), of whom 88% were hospitalized, detailed the normal range of research facility laboratory abnormalities seen in COVID-19, counting raised serum C-reactive protein (expanded in >60% of patients), lactate dehydrogenase (expanded in roughly 50%-60%), alanine aminotransferase (increased in roughly 25%), and aspartate aminotransferase (roughly 33%).

Almost 75% of patients had low albumin. The most conventional hematological anomaly is lymphopenia (absolute lymphocyte number <1.0 × 109/L), which is display in up to 83% of hospitalized patients with COVID-19. In conjunction with coagulopathy, mellow thrombocytopenia (show in roughly 30% of patients), mean prolongation of prothrombin times (prolonged in >5% of patients), and raised D-dimer values (show in 43%-60% of patients) are common [1].

9. The Important Methods of Prevention COVID-19

A few Instructions were displayed by WHO and ECDC. Fundamentally, these rules are for the well-being profession to set amid the caring of the infected patients [16]. To avoid the spread of COVID-19, we must do a few basic and valuable works. Clean your hands regularly. Utilize cleanser and water, or an alcohol-based hand rub. Keep up a secure distance from anybody who is coughing or sneezing. Wear a cover or musk when physical separating isn't conceivable. Don’t touch your nose, eyes, or mouth. Cover your nose and mouth together with your bowed elbow or a tissue once you cough or sneeze. Remain domestic in the event that you are feeling unwell. In the event that you have got a fever, cough, and hard breathing, look for restorative consideration. Calling in

advance permits your healthcare supplier to rapidly coordinate you to the proper wellbeing office. Utilizing Cover or Mask can avoid up to 99% of COVID-19 transfer [12, 16].

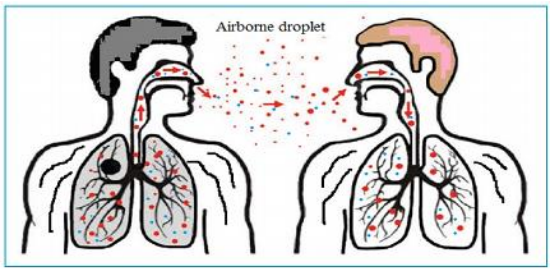

Fig. 15. *Transmission of COVID-19 via airborne droplets [16].*

Corresponding to WHO, a few common guidelines were distributed such as partitioned the infected patient from another family part to an isolated room, usage of contact and droplet precaution, airborne safety measure van be valuable.

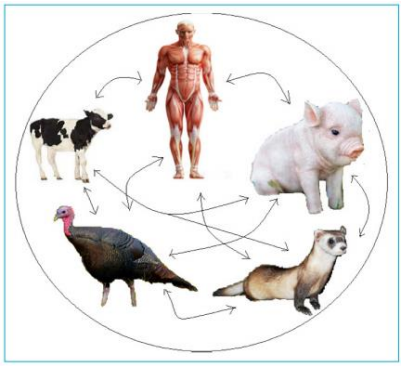

Fig. 16. *Coronavirus targets [16].*

European Centre for Disease Prevention and Control (ECDC) moreover distributed the data pamphlet to people groups i.e., Keep the social distance with sick individuals, in specific those with a cough. Maintain a social distance in markets and places where live or dead creatures are taken care of, wash your hands with cleanser and water, or utilize an alcohol-based disinfectant arrangement sometime recently eating, after utilizing the toilet, and avoid contact with animals, their excretions, or droppings [12].

10. Treatment Methods

If the test isn't accessible, remain at home and away from people for 2 weeks. Keep a 1-meter separate from others, indeed from your family. Wear a medical cover to protect others. Keep the room well-ventilated. When you share a room, put beds at a minimum of 1 meter separated. check yourself for any symptoms for 2 weeks. Call your health care provider urgently in case you've got any of these danger signs, such as trouble breathing, loss of speech or mobility, confusion, or chest pain [1, 12].

10.1 Supportive care and respiratory support

Right now, useful practices for strong administration of intense hypoxic respiratory failure and ARDS ought to be taken after. More than Three quarters of patients hospitalized with COVID-19 need supplemental oxygen therapy. For people or patients who are unresponsive to common oxygen treatment, warmed high-flow nasal canula oxygen may be managed. For patients needing invasive mechanical ventilation, lung-protective ventilation with minimum tidal volumes (4-8 mL/kg, anticipated body weight) and plateau pressure less than 30 mg Hg is prescribed. Furthermore, inclined to situate, a better positive end-expiratory pressure technique, and short-lived neuromuscular blockade with cisatracurium or other muscle relaxants may Accelerate oxygenation [1, 12].

The threshold for intubation in COVID-19–related respiratory failure is disputable since numerous patients have typical work of breathing but serious hypoxemia. “Earlier” intubation permits time for a more controlled intubation preparation, which is vital given the calculated challenges of moving patients to an airborne separation room and wearing individual defensive hardware prior to intubation. Although, hypoxemia within the nonattendance of respiratory trouble is well endured, and patients may do well without mechanical ventilation. In observational researches, almost 8% of hospitalized patients with COVID-19 encounter bacterial or parasitic co-infections, but up to 72% are cured with broad-spectrum antibiotics [1, 12, 16].

11. Social Disparities Factors

Social factors in underdeveloped countries can be one of the reasons for the faster spread of Coronavirus and are more prevalent in the poor and financially weak. Lack of finances leads to the use of public transportation and attendance at work to earn money even under quarantine laws. In rural communities and poor countries, due to lack of proper education and health issues, as well as attending religious communities and ceremonies such as mosques, churches and not wearing masks, the virus spreads further. Issues of personal and public health education and financial poverty are at the forefront of social factors.

11.1 Hospital mortality complications of COVID-19

In general clinic or hospital fatality from COVID-19 is roughly 15% to 20%, but up to 40% among patients needing ICU admission. In spite of the fact that long-term results from COVID-19 are right now obscure, patients with the serious disease are likely to suffer considerable sequelae. Survival from sepsis is related to expanded risk for fatality for at slightest 2 years, modern physical inability, new cognitive disability, and expanded powerlessness to repetitive infection and further health disintegration. Comparable sequelae

are probably to be seen in survivors of extreme COVID-19 [1, 12, 16].

12. Corona Mutations

Researches indicate a direct connection between transformations or mutations within the SARS-CoV-2 virus genome and changes in pathogenesis. Subsequently, customary evaluation of the virus genetic differences in each nation can give important information for the improvement of vaccines and medicines. The majority of viruses mutate, and this transformation happens when it replicates in arrange to adapt to the environment. Scientists have so distant distinguished a few changes within the new sort of Coronavirus. Although, a few of these transformations may have particular benefits for keeping the virus lively, counting speeding up the transmission. Both strains of the Coronavirus have experienced various mutations, particularly within the protein spike, which cause them to be more quickly absorbed by cellular receptors and to contaminate more cells.

12.1 Various coronavirus mutations Characteristic

Modes of the Coronavirus, such as the British or South African or Brazilian and French mutant viruses, includes a genetic mutation in the “spike” protein that could be the cause of immediate and easy spread of the virus amongst people.

12.2 Different spreading capability in mutant forms

Regarding the comes about of a few scientific types of research, primarily based on modeling, the mutated version of the Coronavirus, which has been distinguished in the UK, contains an exceptionally high capability and speed of transmission. A gather of British analysts has approved that this sort of infection is 50 to 70% more able and speedier than the known Coronavirus. Preparatory thinks about the changed strain of the Coronavirus in South Africa, also indicated
that it is more infectious than the known strain of the Coronavirus.

12.3 Classification of Coronavirus Mutations

Rapid mutation of the coronavirus, which can lead to the formation of different types with double and triple mutations in a short time. Scientists detect mutations through the process of sequencing genomes from samples collected from infected people.

As the virus spreads, it has more opportunities to achieve mutations and grow faster, said Dr. Veena Menon, a faculty member at the Amrita Institute of Medical Sciences' Clinical Virology Laboratory. This is a normal part of the virus life cycle, but it is important that we track these changes (virus monitoring) and follow the important viral characteristics associated with these mutations. Some mutations weaken the virus, while others may make it stronger and cause it to multiply faster and cause more infections. As the virus spreads, it has more opportunities to achieve mutations and grow faster. This is a normal aspect of the virus's life cycle, but it is very important to find these changes by monitoring the virus and learning about the important features of the virus. Evidence so far shows that none of the types of viruses are associated with disease severity. But in the UK variant it is associated with increased transmissibility of the disease, while in
the South African and Brazilian variants, exhibit ability to escape of vaccine-induced immunity [78].

Mohammad Reza Tavakoli, Ph.D. in Psychology, and Esmat Heydari, Ph.D. in Health Education, have briefly introduced the types of major mutations found throughout India. Double mutation: A type of binary mutant, scientifically named B.1.617, is a combination of E484Q and L452R SARS CoV-2 mutations that cause COVID-19. The virus is reported to be spreading in India, but the spread of the virus in many states is still unclear. Positive cases of this type have been identified in Delhi and Punjab. In addition, it is found in approximately 20% of specimens in Maharashtra. The individual strain of E444Q: Similar to the E4444K mutation in Brazil and South Africa that attracted global attention in December 2020. The L452R mutation has been reported in many cases in Maharashtra and, among some cases, in California, USA.

Genomic analysis has shown that both E484Q and L452R mutations are associated with an increased viral infection. The double mutation shows two separate spike protein substitutions on this strain of the coronavirus. With continuous mutation, the structure of spike proteins changes, which poses a threat to the effectiveness of vaccines that target such proteins. Triple mutation (Bengal strain): This is the latest threat to the Indian population, as its discovery coincides with a horrific increase in the number of COVID-19 cases.

This third mutation originated from B.1.617 and was named B.1.618 or Bengal strain and was found among
specimens collected from the states of Maharashtra, Delhi, West Bengal, and Chattisgarh.

According to reports, this option has the ability to evade the immune response and can cause more pathogenic contamination. Experts warn that this could make the COVID-19 emergency situation more critical across the country. According to Dr. Seridhal, an assistant professor at the West Bengal Institute of Medical Genetics (NIBMG), the Bengal strain (B.1.618) has four mutations, distinct from the double mutation, which has been circulating in some parts of India in recent months. This includes the proven D614G mutation, which could be identified as the first type of virus to have apparently originated in Wuhan, China. It also has the E484K mutation. Apart from India, the Bengal strain has been found in specimens

outside India, in countries such as the United States, Singapore, Switzerland, and Finland.

Other strains of the coronavirus are circulating in India. The GISAID online database shows that B.1.618 is the third most common, prevalent in India in the last 60 days, accounting for approximately 12% of cases. On the other hand, the double mutation of B.1.617 caused
28% of the cases. Another common type of sequence is B.1.1.7 or the English type throughout the country.

Apart from these types, other types from Brazil, South Africa as well as N440K, E484Q, and B.1.36 are also common throughout India. Is it possible to control and manage the disease with these complex conditions? Despite the growing number of patients and various mutations of the virus, the possibility of a silver coating (acceptable immunity) in the community is increasing.
Although new strains of the virus are spreading more rapidly and have affected a large number of people, their mortality rate is not higher than previous samples," said Abiola Panda, director of the Institute of Immunology (India's leading vaccine institute). Preliminary findings show that different types of viruses can be dangerous, but they are not more dangerous than previous samples. Thus, while the transmission rate associated with new strains may increase in the short term, mortality and hospitalization can be controlled by increasing vaccination and taking all necessary precautions.

12.4 Importance of mutant virus databases

Virology researchers and analysts must assemble all the data around mutant viruses and recognize recently transformed viruses. More current vaccines are given to various individuals each year amid the episode seasons. The rise of two modern and transformed strains of SARS-2, which we know for brief as Coronavirus, has raised unused concerns among health specialists and authorities, as well as people around the world. The virus, which has the potential to spread much quicker, was, discovered in Britain within the B117 and in South Africa as the 501.V2.

13. Prevention and Vaccine Development

COVID-19 may be a possibly preventable illness. In common, these cases can be divided into those
comprising of individual activities (eg, social distancing, individual cleanliness, and musk), case and contact recognizable proof (eg, trace-test, separation, responsive school or working environment closure), administrative activities (eg, governmental limits on sizes of social occasions or commerce capacity; proactive school, stay-at-home orders, work environment, and open transport closure or constraint; cordon sanitaire or inside border closures), and universal border measures (eg, border closure or compulsory quarantine). A key need is to recognize the composition of measures that can minimize societal and financial disturbance whereas satisfactorily controlling disease. Ideal measures may shift between nations based on asset impediments, geography (eg, island countries and worldwide border measures), populace, and political components (eg, wellbeing education, belief in government, social and cultural differences). The prove basic these public health intercessions has not altered since the 1918 flu widespread. Numerical modeling thinks about and observational prove back that public wellbeing intercessions, counting quarantine, limiting mass get-togethers, travel limitations, and social distancing, are related to diminished rates of transmission. [1, 12, 16].

A few human vaccines are right now accessible for SARS-CoV-2, and there are beneath improvement. Approaches contain the utilize of nucleic acids (DNA or RNA), inactivated or live constricted virus, adenovirus serotype, viral vectors, and recombinant proteins or infectious virus. Challenges to creating a viable vaccine comprise of specialized boundaries and legal obstructions (eg, innovation exchange and licensure understandings). moreover, strong treatment could be a treatment procedure taken after by health experts. Strong treatment incorporates the organization of antipyretic and analgesic, support of hydration, mechanical ventilation as respiratory support, and employments of antibiotics in bacterial contaminations. A few inquire about ponders claimed that ribavirin and interferon-alpha have advertised. synergetic impact in early arrange. Whereas other studies detailed mycophenolic acid as monotherapy. Thus, Advance clinical investigation required [1, 12, 16].

13.1 Vaccine and Therapy Development

One of the main ways to ensure against infection is to stimulate the immune system of the body with a vaccine. For Instance, the polio vaccine comprises inactivated or weakened viral particles. These are incapable to start an infection but are recognized by the white cells of the immune system. During the several weeks, the white cells that recognize the virus replicate within the body. These white cells synthesize and emit
new antibodies that can bind to the virus within the vaccine. If the person exposed to infectious poliovirus, the circulating antibodies are as of now display and are
able to inactivate the contaminating particles. This immunity may take decades, in spite of the fact that contrasts depending on the antigen. Creating a vaccine requires developing a huge number of viruses, frequently in animals, or in tissue culture at a big scale. The viruses are inactivated by radiation, heat, or chemicals, or are produced with virus manipulation from genetically weakened strains. Another choice is to filter disconnected viral proteins like a spike. This is often more secure and comfortable to scale up, but the immune system reaction to the isolated protein is frequently not as strong, because it is to the organized grid of the intact

virus molecule. A later methodology includes infusing people with RNA or DNA encoding for viral proteins. These nucleic acids can be managed alone or through man-made vectors that offer assistance provide material into the body. In any methodology, sufficient material is required to infuse sensible dosages into millions of people. Generally, a vaccine may be a biological matter that produces an obtained active immunity against a particular microbial infection. Vaccines are exceptionally crucial to save the lives of millions of people each year. The essential work of vaccines is to prepare and get ready the immune system to detect and combat the target viruses and microscopic organisms. Common components of vaccines are as follows [83].

1) Active ingredients bacterial or viral antigens that directly stimulate the immune system but cannot cause illness.
2) Adjuvants Aluminum salts in small values that help to boost the immune reactions to the vaccine.
3) Antibiotics protect infection by bacteria during the vaccine production process.
4) Stabilizers such as Sugar or gelatin keeps the valuable vaccine until it is administered to a patient.
5) Preservatives Thimerosal prevents dangerous bacterial or fungal infection (only used for influenza vaccines).
6) Trace components residual inactivating ingredients such as formaldehyde, and residual cell culture materials (show in little amounts that don't posture a immunity concern).

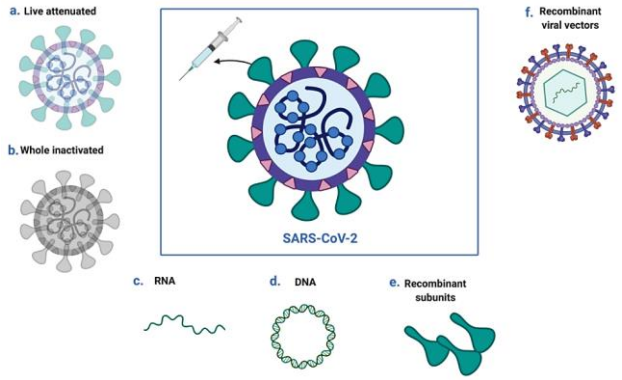

Fig. 17. *Approaches to SARS-COV-2 Vaccine development.*

13.2 An effective vaccine with a long-lasting antibody in the body

Before the virus connects and attacks the host cell, B cell-secreted neutralizing antibodies can connect with the spike protein, rendering it incapable to contaminate host tissue. Although, once the virus has attacked a host cell, as it were cytotoxic T-cell reactions can destroy the infected epithelial cells. A few methods are being created for COVID-19 vaccines [17], generally centering on the production of 'neutralizing antibodies', which can neutralize viral particles making them non-infectious; Although, there's a small accentuation on the generation of dynamic T cells that can destroy contaminated cells and enhance other immune reactions, critically counting importantly containing antibody generation [18]. There are expanding anxieties about the over-emphasizing of neutralizing antibodies as the basic index of COVID-19 vaccine victory [19]. A few researches, have appeared that patients who have recovered from COVID-19 infection, illustrate a fast decay of antibodies against SARS-CoV-2 [19]. As such, a diminish of antibody titers has been appeared to be divided every 73 days, proposing the antibodies may be drained inside a year [20].

This rate of decay is quicker than already detailed for the SARS-CoV-1 infection [21]. This has increased concerns that humoral immunity against the SARS-CoV-2 infection may not be adequately long-lasting [20]. In other investigations, it has been detailed that patient create a variety of immunity reactions post-vaccination where a few create strong B and T cell reactions, whereas some do not [22]. These are all disturbing signals against overreliance on neutralizing antibodies as a implies of accomplishing herd immunity or a capability for 'vaccination international ids. This moreover fortifies that T cell reaction is basic for the long-term security against COVID-19 infection and these must be evaluated and detailed. In case a vaccine is able of activating both neutralizing antibodies and T cells (CD8 T cells), it would likely give more grounded, long-lasting protection from SARS-CoV-2 virus disease.

13.3 Some important vaccines for COVID-19

Immunization with Vaccination is the most effective strategy for a long-term procedure for the protection and control of COVID-19 within the future. Numerous various vaccine formulations against SARS-CoV-2 are in improvement, the techniques of which include recombinant vectors, DNA, mRNA in lipid nanoparticles, inactivated viruses, live weakened infections, and protein subunits. In Table 2, some vaccines have compared with each other. Most corona vaccines provide immunity to the virus for 3 to 6 months. For example, the Pfizer vaccine provides 6 months of immunity and provides over 99% immunity against all mutated strains of the virus.

Table. 2. Comparison of different COVID-19 vaccines and their effectiveness.

Company	Type	Dose	Effect	Storage
AstraZenca Oxford-Uni	Viral vector Genetically modified virus	2	62-90 %	Regular Fridge Temp
Moderna	mRNA Part of Virus genetic code	2	95 %	-20 C Up 6 months
Pfizer-BioNTech	mRNA	2	95 %	-70 C
Johnson and Johnson	Adenovirus-based Genetically modified virus	1	72 %	Regular Fridge Temp
Sputnik V and Sputnik Light	Adenovirus-based Genetically modified virus	2 and 1	92 %	-18C

Sinovac Biotech	inactivated vaccine *technology weakened or killed virus*	2	50-78 %	Regular Fridge Temp
Novavax	recombinant nanoparticle technology Protein carrier	2	89 %	Regular Fridge Temp
CanSino Biologics	Adenovirus-based Genetically modified virus	1	65 %	Regular Fridge Temp
Kovo-Iran Barekat	weakened or killed Virus	2	80 %	Regular Fridge Temp

13.4 How can I prevent vaccine side effects and the risk of death for patients?

In the vaccine experiments, only patients with a background of extreme antagonistic response related to a vaccine or extreme allergic response to any component of the vaccine ought to talk to a doctor before accepting the new vaccine. The earlier history of vaccine allergy or history of sensitivity to polyethylene glycol (PEG) or polysorbate with responses such as rash, hives, itching, wheezing, swelling/angioedema, shortness of breath, chest tightness, or anaphylaxis Idiopathic anaphylaxis (anaphylaxis with unknown cause) and also another anaphylaxis history (such as to an injectable medication).

Expanded rates of response to the COVID-19 vaccine in patients with nourishment, medicine, latex poison hypersensitivity from the clinical trial information have not been reported. Patients with unfavorably allergic conditions, such as nourishment, medicate, latex poison, or other unfavorably allergic disorders, were not excluded. Patients with a history an anaphylaxis history and of an irrelevant medicine or nourishment are recommended to be watched for 30 minutes after vaccination.

13.5 What are the side effects of a COVID-19 vaccine?

In some cases, vaccines can cause local responses that start within the hours taking after vaccination or indeed the following day. You'll likely be observed for 15 minutes after getting a COVID-19 vaccine to see on the off chance that you have got a quick response. Most side effects happen inside the primary three days after vaccination and regularly takes 1 to 2 days. The location of vaccination (as a rule the arm) can become swollen, redness, and painful.

A COVID-19 vaccine can cause gentle side impacts after the primary or second dose, containing pain, redness, or inflation where the shot was given additionally, fever, weakness, headache, muscle pain, feeling unwell, chills, Joint pain, nausea, and vomiting, swollen lymph nodes. When you have been exposed to COVID-19 and you create side effects more than three days after getting vaccinated, or the side effects final more than two days, self-isolate and get tested. It isn't suggested simply take the pain; you must use medication before recently getting a COVID-19 vaccine to avoid possible inconvenience. But, it's Alright to require this kind of medicine after getting a COVID-19 vaccine, as long as you've got no other therapeutic reason that would prohibit you from taking it.

The CDC (Centers for Disease Control and Prevention) for pain or inconvenience, suggests inquiring your specialist about over-the-counter or other treatment alternatives. Contact your specialist, in case the redness or delicacy where you got the shot increments after 24 hours. Your side impacts are stressing you or
don't appear to be going away after a number of days. To decrease discomfort from fever, drinking plenty of liquids, dressing softly, and assist with the pain or inflation in your arm from the infusion, apply a clean, cool, damp washcloth over the area. Utilize or move your arm.

13.6 How can I prevent vaccine side effects and the risk of death for patients?

To reduce the side effects of Corona vaccines, it is best to ask people before the vaccine what allergies they have and if they have ever had a problem with a similar vaccine, such as the flu vaccine or penicillin. It is best to test the vaccine subcutaneously and also to ask about specific patients, such as coagulation disorders (in patients with coagulation factor 8 deficiency or hemophilia A) for the person receiving the vaccine. Before the injection, the blood coagulation test and the number of red and white blood cells for these people should be checked. For example, carcinoma, acute kidney failure, heart disease, or changes in arteriosclerosis should be checked in the person receiving the vaccine. Most importantly, there are people who take corticosteroids and have Autoimmune disease. These questions and tests are absolutely necessary for the patient's risk of death. Even patients who have just had major surgery such as open-heart surgery and have high blood sugar or underlying conditions. Pregnant and weak mothers during menstruation are no exception to this group and the patient should be asked before vaccination important cases.

14. Treatment Methods and Developing New Drugs Against COVID-19

14.1 Antiviral Therapies for Infected Individuals

Antivirals that interfere with the viral life-cycle without significantly impacting normal cellular function are critical to combating viral infections. Such therapies are in use for other RNA viruses, like Influenza, and are administered generally as small molecules, taken in pill form. These antivirals act by binding to and interfering with viral proteins needed to replicate the viral RNA or facilitate binding and entry or the virus into the cell. Another class of antiviral drugs, which are effective with HIV, act by interfering with the synthesis and assembly of the coat proteins into the viral capsid. For instance, Pfizer's experimental oral drug to treat COVID-19 at the first

sign of illness could be available by the end of the year, CEO Albert Bourla told CNBC on Tuesday. The medicine is section of a class of drugs called protease inhibitors and acts by inhibiting an enzyme that the virus requires for reproduction in body cells. Protease inhibitors are utilized to cure other viral pathogens such as hepatitis C or AIDS. If clinical trials go well and the Food and Drug Administration approves it, the drug could be distributed across the U.S. by the end of the year, Bourla told CNBC's "Squawk Box." Health experts say the drug, taken by mouth, could be a game changer because people newly infected with the virus
could use it outside of hospitals. Scientists hope the drug will retain the disease from progressing and prevent hospital trips.

14.2 Targeting the virus and the host response with various medicines

Some classes of drugs are being measured or developed for the management of COVID-19. Some antibodies (Convalescent plasma, and hyperimmune immunoglobulins), some antivirals (Remdesivir, Favipiravir), some anti-inflammatory agents (Dexamethasone, statins), some targeted immunomodulatory therapies (Tocilizumab, Sarilumab, Anakinra, Ruxolitinib), some antifibrotics (Tyrosine Kinase inhibitors) and anticoagulants (Heparin). It is probably that distinctive treatment modalities might have distinctive efficacies at distinctive stages of sickness and completely different signs of infection.

In fact, more than 200 tests of chloroquine or hydroxychloroquine, materials that prevent viral entry and endocytosis of SARS-CoV-2 in vitro and may have beneficial immunomodulatory influences in vivo, have been started, but early information from clinical tests in hospitalized patients with COVID-19 have not proved clear advantage. A few reported cases indicated hydroxychloroquine plus azithromycin may be useful.

Most antiviral medicines undergoing clinical testing in people with COVID-19 are repurposed antiviral agents originally developed against flu, AIDS, Ebola, or SARS/MERS. Among the RNA-dependent RNA polymerase inhibitors, which halt SARS-CoV-2 replication, being evaluated, containing ribavirin, Favipiravir, or Remdesivir, the latter seems to be the most hopeful. Evidence of lower respiratory tract involvement who were accidentally assigned to receive intravenous placebo or Remdesivir for up to 10 days illustrated that people randomized to receive Remdesivir had a shorter time to recovery than patients in the placebo group (11 vs 2 weeks).

Remedy with plasma gotten from patients who have recovered from viral diseases was initially detailed amid the flu widespread. The primary report of 5 fundamentally sick patients with COVID-19 cured with gaining strength plasma containing neutralizing antibody indicated improvement in clinical status among all members, characterized as a combination of fluctuations of body temperature, Consecutive Organ Assessment score, partial pressure of oxygen/fraction of inspired oxygen, viral load, serum antibody titer, schedule blood biochemical index, ARDS, and ventilatory and extracorporeal film oxygenation bolsters before and after gaining strength plasma transfusion status. Alternative methods being considered to include the utilize of healing plasma-derived hyperimmune globulin and monoclonal antibodies focusing on SARS-CoV-2.

Some alternative therapeutic methods include modulating the inflammatory reaction in people with COVID-19. Some monoclonal antibodies coordinated against key inflammatory mediators, such as interferon-gamma, interleukin 1, interleukin 6, and complement, all target the overpowering provocative reaction taking after SARS-CoV-2 disease with the objective of preventing organ harm. Tyrosine kinase inhibitors, such as imatinib, are examined for their potential to protect pneumonic vascular leakage in people with COVID-19. A few researches have detailed that dexamethasone decreased 4-week all-cause fatality. The advantage was most noteworthy in patients with side effects for more than 1 week and patients who required mechanical ventilation. In return, there was no advantage (and feasibility for hurt) among patients with shorter side effects time and no supplemental oxygen necessity. A few researches about China, with affirmed COVID-19 pneumonia and ARDS, reported that remedy with methylprednisolone was related to diminished chance of death.

15. The Most Important Findings

15.1 Introducing new and efficient methods for treatment and prevention

In spite of the striking common likeness to the structure of SARS-CoV 3CLpro, the SARS-CoV-2 3CLpro substrate binding or connecting site had principal contrasts, highlighting the require for fast medicate disclosure to address the caution infection COVID-19. Herbal therapeutic compounds have been utilized to treat viral illnesses effectively. A database of

therapeutic plants containing 32,297 antiviral chemicals were screened and those that restrained the movement of COVID-19 for virus replication were chosen. Moreover, in-vitro and in-vivo investigation is required to translate these potential inhibitors into unused clinical drugs. Employing a database of chemical and herbal antiviral compounds can offer assistance deliver modern drugs. The Docking research about was performed by Molecular Operating Environment computer program (MOE) [25].

In this research, docking investigations appeared that the COVID-19 protease (6LU7) may be hindered by a few compounds from herbal drugs, based on the

official vitality score, we propose that these compounds such as; Capsaicin, Naringin, Quercetin, Psychotrine, and Gallic acid can be tried against Coronavirus and utilized to create viable antiviral drugs. These particles may be utilized for the advanced development and advancement of antiviral compounds against Coronavirus [25].

15.2 New evidence shows Coronavirus can infect and kill heart muscle cells

New researches indicate that the Coronavirus taints and terminates heart cells by infecting and destroying them. For this reason, heart issues are one of the foremost common complications of COVID-19. Until the comes about of this research, analysts accepted that heart problem caused by COVID-19 were due to irritation in reaction to viral infection, but new researches which utilize designed stem cells from the heart muscle, appear how the virus specifically targets the heart cells and destroys the cells dependable for the contraction of the heart muscle. (cardiomyocytes).

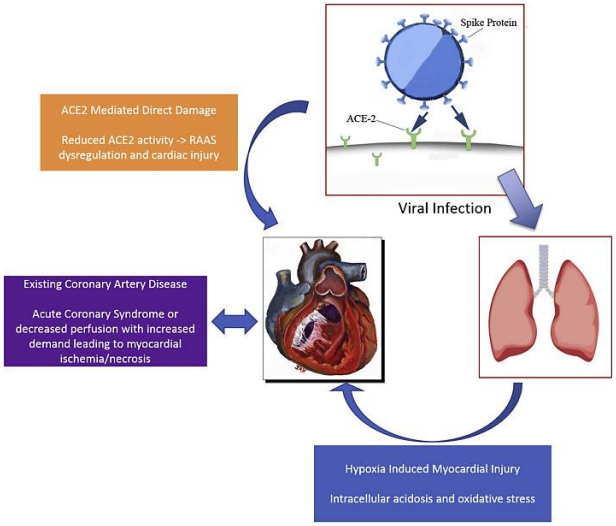

Fig. 18. *Possible mechanisms of cardiac injury with COVID-19 [26].*

This specific heart cell harm, can happen within the nonappearance of any inflammation or be increased by any resultant inflammation.

15.3 Image processing enables rapid COVID-19 lung imaging analysis

The researchers accept that chest X-rays are cheaper, the equipment is more convenient and less demanding to clean, and comes about are returned more rapidly than numerous other diagnostics. “That’s where imaging can play a critical role. Ready to rapidly triage patients to the fitting level of care, indeed sometime recently a COVID-19 determination is formally confirmed,” It can be seen in Fig.19 that the high-resolution Camera is connected to fortify the backlight impact with an attracted light sheet (dark sheet). This framework incorporates a digital Camera for photography and computer software to control the image processing performing the pattern detection algorithm. It is applicable to filter out pictures of undesirable objects such as redundant spots or noises within the picture and clearly, by taking high-resolution images, the result of the prepared pictures would be more reliable [27].

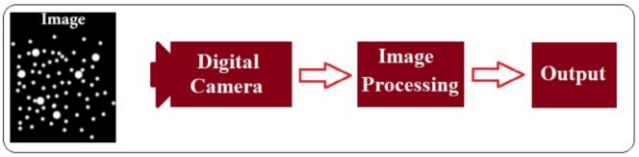

Fig. 19. *Block diagram of image sensing and processing system [27].*

It also facilitates generation of the needed statistical analysis for material science, medical science, and other applications. This kind of image processing method decreases total time, eliminates subjective observer mistake in photos, impressively [27].

Fig. 20. *Chest X-rays from a patient with COVID-19 pneumonia, original x-ray (left) and Image Processing for pneumonia result (right) (Photo courtesy of UC San Diego Health).*

15.4 Low-Dose radiation could be the trick for treating COVID-19

Most substantial for COVID-19 was radiation treatment for patients with viral pneumonia who did not react to sulfonamides. COVID-19 causes viral pneumonia. Whereas antiviral medicines, anti-inflammatory drugs, and statins are systemic medicines that influence the entire body, radiation treatments are able to target the lungs where inflammation happens. None of the radiation measurements utilized are at levels that posture critical health dangers. Low-dose radiation does not straightforwardly target the organism, maybe rather than the immune resistant reaction of the host.

This is often not the case for biochemical materials such as antivirals and anti-microbials. They work specifically against destructive organisms. If they eliminate all the last infectious particles or viruses, at that point they are effective. In differentiate to antiviral drugs, a single dosage of X-rays does not put significant selective impact on the SARS-CoV-2 virus and thus does not lead to resistance. These researches reported treating pneumonia patients by giving an awfully unassuming X-ray dosage of almost 0.3 Gy to the lungs. The normal remedy rate for all the studies was 83%. In one research by J. P. Rousseau et al., X-ray treatments of pneumonia patients decreased the mortality rate from 28% to 6% [28].

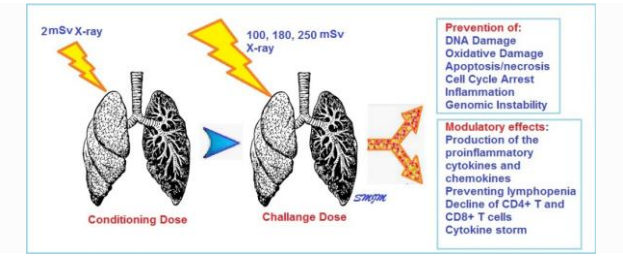

Fig. 21. *Proposed radiation treatment plan for COVID-19 associated ARDS [28].*

Whole-lung low-dose radiation treatment accomplished speedier and more total recovery from COVID-19–related pneumonia compared with best strong care with or without COVID-19-directed drugs. This research sends a preparatory signal for the restorative adequacy of low-dose radiation treatment in this setting. Bigger, corroborative trials are required. Analysts at Emory University Hospital in USA, driven by Dr. Mohammad Khan, an assistant professor of radiation treatment cured five COVID-19 patients with extreme pneumonia with oxygen treatment and their common condition was deteriorating [28, 29]. The patients ranged in age from 64 to 90 years and their middle age was 90 years: one was white, four were African-American, and four were female. These patients gotten low-dose radiation treatment (1.5 Gy) in two lungs in a (10 to15) miniature session. The "Gray" (symbol: Gy) may be a derived unit of ionizing radiation measurements within the International System of Units (SI). Gray is characterized as the absorption of one joule of brilliant vitality per kilogram of matter. One gram is identical to 100 "rad" which was the old unit of radiation. Four of these patients appeared quick enhancement in blood oxygen levels and state of consciousness inside 24 hours and were released from the clinic 12 days later. Repeated blood tests and imaging of the lungs appeared that radiation treatment was safe and effective and did not cause side impacts and no intense dermatological, gastrointestinal or urinary genotoxicity happened in these patients [28].

Serious cases of COVID-19 are related to the release of highly inflammatory substances called cytokines, known as "cytokine storms." This condition causes a serious, uncontrollable, extreme inflammatory reaction that harms the lungs and causes "acute respiratory distress syndrome," or ARDS. The fatality rate from COVID-19 increments with age. That's why it is so critical to discover the successful and secure treatment for elderly patients. The appearance of anti-inflammatory impacts of radiation, not its antiviral impact, has been able to assist treat these patients. Whereas we attempt numerous solutions to control the Coronavirus in SARS-Cov-2, we must utilize anything tools we have at our disposal, and low-dose radiation treatment may be an imperative method [28, 29].

15.5 Imaging technique effects

Early within the disease, chest computed tomographic imaging disclosures in around 15% of individuals and chest radiograph disclosures in generally 40% of individuals can be standard. The quick headway of abnormalities can happen inside the primary 14 days after side effect onset, after which they will be vanished slowly [15]. A few patients conceded to the hospital with polymerase chain response testing–accepted SARS-CoV-2 illness have conventional computed tomographic imaging discoveries, whereas anomalous chest computed tomographic imaging discoveries suitable with COVID-19 happen for the most cases, a few days before the detection of SARS-CoV-2 RNA test in other patients with serious cases [1, 15].

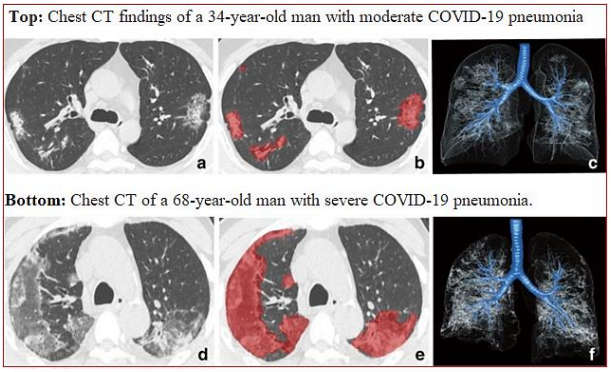

Fig. 22. *Top) a: CT picture of lung parenchyma indicated multi-focal crazy-paving pattern and solidification peripherally conveyed within the superior lobes of both lungs. b: The injuries were automatically labeled by an artificial intelligence (AI) computer program. c: 3D picture recreation appeared the degree of the crazy-paving pattern and solidification with the scattered model. Bottom) d: CT picture of lung parenchyma appeared multi-focal GGO and consolidation diffusely conveyed within the center and inferior lobes of the right lung and of the inferior lobe of the left lung. e: The injuries were naturally labeled by AI computer program. f: 3D picture reconstruction appeared the degree of the crazy-paving pattern and combination with a scattered model. GGO, ground-glass opacity [15].*

15.6 Radiological findings about COVID-19

The respiratory organ is the primary to be influenced by COVID-19, so in suspicious cases, it is conventional to ask for a chest X-ray (CXR) as the primary imaging test. Although, its symptomatic execution within the beginning stages of the illness is constrained since it has been detailed those pathological discoveries identifiable on chest computed tomography (CCT) may not be identified on X-rays. CCT has demonstrated to be an imaging procedure with, especially great results to distinguish lung involvement caused by SARS-CoV-2 (COVID-19), indeed in asymptomatic patients. Ground-glass opacities, confined or in combination with lung components, are the foremost conventional radiological finding. The radiological discoveries that connect with clinical change happen after 2 weeks of favorable symptom movement and involve a gradual consolidation resolution, with a diminish within the number of injuries and the number of influenced lung

lobes. On the other hand, in cases of destitute movement, the foremost common cause of exchange to ICUs and the primary cause of death is ARDS. A few kinds of research indicate that CCT discoveries can change concurring to the age of the patients, with combinations being more common in older patients and GGO in more youthful patients. Within the case of patients with negative PCR results, but with normal clinical appearances, history of exposure, and, thus, a high clinical doubt of disease, CCT can be a highly profitable demonstrative method since it can distinguish the characteristic discoveries of the illness [30].

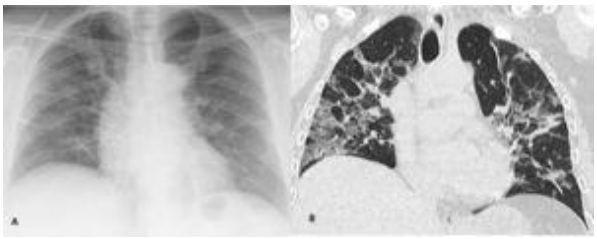

Fig. 23. *(A) CXR picture. (B) CCT imaging, coronal remaking. COVID-19 positive patient. GGO is more comfortably distinguished on CCT imaging compared to CXR [30].*

15.7 Severe COVID-19 may be caused by Autoantibodies

The Study appears that in patients with extreme COVID-19, the body produces “autoantibodies”. These are antibodies that rather than assaulting the attacking virus, assault the patient’s own immune system and organs. The scientists found that individuals with serious COVID-19 had autoantibodies that connected onto significant proteins included in recognizing, alarming, and clearing cells tainted with the Coronavirus. These proteins contain cytokines and chemokines, imperative messengers, in the immune system. This interfered with the typical immune system performance, blocking antiviral defenses, possibly making the illness more extreme. For many years, autoantibodies have been known to be included in autoimmune illnesses, such as rheumatoid arthritis and lupus. Viral diseases have moreover been connected to the onset of a few autoimmune diseases. Recent researchers found that individuals with extreme COVID-19 can moreover create autoantibodies to interferons, immune proteins that play a major role in combating viral infections [31].

The researchers who carried out the most recent research utilized a new technology that screened for autoantibodies that work against thousands of the body’s proteins. They looked for autoantibodies in 170 hospitalized patients and compared them with autoantibodies found in individuals who endured mild illness or asymptomatic infection, as well as individuals who had not been infected with the Coronavirus. Within the blood of the hospitalized patients, they found autoantibodies that seem to attack interferons, as well as autoantibodies that seem meddled with other basic cells of the immune system such as common killer cells and T cells. The discoveries showed that autoantibodies were a really common include of extremely sick COVID-19 patients [31].

But the inquire recommends that individuals with existing autoantibodies may be at higher danger of getting serious COVID-19. These individuals may have insufficiencies in their immune reaction amid early Coronavirus infection or be inclined to making new autoantibodies that seem to prevent their immune reaction to the virus. Understanding what drives the generation of autoantibodies will offer to assist researchers to create new medicines for this disease. Researchers don’t know how long these autoantibodies survive after the infection has cleared. An imperative unanswered question is whether long-term harm caused by autoantibodies might clarify a few symptoms of long COVID-19 [31].

15.8 Using corticosteroids against COVID-19 in severe cases

Corticosteroids can be given to all patients who are in the second stage of their ailment (about seven days after the primary symptoms) and require oxygen. In this way, not as it did, we save a few patients from death, but the number of patients transferred to the intensive care unit (ICU) is significantly decreased; The length of time patients spend in bed is additionally exceptionally brief. Of course, patients with infectious issues are not more often than not endorsed corticosteroids, since they weaken the body immune system. Therefore, in the case of coronary heart disease, international health organization (WHO) do not prescribe corticosteroids to date. The use of corticosteroids with antibiotics to prevent lung infection is recommended in the second or immunological phase of coronary artery disease, which is one week after the onset of symptoms, and under shortness of breath and the severity of the disease and pneumonia due to antibody accumulation. In conclusion, addition of corticosteroids to our institution’s COVID-19 treatment protocol was associated with a significant reduction in hospital mortality in the ‘after’ period [32].

15.9 Use dexamethasone to rescue critically ill COVID-19 patients

Dexamethasone is a steroid, a substance that mimics the action of anti-inflammatory hormones. The body makes these hormones naturally. This drug reduces the efficiency of the immune system. In people with COVID-19 virus, both the virus itself and the body's response to it, cause inflammation. In some cases, the immune system is overactive, and this reaction can lead to the patient's death. In other words, the same reaction that nature has designed to attack infectious agents, itself attacks and destroys the cells of the diseased body. Dexamethasone alleviates this reaction. This medicine is suitable for patients who are hospitalized and given oxygen or connected to a ventilator. That is, critically ill patients.

It has no effect on people with milder forms of Coronavirus, and it is not helpful to suppress their immune system in such conditions. According to researchers involved in research on the drug, its use for ventilator-linked patients could save the life of one in three patients on the verge of death. In patients who use only oxygen, it is less effective and prevents the death of one in five patients on the verge of death. In the dexamethasone trial, about 1,200 patients were given 6 mg of dexamethasone daily. Currently, this drug is only recommended for adults and is not used for pregnant women or breastfeeding mothers [33].

15.10 Some useful nasal spray drugs against COVID-19

The Ichilov Medical Center in Israel announced that one of its researchers had carried out the first of three phases of clinical trials on a nasal spray he developed against respiratory symptoms linked to COVID-19. This researcher, Nadir Arber, reported he had administered the spray to 30 patients with moderate to severe cases of COVID-19, and that 29 of them had been released from hospital in three to five days and may be successful for treatment in near future [34].

15.11 Ultrasound Waves Shown to Kill Coronavirus in MIT Experiments

Shortly after COVID-19 lockdowns started to come into force almost exactly a year ago, a wave of novel engineering methods for breaking down the virus were proposed, including ultraviolet light-emitting robots and drones. Now, researchers are turning to another approach with the same prefix: an MIT study shows that ultrasound waves at medical imaging frequencies can cause the virus shell and spikes to collapse and rupture in advanced simulations. In their simulations, researchers from the MIT Department of Mechanical Engineering modeled the virus's mechanical response to vibrations rippling through its structure across a range of ultrasound frequencies. They found that vibrations between 25 and 100 megahertz triggered the virus shell and spikes to collapse and start to rupture within a fraction of a second. The simulations showed that the virus would rupture in air and water at the same frequencies. Such a treatment could help individuals who have not taken, or cannot take the vaccine. It could also provide an alternative and a failsafe in the unlikely event that new mutations of the virus bypass the immunity granted by the several COVID-19 jabs out there [72].

15.12 How Can Robots Help Health Care in the Fight Against Coronavirus

Telehealth to assist frontline healthcare workers in COVID-19 Crisis. In times of extreme strain on the healthcare system such as during the coronavirus pandemic, robotic systems can significantly reduce risk of infectious disease transmission to frontline healthcare workers by making it possible to triage, evaluate, monitor, and treat patients from a safe distance. Enabling remote screening of patients will reduce the contact time between patients and frontline healthcare workers and, critically during the COVID-19 pandemic, can reduce the use of facemasks and other personal protective equipment during patient intake. Robots can also automate manual operations that are labor-intensive, time-consuming and repetitive in order to reduce the burden on frontline healthcare workers, because robots can provide highly precise, reproducible, fast and controlled maneuvers, they can facilitate a much higher throughput in lab testing and sample analysis, hospital equipment and environment sterilization, sanitization, and pharmacy services [73].

15.13 Can you kill Coronavirus with UV light?

There's just 1 type of UV ray that can reliably inactivate COVID-19 and it's really dangerous. We can't we just get one of your UV lights and put it up on the exit to the supermarket and people can stand under it for a few seconds before they go in. Among the abundant "health" advice that has been swarming around the internet in recent weeks, the idea that you can disinfect your skin, clothing or other objects with UV light has proved extremely popular. Research on SARS, a close relative of COVID-19, found that exposing the virus to UVA for 15 minutes had no impact on how infectious it was. However, the study didn't look at longer exposures, or UVB, which is known to be more damaging to genetic materia. No one knows how long it takes to deactivate COVID-19 with sunlight, or what strength is needed. All this means that using sunlight to disinfect surfaces is extremely problematic.

First of all, no one knows how long it takes to deactivate COVID-19 with sunlight, or what strength is needed. And even if they did, the amount of UV in sunlight varies depending on the time of day, the weather, the season, and where in the world you live, especially which latitude. So, this wouldn't be a reliable way to kill the virus. Finally, it goes without saying that disinfecting your skin with any kind of UV will lead to damage, and increase your risk of skin cancer. And once the virus is inside your body, no amount of UV is going to have any impact on whether you're infected [74].

16. Mathematic Calculations and Important Statistical Results

16.1 Why is it important to check the size of the COVID-19 virus?

The estimated size of viral or bacterial particles can give analysts valuable data about how they influence host cells. Since the episode of the Coronavirus around the world, researchers have been examining the impacts of the infection on the human body to discover a viable medicate to destroy the virus. It is evaluated that N95 musk can absorb roughly 99.8% of particles with a normal diameter of 100 nm.

In this way, the measure of the virus particles identifies how well an individual can secure

themselves and others against the Coronavirus. Moreover, Scientists and doctors can decide the characteristics of the virus that individuals are exposed to in several ways by knowing the estimated size of the virus particles. For instance, the length of the respiratory droplets is between 5 and 10 micrometers; Hence, healthy individuals are more likely to become contaminated with the Coronavirus through respiratory drops. Respiratory drops can be transmitted through coughing, sneezing, and contact with infected surfaces, or indeed by breathing in airborne particles.

16.2 Estimating the number and mass of the cells

Assessing basic biological values such as the number and mass of total body cells contributes to the current exertion to investigate and control the spread of COVID-19. Considering the number of infected cells and the rate at which infection particles spread within the human body is basic to understanding the current global widespread. We are able to assess the potential SARS-CoV-2 host cell abundance and normal concentrations of the virus in body liquids with a monkey that has the highest similarity to the human body.

Fig. 24. *The image of rhesus macaques.*

We need some data to estimate the total number of virus particles in infected people at the peak of the infection, based on the measured concentration of virions in Rhesus Macaques (a species of old-World monkey) tissues after being infected with SARS-CoV-2 (according to former researches concentrated on similar samples of relevant tissues in the respiratory and digestive tracts and in immune reactions) [35].

16.3 The total number and mass of SARS-CoV-2 virions in an infected person

There is a small explanation of the time course of SARS-CoV-2 disease in a contaminated individual to realize the current worldwide epidemic and conceivable ways to combat it. Here, an evaluation of the abundance of potential SARS-CoV-2 host cells and ordinary concentrations of the virus in body liquids is evaluated to find out the whole number and mass of SARS-CoV-2 infections in a contaminated person. It can be estimated that each infected individual carry 10^9-10^{11} virions during the peak of infection, with a total mass of almost 1 µg -0.1 mg, which strangely indicates that all SARS-CoV-2 viruses that they are currently in the world, only 0.1-1 kg. Investigating the absolute number of viruses in an infected human can identify the main factors of the immune system response, minimum infectious doses and diagnostic limits [35]. A research group multiplied the viral concentration of each tissue in the total tissue mass to estimate the total number of virus particles. The lungs have the largest tissue mass and the highest viral concentration. Another research (Rockx et al. 2020) measured the viral concentrations in tissues taken from infected Rhesus Macaques, a few days after injection or inoculation.

Although, this research shows its values in units of $TCID_{50}$ which give an evaluation of the concentration of infectious viruses. The scientific investigation reports much smaller maximal values of 10^3-10^4 $TCID_{50}$/ml for lung tissue. Combining their concentration with the volume of an adult human lungs, we get an estimated value of 10^5-10^7 $TCID_{50}$ virions in an adult person, compared with 10^9-10^{11} RNA copies, previously estimated from (Munster et al. 2020) (Fig.25). This huge difference shows up to be an agent of the utilize of viral titers rather than viral loads, as a comparative difference of 4-5 orders of size is watched in bronchoalveolar lavage liquid estimations in Rhesus Macaques (Williamson et al. 2020) and in nasopharyngeal swabs taken from about 450 human members (Quicke et al. 2020).

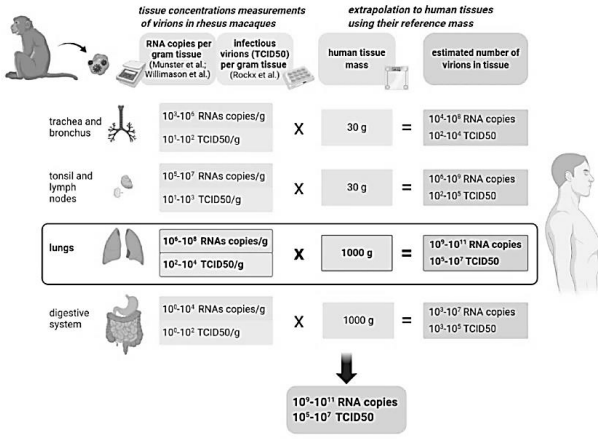

FIG. 25. *A schematic image of the estimated number of virions in an infected person. This recent estimate is made utilizing the concentrations of virions measured in a gram of Rhesus Macaque tissue multiplied by the mass of human tissues [35].*

Based on this proof method, we estimate the entire number of virions in an infected person during peak infection at 10^9-10^{11} RNA duplicates or 10^5-10^7 $TCID_{50}$. Almost 1 to 10 percent of lung and airway cells include the required ACE2 receptor to be contaminated with SARS-CoV-2. The number is higher than the estimated value for the overall number of infected cells. This proposes that out of the cells that express both ACE2 and TMPRSS2 (Transmembrane protease, serine 2), as it were a little part gets infected by the virus. The medical experts think that having better quantitative information on the infection process at the cellular level, the intra-host level, and the inter-host level will assistant to prepare researchers with superior devices to fight the

spreading of the COVID-19 widespread.The lungs are the largest tissue in terms of mass (Mlungs≈1kg) and had the highest viral concentration (Cvirions) and thus contribute the most to the overall estimated value, is as following:

$$N_{VIRIONS} = M_{LUNGS} * C_{VIRIONS} = 1000\,GR * (10^6 - 10^8) = 10^9 - 10^{11}\,(RNA\,COPIES) \quad (1)$$

Other body organs or tissues, like the nasal mucosa, bronchial tree, larynx, and adjacent lymph nodes all have a combined mass of about 100g and maximal concentrations of 10^6-10^7 RNA copies/ml and thus contribute at most an additional 10% to the estimate based on the lungs (Fig.25).

16.4 The size of the COVID-19 virus compared to other viruses

The researches indicate that the size of all recognized viruses is between 20 and 500 nm. Viruses, particularly those originated from creatures or animals, are exceptionally diverse in size, such as the COVID-19. Currently, the biggest and most complicated virus known so far is Mimivirus (APMV), with an external layer almost 750 nanometers in diameter, and the smallest animal virus is Parvovirus, that is between 20 and 30 nanometers in diameter. Moreover, the scientists assessed the molecule size and characteristics of the COVID-19 virus and understood that the virus extended in size from 60 to a maximum of 140 nanometers and its external surface length extended from 9 to 12 nm (nanometers). Hence, it can be said that one human hair is comparable to at slightest 400 and at most about 1000 COVID-19 viruses.

16.5 The size of the COVID-19 virus compared to bacteria

Coronavirus size is much smaller than bacterial cells such as Bacillus subtilis, Staphylococcus aureus, and Escherichia Coli (E. coli), so that the cell volume of
these 4 types of bacteria ranged from one Nanometers to three micrometers; It is noteworthy that the large size of the bacteria increases their proliferation.

16.6 How much of the Coronavirus does infect each person?

Based on different researches about the MERS and SARS viruses, it is evaluated that 1000 virus particles are required to cause disease. A cough drops approximately 3,000 drops, and the droplets can travel at a speed of approximately 80 kilometers per hour.
Most droplets are very large in size and fall rapidly, but numerous stays within the air and can travel the length of a room in few seconds. Each sneeze transmits around 30,000 drops that can travel up to 321 kilometers per hour. If a human is infected, the drops in each cough or sneeze may contain 200 million virus particles. When a person is near to the patient and sneezes or coughs specifically at him, it is exceptionally likely that he will breathe in 1000 particles of the virus and get the disease. Even if it is not coughing or sneezing, a few little infected droplets can remain in the air for a few minutes. When a human sneezes or coughs into the closed space a number of minutes later, another people take some breaths, they are more likely to get the Coronavirus.

16.7 What are the dangers of talking to an infected person?

Respiratory drops move slowly and fall quickly. Because of the need of expiratory drive in one breath, viral particles don't exit from the lower respiratory tract. Respiratory droplets include low levels of viruses. In case, an individual enters a room where an infected individual is breathing, it may take 50 minutes or more to breathe in an infectious dose. Talking also increments the discharge of respiratory droplets by 10 times. It takes 5 minutes of talking closely with a contaminated individual to urge the healthy person to get the healthy person the dose they require to get sick. Subsequently, any individual who remains with a contaminated individual for a while in a closed space such as an office has the potential to gotten to be infected.

16.8 How long does it take to infect a person by exposure of infected people?

Each time you breathe normally, about 20 viruses are expelled from your mouth, and on average, 200 viruses enter the air as you speak. About 1,000 viruses
particles are needed to infect each person with the Coronavirus. In each human carrier, the number of breaths per minute is about twelve times (inhaling and exhaling), which releases about 240 viruses into the environment per minute. Thus, exposure to sneezing and coughing, talking to an infected person for 5 minutes, or being in a closed place with an infected
person for about 50 minutes significantly increases the risk of getting sick in healthy people.

$$n = \frac{1000}{20} = 50, t = \frac{60}{12} = 5\ sec \quad (2)$$

$$T_{norm} = 50 * 5 = 250\ sec = 4.16\ sec \approx 5\ min \quad (3)$$

$$T_{talk} = \frac{1000}{200} = 5\ sec \quad (4)$$

The two factors influencing COVID-19 disease are dose (number of viruses) and exposure time. In short, exposure to sneezing and coughing, 5 minutes of talking, or about 50 minutes in a closed place with an infected person significantly increases the risk of getting sick in healthy people. Therefore, it is better for people to wear masks and not talk to each other in public places such as buses, restaurants, stations, coffee shops, shops, hairdressers, etc. Also, do not have more than one or two people sitting at one time table at a time, to minimize the possibility of the virus spreading.

16.9 Estimated volume of all COVID-19 in the world

According to statistic websites, our World in Data according to formal data from different governments, half a million people are testing positive for COVID-19 every day. Using statistical and epidemiological modelling, in a time of 15 days in quarantine and the time of treatment and healing (enhancement) is about 7-14 days in average for each person. Thus, the true number of people infected each day is more like 3 million. The final thing we need to know is the number of virus particles people spread at any point during their infection. Since we know roughly how viral load changes over time, it's enough to have an estimate of the peak viral load. A new study has estimated for peak viral loads range from 1 billion to 100 billion (10^9-10^{11}) virus particles [36]. Let's work with a value in the middle of this range (the geometric mean) at 10 billion. When you add up all the contributions to the viral load of each of the 3 million people who became infected on each of the previous days (assuming these 3 million rates is roughly constant) and the average of 5000 death person who died which is the maximum infection by Coronavirus (100 billion per each body).

$$N_{infected} = 3 * 10^6 * 10^{10} = 3 * 10^{16}\ Virus \quad (5)$$

$$N_{death} = 5000 * 10^{11} = 5 * 10^{14}\ Virus \quad (6)$$

$$N_{total} = N_{infected} + N_{death} = 3.05 * 10^{16}\ Virus \quad (7)$$

Then, we find that there are roughly thirty quadrillion (3x10^{16} or thirty million billion) virus particles in the world at any one time. This sounds like a really big number, and it is. But when calculating the total volume, we've got to remember that SARS-CoV-2 particles are extremely small. Estimates of the diameter range from 60 to 120 nanometers. We use the average value for the diameter of 90 nanometers in our approximate calculation.

To work out the volume of a single spherical virus particle, we need to use the formula for the volume of an elliptical volume (a, b, c dimensions) or a sphere (r is about 45*10^{-9}):

$$v_{virus} = \frac{3}{4}\pi r^3 = 3.817 * 10^{-22}\ m^3 \quad (8)$$

Assuming a 45 nm in radius (at the center of the estimated range) of SARS-CoV-2 for the value of *r*, the volume of a single virus particle works out to be 381,700 nm³. Multiplying this *very small* volume by the number of particles, we calculated earlier, gives us a total volume of about 12 cc (ml). That is equivalent to the volume of a tablespoon.

$$V_{total} = N_{total} * v_{virus} = 1.1642 * 10^{-5}\ m^3 = 11.642 \approx 12\ cc\ (ml) \quad (9)$$

Even if other possibilities and sizes are taken into account, in most cases the whole corona of the world can be accommodated in a small cup of coffee. If we wanted to put all these virus particles together in one place, then we'd need to remember that spheres don't pack together perfectly.

16.10 Close sphere packing

Many spherical balls with certain materials will be packed in a cylindrical container/bed for specific purpose. If d << D and you can work with an approximate rather than provably optimal answer, then cannonball-style packing will probably do a good job. One can from there estimate how many such spheres will fit. Roughly 1/4 of the space is empty from the optimal packing ratio, and you lose more from edge effects since the Hales result which refers to the situation with no boundaries. In geometry, close-packing of equal spheres is a dense arrangement of congruent spheres in an infinite, regular arrangement (or lattice).

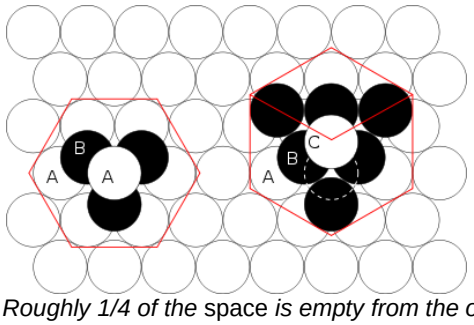

Fig. 26. *Roughly 1/4 of the* space *is empty from the optimal packing ratio.*

The great German mathematician, Carl Friedrich Gauss proved that the highest average density that is, the greatest fraction of space occupied by spheres that can be achieved by a lattice packing is:

$$V_{packed} = \frac{\pi}{3\sqrt{2}} = 0.74 \quad (10)$$

$$\rightarrow V_{empty} = 1 - 0.74 = 0.26 = 26\% \quad (11)$$

In fact, the best you can do to minimize empty space is a configuration called "close sphere packing" in which empty space (porosity or ϵ) takes up about 26% of the total volume. This increases the total *gathered volume* of SARS-CoV-2 particles to about 15ml. Even taking the upper end of the diameter, estimate and accounting for the size of the spike proteins all the SARS-CoV-2, still wouldn't fill a coffee cup.

$$V_{real} = V_{total}(1+\epsilon) = 12 * 1.26 = 15.12\ ml \quad (12)$$

17. The Structure of Viruses

The structure of viruses is limited to the genome and the protein coat around it. In some viruses, a layer of lipoprotein and lipopolysaccharide is also placed around it to protect the protein coat. To replicate, viruses must penetrate into the cell, alter the cell production program in their favor, and use the cell protein-making workshop to produce all the proteins and enzymes needed. Viruses, while small enough to have sufficient genes, easily control and control the very complex stages of their replication in the host cell or hostage, and multiply parasitically.

Viruses contain only one type of DNA or RNA nucleic acid, which encodes the genetic information needed for viruses to multiply. The viral genome may be single or doubly circular or linear, fragmented, or integrated. The type of nucleic acid, the type of genomic chain, and the size of the viruses are some of the important characteristics used in classifying viruses. The ratio of nucleic acid to virus pod protein varies from 1% in Influenza virus to 50% in some bacteriophages. The total amount of nucleic acid varies from a few thousand nucleotides to one nucleotide. One of the properties used in the detection of viral nucleic acids is the use of guanine and cytosine (G + C) content. The DNA of different viruses can be examined and compared using restriction endonucleases. Using these enzymes, the DNA of different viruses will have a special cut pattern.

17.1 Investigation of the Virus Structure

Viruses have some spherical, some conical, and many geometric shapes, such as cubic or polygonal shapes. The smallest viruses are reported to be 20 nanometers in diameter and the largest are 4500 nanometers (nanometers is one millionth of a millimeter). Large viruses (smallpox viruses) have a relatively complex structure and, like bacteria, do not pass through the filter at all. Viruses resemble organisms only because they have genetic information for reproduction. In fact, viruses are mandatory parasites. The above findings confirm that, unlike all living organisms, whether single-celled or multi-celled, and prokaryotes and eukaryotes, viruses lack a cellular structure, are free of any chemical, enzymatic, and metabolic interactions, and, without the

need for cloning, can never They do not reproduce and copy themselves. They should be considered as a composite macromolecule or an infectious unit outside the living cell. Because the macromolecules, which are nucleic acid chains with protein proteins and possibly a sheath of lipoproteins and lipolysaccharides, are ready to take over the host protein's genome as soon as they come in contact with the host cell and after absorption, penetration and release. And arrange the general stages of their proliferation with the help of cellular systems (transcription and translation). Cells, both prokaryotes and eukaryotes, can become forced host cells of viruses. Not every cell is receptive to any virus, they only accept their familiar virus.

17.2 Steps of the viral replication

Viral replication has some steps for spreading in the human body is very complicated as is shown in Fig. 27.

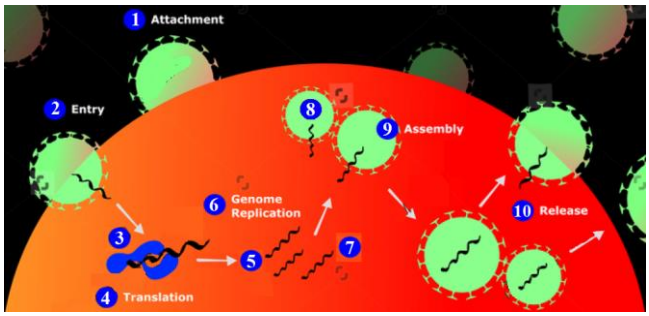

Fig. 27. *Steps in viral replication, 1. Attachment and Adsorption, 2. Penetration, 3. Uncoating, 4. Early Viral mRNA Synthesis, 5. Early Viral Protein Synthesis, 6. Viral Genome Replication, 7. Late Viral mRNA Synthesis, 8. Late Viral Protein Synthesis, 9. Assembly. 10. Release.*

17.3 Various Forms of Viruses

Viruses come in many forms and sizes. Access to building information is essential for classifying viruses and determining the relationship of building to the function of viral proteins. The structural characteristics of each virus family are determined by knowledge of the functions and structure of its proteins, including how the virus completes and releases it from infected cells, how it is transmitted to new hosts, and how the virus binds, penetrates, and covers itself in new cells. Is the host. Increasing information about the structure of viruses helps to better understand the mechanism of reactions such as the reaction between the virus and the surface receptors of the host cell, as well as the reaction of the virus with neutralizing antibodies.

17.4 Virus Capsid Structure Divisions

Today, viruses have been studied using an electron microscope and X-ray, and the capsid structure of viruses has been divided into three categories:

- Viruses that have spherical or polyhedral symmetry.
- Viruses that have spiral symmetry.
- Viruses that have a complex (hybrid) structure.

17.5 multidimensional symmetry viruses

The majority of animal viruses and human pathogens are in this group, some of which are uncoated and some of which are coated. Among the non-enveloped viruses in this group is polio virus and among the enveloped viruses of this group are Influenza virus and paraInfluenza. Viruses in this group can contain RNA or DNA. They can also be wrapped or not wrapped. This form of spherical capsid is usually formed by the synthesis of one or two types of protein. As a result, it is considered an economic saving. One form of the capsid is a hollow quasi-

spherical structure, which surrounds the genome. In 1960, a direct study of a number of viruses revealed that these viruses appeared to have multifaceted symmetry rather than spherical shapes. Because protein molecules are irregularly shaped, the simplest polygonal capsids are made using three identical subunits to form each triangular face. This means that 60 identical subunits are required to build a complete capsid (Fig.28).

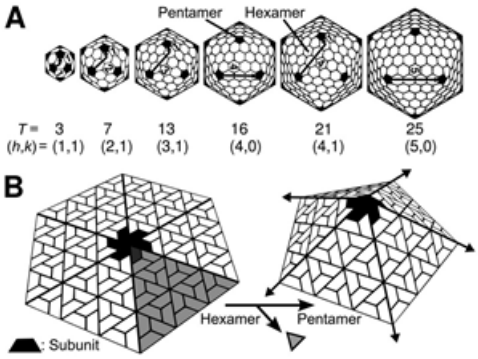

Fig. 28. *The structure of multidimensional capsids in different types of viruses.*

Capsids of viruses that have twenty-dimensional symmetry are made of monomer. The number of these monomers is small, and in order to save on the use of monomers, the shape of the virus should be such that both the virus is stable and the monomers can be placed in the smallest suitable shape. The most suitable shape for this feature is twenty-sided (Fig. 29).

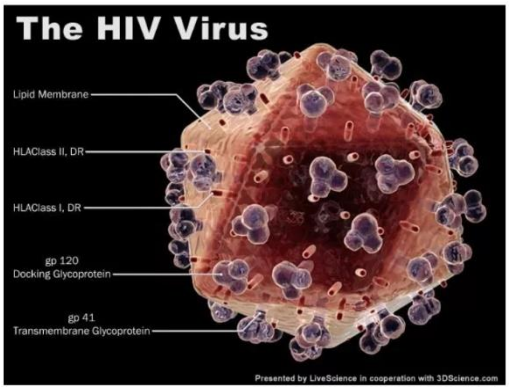

Fig. 29. *A 3-D rendering of the HIV virus with some of its key parts labeled. (Image credit: 3DScience.com).*

The total number of capsomeres in Fig. 30, is obtained by the formula N = 10 (n-1) 2 + 2, where n is the number of capsomeres on one side of an equilateral triangle of viruses. This explains that this form of virus is made up of 20 surfaces, 12 corners and 30 sides, and each surface is made up of an equilateral triangle. The simplest virus is a bacteriophage with 12 capsules. The polyhedral symmetry most commonly found in animal viruses is a polyhedral symmetry, made up of twenty equilateral triangles (Fig. 30).

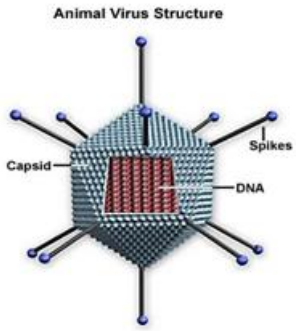

Fig. 30. *Animal virus structure.*

some virus have 12 vertices and axes of rotational symmetry 3, 2, and 5 (Fig. 31). Twenty-dimensional symmetry is seen in viruses such as Adenoviruses and Picorna viruses.

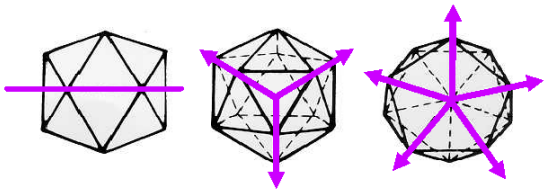

Fig. 31. *Twenty-dimensional symmetry shape viruses.*

17.6 Advantage of polyhedral symmetry for the virus

Due to the characteristics of Platonic volumes, polyhedral shapes are relatively stable. This stability makes viruses more environmentally friendly and able to survive. This feature also helps the virus to enter its genetic material into the cell more easily by being stable in the environment, thereby increasing the likelihood of infecting the cell.

17.7 Viruses with helical symmetry

In this type of virus capsid, the nucleic acid is like a helix inside. Capsomers sit in the nucleic acid chain in a way that gives the building a helix view. In the form of such a structure, nucleic acid and capsomers are jointly responsible. But in globular viruses, capsomers form

this independently and nucleic acid is not involved. Helical, RNA, and enveloped viruses are human pathogens, and helical, RNA viruses, without envelopes, are plant pathogens. Like the tobacco mosaic virus (TMV), where the number of capsomeres of these viruses is possible using powerful electron microscopy and mathematical calculations. For

example, in the case of TMV, this number is 2160. The easiest way to organize multiple and identical protein subunits is to use rotational symmetry and arrange irregular proteins around the perimeter of a circle to form a disk. Multiple disks can then be stacked together to form a cylinder, in which the virus genome is covered by protein layers. The capsid structure, of course, is actually a helix, until a mass of disks are stacked on top of each other (Fig.32).

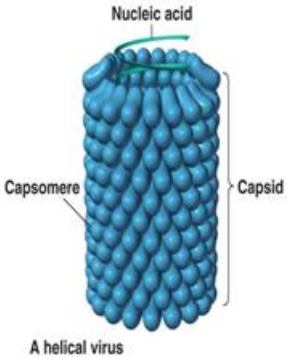

Fig. 32. *Helical virus.*

In a helical structure, the amplitude-to-degree ratio remains constant (equal to the golden number); otherwise, the helical structure causes the genome to leak out. A helix in mathematics, can be defined by two parameters.

1. amplitude (physics) which is the size of the diameter of the helix.
2. The degree of screw that is equal to the distance covered in each complete turn of the helix.

17.8 Viruses that have a complex structure

This group, like the first group, has a regular geometric shape and, like the second group, is not rod-like and regular. Rather, they are seen in the form of ova (oval) or break shap or brick. Exceptionally, these viruses are the largest viruses in terms of size, and among the viruses in this group is the smallpox virus or Vaccina. It is a combination of the two previous structures and is mostly found in bacteriophages (destroyers of bacteria) (Fig. 33).

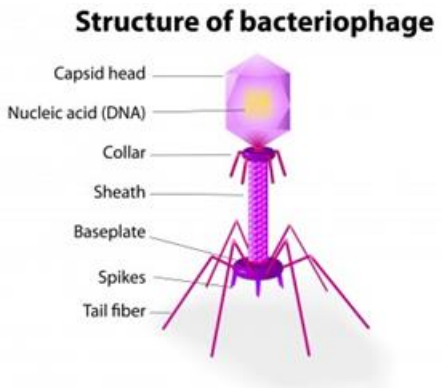

Fig. 33. *Bacteriophage virus.*

These findings may be useful in designing drugs that can prevent the virus from attaching to the cell membrane or causing the virus to develop in infected cells. Undoubtedly, mathematics is the only language that can interpret the natural phenomena of the universe well. There are laws in nature, the source of which is mathematical laws. The universe will always be wide open before the astonished eyes of man, and man can never understand it unless he learns the language in which this world is written and explained and knows its letters. This language is nothing but mathematics and these letters are nothing but triangles, circles and other geometric shapes. An example of a well-known virus with a variety of structures is shown in the Fig. 34.

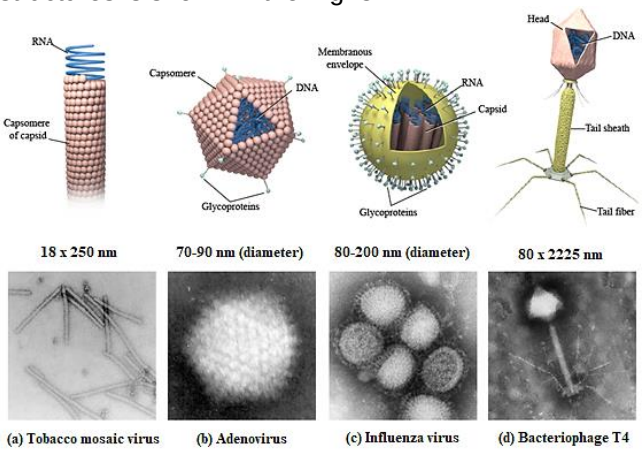

Fig. 34. *Different multifaceted structures of the virus.*

18. Nanotechnology for Diagnosis of Corona

Nanoparticles have been used in medicine for decades. There is also a lot of research on the use of a set of nanostructures including metal nanoparticles, graphene oxide, quantum dots, silica nanoparticles, polymer nanoparticles and carbon nanotubes to identify viruses [39-41]. Advances in nanohybrid structures are common methods in the use of nanoparticles in the detection of viruses, which include virus-derived biomolecules. Antibodies, DNA, RNA, antigens conjugate on the surface of nanoparticles, which makes their rapid and direct detection. The surface of gold nanoparticles, as soft metal ions, binds easily to ligands such as thiols. Gold nanoparticle-based detection is performed for different types of viruses of clinical significance. However, the detection of viruses using biohybrid systems of gold nanoparticles is focused. At present, nanotechnology is focused on pathogenic viruses and the detection of viral infections [42]. In this case, gold nanoparticles (NPs Au (and quantum dots) (QDs) are key components used to detect a large number of respiratory viruses. Gold nanoparticles are stained with silver and used to detect human papillomavirus in uterine cancer cells. In addition, some methods use biosensors made of carbon electrodes containing gold nanoparticles with protein S, which is used to detect the Mercus virus. In the diagnosis of COVID-19virus, transistors with graphene sheets attached to antibodies that detect the S protein in this coronavirus are used [53]. Fig. 35 shows examples of methods for detecting coronaviruses Has been [54]. As General PCR is one of the most efficient methods of detection and detection of coronaviruses, which has been improved by its nanoparticles and by this technique DNA and RNA viruses can be detected and detected [55-58]. In addition, inactivation of the virus by nanoparticles and
inhibition of virus binding to host cell surface receptors are important examples of the application of nanotechnology to viruses. Nanoparticles can also release antigens and transfer many side compounds

with them due to their ease of surface operation. One of the essential and important needs in effective treatment with nanodrugs is to deliver the drug in the right concentration and time to the target tissue and organs [38]. To avoid false positive and negative errors, standard detection methods such as PCR and nano-sensitive hypersensitivity methods are used. One method is based on super-sensitive mechanisms, which are visible to the naked eye, and the other method is based on fluorescence measurements at 412 nm, consisting of a complex of zirconium quantum dots adjacent to the coronavirus antibody attached to the coronavirus. By measuring the fluorescence of coronaviruses. In the next method, nanoparticles are used to trap and accumulate coronaviruses to identify these viruses (Fig. 35, part b). In addition, in a PCR method with Nanoparticles are used (Fig. 35, part c). Silver nanoparticles are obtained and the presence of coronavirus is determined (Fig. 35, part d) [43-52]. In addition, some methods use biosensors made of carbon electrodes containing gold nanoparticles with protein S, which is used to detect the Mers virus. In the diagnosis of COVID-19 virus, transistors with graphene sheets attached to antibodies that detect the S protein in this coronavirus are used [53]. Fig. 35 shows examples of methods for detecting coronaviruses [54]. As General PCR is one of the most efficient methods of detection and detection of coronaviruses, which has been improved by its nanoparticles and by this technique DNA and RNA viruses can be detected and detected [55-58].

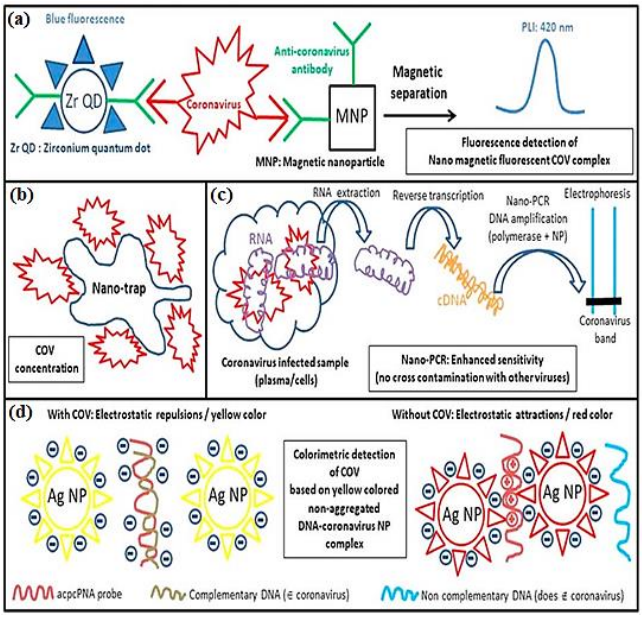

Fig. 35. *Examples of methods for identifying Coronaviruses, a, b, c, d cases [54].*

18.1 Application of nanotechnology in the prevention of Coronavirus

In the first generation of vaccines, they are produced from inactive or killed organisms and attenuated live. While in the second and third generations, vaccines with subunits and DNA or RNA are used to stimulate the immune system against infectious disease [54]. Although these types of vaccines have many benefits, but with challenges related to Weak immunity, toxicity, instability in the body and the need for multiple prescriptions. Therefore, there is a need to create a new generation of vaccines, which can have a safety and auxiliary function. In the new strategy, vaccination sequentially improves the effectiveness of viral vaccines. Nanotechnology also plays an important role in the production of vaccines [59, 60]. Nanoparticles have a long history of being used as supplements to make vaccines against viral diseases. Nanoparticles multiply the number of antibodies. In organisms that are vaccinated with nanoparticles, compared to compounds without nanoparticles [61, 62]. Many researchers are trying to develop a nanoparticle-based vaccine to prevent coronavirus infection. A large number of carrier nanostructures such as non-metallic nanoparticles, carbon nanomaterials, quantum dots, polymer nanoparticles, metal oxide nanoparticles, silica nanoparticles, carbon black nanoparticles, liposomes, v-dendrites, nanocarriers Carrying molecules such as drugs, peptides, proteins, antibodies, DNA, RNA are used. Vaccines for use, both as antigen nanocarriers and as stimulants of the immune response used by the body. Nanoparticles or nanocarriers, due to their structural and chemical properties, have been extensively studied for use in vaccine compounds [63, 64]. Fig. 36 shows the types of nano-vaccines.

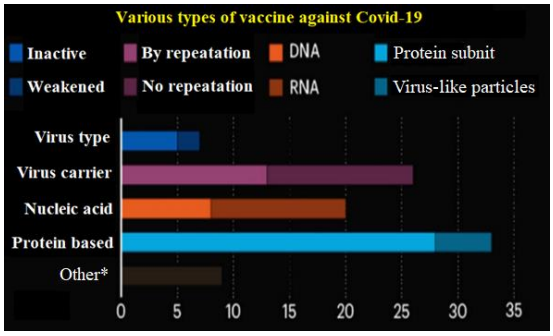

Fig. 36. *Types of nano-vaccines against Coronaviruses [38].*

Glycoprotein S acts as a mediator in the binding of the virus to the host cell. In immunological studies, the selected sequence of S protein is used, which stimulates the immune response and increases the entry of virus-dependent antibodies into B cells [65]. S protein from MERS virus assembled inside nanoparticles It is another vaccine that has been proposed against the MERS virus [66]. Anti-coronavirus nano-vaccines have better results than conventional vaccines. Some nano-vaccines contain gold nanoparticles and polymers such as chitosan, polyethylene, polylactic glycolic acid, protein groups, or specific proteins for coronaviruses, such as protein S. One of the characteristics of nano-vaccines is their positive charge and spherical shape [54].

18.2 Use of nanoparticles to prevent COVID-19

Using nanotechnology equipment, it has been determined that the mask can filter out virus particles. Of course, it has been shown that a simple cloth mask that has pores cannot prevent the virus from entering, but combined masks such as cotton and silk, linen and chiffon or linen and wool can prevent the virus from entering 90-80%. To be. This effect is due to interactions. It is mechanical and electrostatic between the virus and the fabric. Another group of masks have nano-tissue filters, which kill airborne coronaviruses. The third group is graphene nanostructures that are placed on the surface of surgical masks. Such highly hydrophobic masks are sterilized at 80°C in the sun and can be reused. An important and necessary aspect is that these masks are easily disinfected and prevent the spread of the virus [54].

18.3 Antiviral nano-drugs for the treatment of Coronaviruses

Although nano-vaccines stimulate the immune response against coronaviruses, antiviral nano-composites prevent an interaction between the cell and the virus. There are basically four types of antiviral compounds:

1. The antiviral compound of Defiling, encapsulated in pharmaceutical polymers, is 40 nm in size. This antiviral compound inhibits cellular endosome acidification and prevents the proliferation of coronaviruses. Defiling is also a nanoparticle, which blocks ATPase and effectively prevents coronavirus replication.

2 - Silver nanoparticles that are 5.7 nm in size and come with graphene sheets. These substances inhibit the synthesis of viral RNA.

3- Silver sulfide nanoparticles with a size of 2.3 nm These compounds elicit a cellular immune response.

4 - Silver-based nanomaterials, which contain silver nanoparticles with a size of 20 nm and nanowires with a diameter of 60-400 nm, which in the presence of silver nanoparticles cause cell death and apoptosis due to coronaviruses.

In general, for the treatment of COVID-19, it has been suggested that special nanomaterials with a structure similar to the angiotensin 2 receptor be used, in which this receptor plays a major role in intrusion and proliferation. The cell is responsible for the virus. These materials contain peptide inhibitors derived from the angiotensin 2 domain protease, which bind specifically to the COVID-19 receptor-binding domains and inhibit virus replication [54]. In Fig. 37 of the designed nano-pharmaceuticals. It has been shown to treat COVID-19 virus [67].

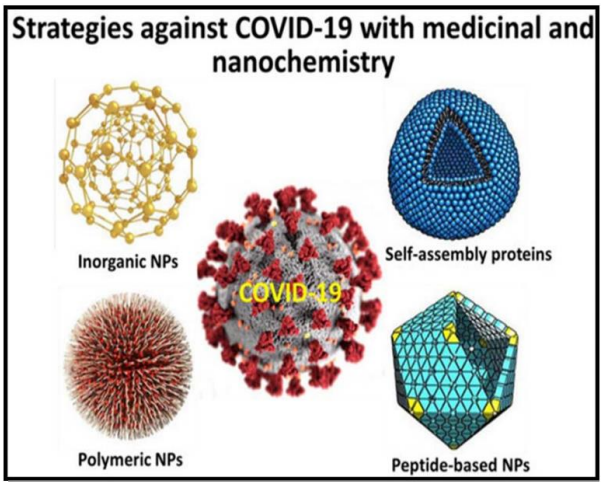

Fig. 37. *Nano-drugs designed for the COVID-19 [67].*

18.4 The most important Nanotechnology benefits

Some characteristics of nanoparticles such as high dissolvability, tiny size, surface flexibility, and versatility are utilized to create secure and high-quality medicine focused on tissue treatments, personalized nanomedicines, and early diagnosis and debarment illness. Nanotechnology can play an important role in distinguishing, treating, and avoiding COVID-19. Fundamental properties of nanoparticles that can be specified within the battle against COVID-19 are:

1) Design of secure individual defensive equipment (IDE) to prevent contamination and increment healthcare workers' safety.
2) Generation of antiviral disinfectants and surface coatings that inactivate the virus and prohibit its spread.
3) Design of precise and sensitive nano-based sensors for fast discovery of infection or immunological reaction.
4) Generation of new medicines to extend the activity, decline toxicity, and continuous release.
5) Focusing on drug delivery.
6) Vaccination generation (improvement of humoral and cellular immune reactions).

18.5 Indirect methods of treatment COVID-19

In addition to the direct methods for eliminating the virus, which were mentioned in the previous sections, there are also indirect therapies, which are based on the mechanism of correction of functional disorders caused by the virus in the body. For example, disorders caused by the introduction of the COVID-19 virus and patients with the virus show symptoms such as diarrhea 2-5 days after transmission. Of course, it is not yet clear with certainty that the virus is transmitted through feces and needs to be tested. Therefore, nanomaterials are used to detect inflammatory compounds or proteins that indirectly detect the presence of COVID-19 virus. Also, for targeted drug delivery to the stomach and intestines, whose function has been disrupted due to the entry of COVID-19 virus, nano-compounds are used to repair these organs.

The use of nanotechnology and nanoparticles is useful and effective against viral infections, especially Coronaviruses. In addition, due to the special properties of these substances in prevention from the entry and amplification of the virus into the host cell, suitable candidates for use as nano-sensors and biosensors for virus detection, nano-vaccines and nanodrugs are for the prevention and treatment of infections caused by Coronaviruses [68].

19. Results and Discussions

19.1 Comparison of worldwide deaths caused by COVID-19 and other diseases

Nearly 150,000 people die per day worldwide, based on the latest comprehensive research published in 2017. Which diseases are the deadliest, and how many lives do they take per day? Cardiovascular diseases, or diseases of the heart and blood vessels, are the leading cause of death. However, their prominence is not reflected in our perceptions of death nor in the media. While the death toll for HIV/AIDS peaked in 2004, it still affects many people today. The disease causes over 2,600 daily deaths on average.

Terrorism and natural disasters cause relatively very few deaths. On the flipside, since the WHO declared COVID-19 a pandemic on March 11, 2020, daily confirmed deaths have fallen in a wide range between 272 and 10,520 per day and there is no telling what could happen in the future. Fig. 38 and Table 3, shows the proportion of patients that died from COVID-19 and other total daily death by different diseases in the World.

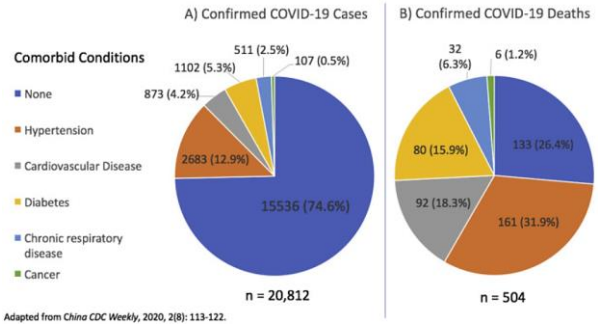

Fig. 38. *A) Proportion of patients and their comorbid conditions that were diagnosed with COVID-19. B) Proportion of patients that died from COVID-19.*

Table. 3. Total daily death by different diseases in the World.

Rank	Cause	Daily Death
1	Cardiovascular disease	48742
2	Cancers	26181
3	Respiratory diseases	10724
4	Lower respiratory infections	7010
5	Dementia	6889
6	Digestive diseases	6514
7	Neonatal disorders	4887
8	Diarrheal diseases	4300
9	Diabetes	3753
10	Liver diseases	3624
Total	Total diseases	147118

According to Fig. 39, there are approximately 5000 death persons in the world per day. Fig. 39 is adapted from Chinese Center of Disease Control and Prevention (CCDCP).

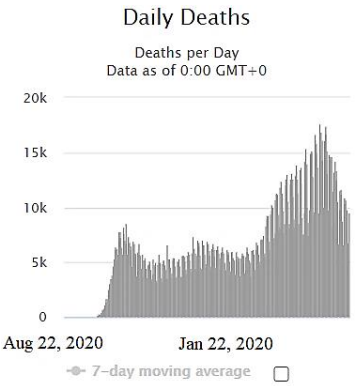

Fig. 39. *Total average of death persons per day by Coronavirus in the World [76].*

19.2 Bitter truths about the main source of Coronavirus and human manipulation

Coronaviruses are wrapped positive-sense RNA viruses extending from 60 nm to 140 nm in diameter with spike-like projections on their surface giving it a crown-like appearance beneath the electron microscope; consequently, the name Coronavirus [3]. Four Coronaviruses namely HKU1, NL63, 229E and OC43 have been in circulation in humans, and normally cause mild respiratory illness. There have been two events in the past 20 years wherein the crossover of animal beta-Coronaviruses to people has resulted in serious illness. The primary such instance was in 2002–2003 when a new Coronavirus of the β genera and with root in bats crossed over to people via the middle person have of palm civet cats, in the Guangdong territory of China. This virus, detected as severe acute respiratory syndrome (SARS)affected 8422 people mostly in China and Hong Kong, and caused 916 deaths (mortality rate 11%) [4]. Nearly a decade afterward in 2012, the Middle East respiratory syndrome Coronavirus (MERS-CoV), moreover of bat root, grows in Saudi Arabia with dromedary camels as the intermediate host and influenced 2494 individuals and caused 858 deaths (casualty rate 34%) [5].

In December 2019, grown-ups in Wuhan, the capital city of Hubei area and a major transportation center of China begun showing to nearby hospitals with extreme pneumonia of obscure cause. Numerous of the initial cases had a common introduction to the Huanan wholesale fish bazar that moreover traded live animals and on 1st January the Huanan Fish market was closed. On 7th January the virus was recognized as a Coronavirus that had >95% homology with the bat Coronavirus and > 70% likeness with the SARS- CoV. Cases in other provinces of China, were reported. Transmission to clinical workers caring for patients was explained on 20th January, 2020. By 23rd January, the 11 million population of Wuhan was placed under lock down with limitations of entry and

exit from the region. Soon this lock down was extended to other cities of Hubei province. The initial cases of COVID-19 in countries outside China were reported. On December 31st 2019, China informed the outbreak to the World Health Organization (WHO). The first fatal case was reported on 11th January 2020. The massive migration of Chinese during the Chinese New Year felled the epidemic. Cases in other provinces of China, other countries (Thailand, Japan and South Korea in quick succession) were reported in people who were returning from Wuhan. The reported statistics are possibly an underestimate of the infected and dead due to limitations of surveillance and testing. Though the SARS-CoV-2 originated from bats, the intermediary animal through which it crossed over to humans is uncertain. Pangolins and snakes are the current suspects.

19.3 Is the Coronavirus produced in the laboratory?

In this section, an attempt has been made to examine the geometric structure of viruses. The structure of viruses is limited to the genome and the protein coat around it. In the 1960s, *Caspar* and Klug proposed a theory of the structure of the protein coat of the genome that is of fundamental importance in virology. This cover structure has spherical, conical and geometric shapes. The structural characteristics of each virus family are related to how it is transmitted to the host, how it binds and penetrates. Coronavirus similarities to AIDS and Influenza in structure and function. Like the Coronavirus, HIV has RNA. In the 40 years since the outbreak of the HIV virus, whatever researchers found in the vaccine has not been effective, and even if the initial research results were very good, it has been discarded after a while. If this technique used by the American manufacturer Pfizer to produce the corona vaccine works, it may be a beacon of hope to prevent humans from contracting other RNA viruses, meaning that a vaccine for these diseases can also be made using this method. For this reason, we can hope that a vaccine will be developed to prevent hepatitis C and HIV, as these are viruses for which no vaccine has ever been developed.

As shown in Fig. 40, the corona virus is larger in size than Influenza (80-100 nm), but like this virus, it invades organs such as the lungs and respiratory tract more aggressively, and its multifaceted structure is similar to Influenza virus. But the way it enters the cell and infects the host through mRNA is like the HIV virus.

Also, the dimension of the HIV virus is 100-120 nm which is similar to the dimensions of the Coronavirus. Moreover, the COVID-19, could have originated or mutated from a combination of the genomes of the two viruses, SARS and HIV, or Influenza, and this could be achieved by laboratory manipulation, because the

structure of the corona virus, is between the two viruses based on animal and human fit. So, this virus is similar to HIV in terms of replication and dimensions and similar to Influenza virus (A/H1N1, seasonal flu) in terms of infectivity and disease.

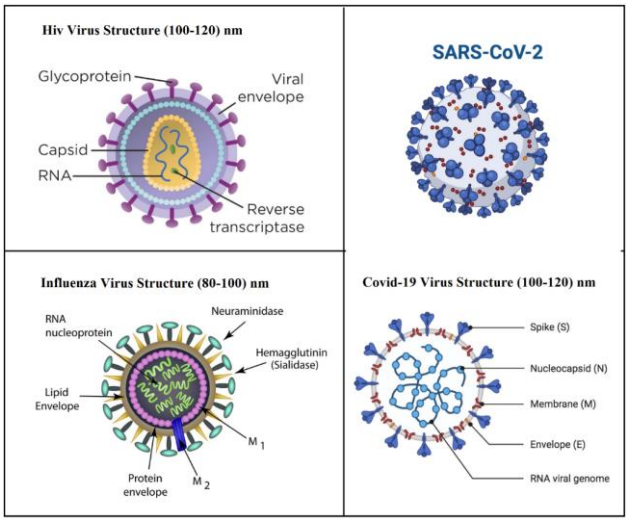

Fig. 40. *Comparison of the structure of Influenza, HIV and Coronavirus.*

19.4 Cancer patients in COVID-19 infection

In differentiate to SARS Coronavirus and MERS Coronavirus, more deaths from COVID-19 have been caused by numerous organ dysfunction disorders instead of respiratory failure, which can be inferable to the far-reaching dispersion of angiotensin-converting enzyme-2 the useful receptor for SARS-CoV-2 in different organs. Patients with cancer are more susceptible to disease than people without cancer since of their systemic immunosuppressive state caused by the malignancy and anticancer remedies, such as chemotherapy or surgery. Therefore, these patients might be at increased risk of COVID-19 and have a poorer prognosis [69]. Researchers found that patients with cancer might have a higher risk of COVID-19 than individuals without cancer. Additionally, they showed that patients with cancer had poorer outcomes from COVID-19, providing a timely reminder to physicians that more intensive attention should be paid to patients with cancer, in case of rapid deterioration.

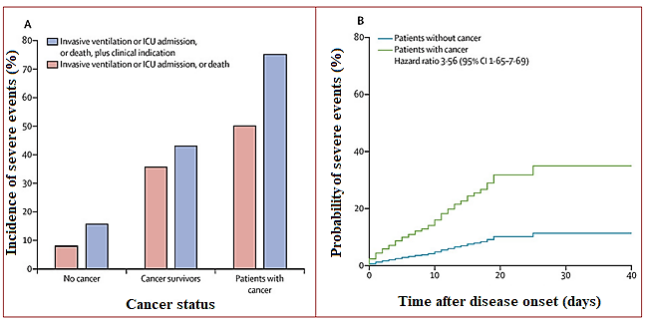

Fig. 41. *A) Severe events in patients without cancer, cancer survivors, and patients with cancer, and B) risks of developing severe events for patients with cancer and patients without cancer [69].*

Therefore, we propose three major strategies for patients with cancer in this COVID-19 crisis, and in future attacks of severe infectious diseases. First, an intentional postponing of adjuvant chemotherapy or elective surgery for stable cancer should be considered in endemic areas. Second, stronger personal protection provisions should be made for patients with cancer or cancer survivors. Third, more intensive surveillance or treatment should be considered when patients with cancer are infected with SARS-CoV-2, especially in older patients or those with other comorbidities [69].

19.5 What can we do to minimize the prevalence of the COVID-19?

At the time of writing this article, the following is recommended. Healthcare providers should take travel history of all patients with respiratory symptoms, and any international travel in the past 2 weeks as well as contact with sick people who have travelled internationally. They should set up a system of triage of patients with respiratory illness in the outpatient department and give them a simple surgical mask to wear and practice hand hygiene frequently.

Suspected cases should be referred to government designated centers for isolation and testing. Patients admitted with severe pneumonia and acute respiratory distress syndrome should be evaluated for travel history and placed under contact and droplet isolation. Regular decontamination of surfaces should be done. They should be tested for etiology using multiplex PCR panels if logistics permit and if no pathogen is identified, refer the samples for testing for SARS-CoV-2. All clinicians should keep themselves updated about recent developments including global spread of the disease. Non-essential international travel should be avoided at this time.

19.6 Successful Coronavirus Control Methods Without Quarantine

There are several ways to do this, and countries like Taiwan, New Zealand and Estonia have been successful. These include controlling the entry and exit of travelers to any country and banning the travel of those coming from epidemic areas. To do this, they must perform two corona tests on passengers. One in the country of origin of the trip, two days before the trip and the other in the country of destination at the airport. Then people are quarantined for 5 days. And take a test after this time. Then, if you are healthy, you can enter the community.

Establish a Central Epidemic Command Center (CECC) in each country to provide immediate information, including close monitoring of patient arrivals. If anyone goes to a hospital with symptoms of COVID-19, the hospital must report it to the CECC, then the CECC tracks the last places the person was present and finally an anonymous 'footprint' of them in public spaces (Such as supermarkets or restaurants). Mobile service providers should be asked to send such a warning message to anyone who may have been there at the same time. Epidemic warning message (if you have been in contact with someone. Please continue to take care of yourself and follow the rules of social distance. Mask in public places and wash your hands regularly. If you have any physical problems, please contact your local healthcare provider). All this is done on the principle of confidentiality; The identity of the infected person is never announced. There should also be an 'electronic fence' system. The system allows local authorities to monitor quarantined locations. The system uses cellular signals to detect whether people are leaving quarantine locations; If anyone leaves these places, the authorities will notice immediately.

In hotels and restaurants, shops, coffee shops, cinemas, theaters, hairdressers, sex service centers, swimming pools and massage parlors, be sure to wear a mask and people in small numbers and at least two meters apart. Hand sanitizers can be used at the entrance and exit, and indoor air can be disinfected. At each time table in the restaurant, a maximum of two people sit so that they are not facing each other. No one should talk in the restaurant and every customer should be given a maximum of one quarter to eat and the tables should be disinfected after each customer leaves. Most orders and office work or purchases are done online. When you get home, put the clothes in a box and close the box after spraying alcohol on the clothes. Then wash your hands with soap and water, preferably with mouthwash or salt water. School classes should be held virtually and remotely, and health services in factories should be controlled and cleaned regularly. People who get sick do not leave the house until they are fully recovered.

On buses, only one person should sit in each seat and people should be at least one meter apart. And control the entry and exit and the number of people who board. Try to use personal vehicles. Television also provides health advice to people with regular programs and full explanations about the dangers of the disease. Regularly disinfect the walls and floors of hospitals and medical centers. Prevent families from entering the hospital. Parties and ceremonies and celebrations should be held in small numbers and controlled in accordance with health protocols. In case of illness, every person should stay at home and the doctor should go to the patient's home, so that the disease does not spread in the community or he is not exposed to the disease in the hospital. Also, avoid holding religious ceremonies, mourning and celebrations in mosques and churches and must be controlled under health laws. By DOIng so, the disease can be controlled and eradicated without quarantine in the shortest possible time, and the world economy will be revived.

19.7 Air disinfection devices

Disinfection and air purification are at the top of the list of measures taken to prevent the spread of SARS-

Cov2 virus. According to research, clean surfaces and clean air reduce the spread of any virus or bacteria. Austrian researchers have developed a relatively small portable device that purifies the air inside the room and disinfects the surfaces. It can kill 99.9% of bacteria and viruses, including the Coronavirus.
Researchers at the TU Institute in Vienna and the Austrian Institute of Technology AIT have developed a mobile device that does both, disinfecting surfaces and purifying the air. Researchers in this field have decided to use hydrogen peroxide or hydrogen peroxide as a disinfectant. For disinfection, the device releases very fine particles containing one tenth of a percent of hydrogen peroxide. For this purpose, the particles emitted from the device should cover all surfaces inside the room. Clara Pogner, a research engineer at the Austrian Center for Biological Resources and Health, said: "They do not sit on any surface and remain suspended in the air." Users of this device must give the device the size of the room and the place where the room is located, after which the disinfection time is set automatically. This device is capable of purifying 1500 cubic millimeters of air per hour. Thus, for a space of 70 square meters, about three hours of air purification is required. After this time, the device becomes filtered and sucks the disinfectant out of the room air. This purifier is programmed to work as an air filter during the day and disinfect surfaces at night.

19.8 Simple oral hygiene help reduce COVID-19 severity, says study

COVID-19 could pass into people's lungs from saliva with the virus moving directly from mouth to bloodstream, particularly if individuals are suffering from gum disease, according to new research. Evidence shows that blood vessels of the lungs, rather than airways, are affected initially in COVID-19 lung disease with high concentrations of the virus in saliva and periodontitis associated with increased risk of death. The researchers propose that dental plaque accumulation and periodontal inflammation further intensify the likelihood of the SARS-CoV-2 virus reaching the lungs and causing more severe cases of the infection. Experts say this discovery could make effective oral healthcare a potentially lifesaving action recommending that the public take simple, but effective, daily steps to maintain oral hygiene and reduce factors contributing to gum disease, such as the build-up of plaque. An international team of researchers from the UK, South Africa and the United States today published their findings in the Journal of Oral Medicine and Dental Research. They note emerging evidence that specific ingredients of some cheap and widely available mouthwash products are highly effective at inactivating the SARS-CoV-2 virus. Simple oral hygiene measures, including use of these specific mouthwash products, could help lower the risk of transmission of the virus from the mouth to the lungs in those with COVID-19, and help prevent severe instances of the infection [70].

19.9 Can blood-sucking mosquitoes transmit COVID-19 disease?

Female mosquitoes are among the most dangerous and deadly creatures on earth because they transmit many diseases by eating human blood, resulting in the death of millions of people in the world. Male mosquitoes do not eat blood and feed on plant nectar, but female mosquitoes need nutrients and protein to grow their eggs. Therefore, it is possible to transmit pathogens such as malaria and some viruses through eating blood from an infected person to a healthy person. However, mosquitoes are not capable of transmitting any virus. For example, mosquitoes cannot transmit HIV and Ebola. To date, there is no evidence of transmission of the new coronavirus, which causes COVID-19, or other coronaviruses. Mosquitoes do not have the ability to transmit all viruses. To transmit a virus, the virus must first be present in the mosquito's body to reproduce [76].

The researchers looked at whether flies could carry the coronavirus, keep the virus alive and transmit it to surfaces. Separate studies have been conducted to investigate this issue. In the first study, houseflies were tested for infection after exposure to coronavirus-infected medium or milk. In the second study, environmental samples were tested for infection after contact with coronavirus-infected flies. The results showed that all flies in the environment or milk infected with coronavirus were positive for viral RNA up to 4 hours and 24 hours after exposure. Viral RNA was also detected in environmental samples after fly contact with surfaces. In total, in vitro, houseflies acquired and possessed infected coronavirus up to 24 hours after exposure. In addition, houseflies were able to mechanically transfer coronavirus genomic RNA to their surroundings up to 24 hours after exposure [77].

19.10 Can Air Conditioning Spread COVID-19?

Early research raised concerns. A study, published in Emerging Infectious Diseases, found that nine people in Wuhan, China (the first epicenter of the new coronavirus outbreak) were infected with the virus simply by sitting near an air conditioning vent in a restaurant. Manish Butte, PhD, an associate professor in the department of microbiology, immunology, and molecular genetics at the University of California, Los Angeles, tells that within a public setting, like a restaurant, workplace, or gym, air conditioning might be potentially risky. It has to do with the way AC works. Air conditioning circulates air more rapidly, which removes humidity. Water vapor can hold onto heat, so with less of it in the air once the humidity is removed, a room or space cools down. “Less humidity in the air promotes evaporation, which causes droplets in the air to dry up and disappear,” says Butte. A single cough releases about 3,000 droplets, while a single sneeze can release about 30,000, according to a blog post that went viral written by Erin

Bromage, a comparative immunologist and professor of biology specializing in immunology at the University of Massachusetts Dartmouth. Different actions produce different sizes of droplets, which can travel varying distances. When an AC unit is turned on, air flow from the vent pushes these droplets through the air and potentially into other people. “The air flow direction is what matters,” adds Butte. Bromage believes that indoor spaces with ventilation systems and lots of people (such as the restaurant in the Wuhan study) are concerning from a transmission standpoint. And Butte agrees that air conditioning can definitely make droplets containing infectious virus particles spread farther. Remember, while air conditioning might make a room feel fresher on a warm day, it’s simply recycled existing air.

When it comes to the Wuhan restaurant study, it’s important to take into account that it had a small sample size and didn’t replicate conditions in a lab. “I don’t necessarily think that this study is representative of transmission risk,” infectious disease expert Amesh A. Adalja, MD, senior scholar at the Johns Hopkins Center for Health Security in Maryland, tells Health. “However, it is important to be mindful of air flow patterns, especially if they are strong and create a jet stream for droplets.” If you’ve been practicing social distancing measures and following all other recommendations regarding hygiene. If you haven’t had a stream of people in and out of your home, the only droplets that could be spread by air conditioning are those from you and whoever you’ve been in lockdown with. “Within a home, where everyone is highly exposed to each other,
there isn’t a need to worry about air conditioning,” says Butte. If you do go to a restaurant or any other busy place with air conditioning, continue to practice social distancing, be vigilant about hand-washing and not touching your face, and, as always, stay home if you feel sick or have symptoms of COVID-19 [77].

19.11 New Software can help researchers and governments

You can only find the different types of this virus if you know what to look for. Although we now know the SARS-CoV-2 genome, at 29,903 bases, it is too long to quickly identify different variants. New mutations have been identified with a new software called VDV (Variant Database) developed by a team led by Pamela Bjorkman of the California Institute of Technology in Pasadena that focuses on changes in the spike protein region. The potentially dangerous mutation (E484K) found in both South African (B.1.351) and Brazilian (P.1) strains alters the amplitude of spike protein receptor binding, and it is here that antibodies have the strongest neutralizing effect that they attack.

19.12 Production of a unique anti-COVID-19 vaccine by nanoparticles

A unique vaccine to protect against COVID-19 begins clinical testing, April 2021, at the Walter Reed Army Institute of Research (WRAIR), part of the U.S. Army Medical Research and Development Command. Scientists developed a nanoparticle vaccine, based on a ferritin platform, which suggests a flexible approach to targeting different variants of SARS-COV-2 and potentially other coronaviruses as well. The vaccine, called spike ferritin nanoparticle (SpFN), stands out in the COVID-19 vaccine landscape. Its multi-faced sphere design allows repetitive, ordered presentation of the coronavirus spike protein to the immune system, a strategy that may help provide broader protection.

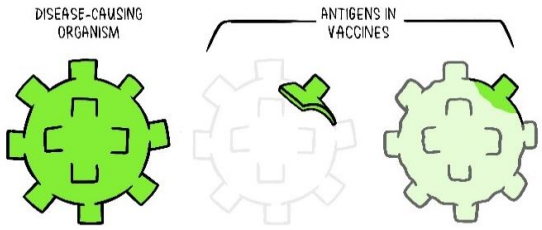

Fig. 42. *The basic ingredient in a vaccine is the antigen. It’s either a modest section of the Disease-Causing life form or a debilitated, non-dangerous version, so your body can learn the particular way to battle it without getting sick.*

Even before recent COVID-19 variants were identified, our team was concerned about the emergence of new viruses like COVID-19 in human societies, a dangerous threat that has been accelerating in recent years, said Dr. Kayvon Modjarrad, director of the Emerging Infectious illnesses Branch (EIDB) at WRAIR who conducts the Army's COVID-19 vaccine research attempts and co-invented the vaccine with WRAIR structural biologist Dr. Gordon Joyce. That's why we need a vaccine like this: one that has potential to protect Widely and proactively against various coronavirus species and strains in future. The WRAIR vaccine avoids both instruction and spike formation, and injects the already formed spike protein directly into the immune system along with an immune-boosting auxiliary compound, quickly triggering an antibody response in the body. Unlike other protein-based vaccines being tested, the WRAIR vaccine provides viral nanoparticles, each containing a fixed array of 24 spike proteins protruding from a ferritin base in small batches of three.

Experiments on thousands of mice and dozens of monkeys have been promising. The vaccine may also protect against newer strains of the virus, but we may see a reduction in protection, says Modjarrrd. But what we have seen so far about our vaccine in animals is that it does not diminish the protective effect of this vaccine against different types and it is also effective against coronavirus viruses such as SARS-1. So, what we're developing now is a vaccine that covers the whole family of coronaviruses, and we're testing everything in between. This vaccine is very stable and does not require special storage

conditions, such as freezing temperature. This means you can put it in a cooler, even on the back of a motorcycle, and the vaccine will still work well.

Pre-clinical studies indicate that SpFN induces highly potent and broad neutralizing antibody responses against the virus that leads to COVID-19 infection, as well as 3 major SARS-CoV-2 variants and SARS-CoV-1 virus. We are in this for the long haul, said Modjarrad. We have designed and positioned this platform as the next generation vaccine, one that paves the way for a global vaccine to save against not only the current virus, but also counter possible future variants, stopping them in their tracks before they can cause another pandemic [71].

19.13 New technologies to fight Coronavirus

As the coronavirus pandemic (COVID-19) evolves, technological applications and initiatives are multiplying in an attempt to stop the spread of the disease, treat patients and take the pressure off overworked healthcare workers, while also developing new, effective vaccines. At a time when everyone needs better information, including epidemic disease modelers, state authorities, international organizations and people in quarantine or maintaining social distancing, digital information and surveillance technologies have been unleashed in an unprecedented manner to collect data and reliable evidence to support public health decision-making. Artificial intelligence, robots and drones are being deployed to help track the disease and enforce restrictive measures; while scientists are frantically applying gene editing, synthetic biology and nanotechnologies in a bid to prepare and test future vaccines, treatments and diagnostics. Blockchain applications can track contagion, manage insurance payments, and uphold medical supply chains. Furthermore, 3D printing and open-source technologies seem capable of sustaining the effort of governments and hospitals around the world to meet the increasing need for medical hardware (e.g., facemasks, ventilators and breathing filters) and optimize the supply of the necessary medical equipment. At the same time, telehealth technologies offer a cost-effective means to slow the spread of the virus and to maintain hospital capacity by operating as a possible filter, keeping those with moderate symptoms at home and routing more severe cases to hospitals.

Presenting a non-exhaustive overview of the technologies currently in use, this analysis highlights their main features and significance in the fight against the Coronavirus pandemic, focusing on the way they
are being used to monitor and contain the rapid spread of the disease, and to ensure that public health institutions maintain their capacity to meet the ever-increasing needs caused by this pandemic disease.
The analysis also illustrates the main legal and regulatory challenges and the key socio-ethical dilemmas that these technologies' manifold applications pose when used in a public-health emergency context such as the current one. A scan of the technological horizon in the context of COVID-19 allows some preliminary remarks regarding the terms of technological engagement in the fight against this once-in-a-century pandemic. First, unlike previous public health crises, this one seems to be transforming citizens from objects of surveillance and epidemiological analysis into subjects of data generation through self-tracking, data sharing and digital data flows. Secondly, although most of these technologies have not been applied in a medical emergency context before, their intensive use on a global scale triggers questions about the effects on civil liberties of mobilizing mass surveillance tools as well as concerns about state authorities maintaining heightened levels of surveillance, even after the pandemic ends [75].

19.14 METH users are at high risk of fatality

Methamphetamine (METH) consumers, together with other medicate abusers, are among the foremost vulnerable bunches in our society, with numerous risk variables such as less get to health care, endure from weaker immunity and poorer wellbeing, respiratory problems, metabolic issues, or cardiac diseases are more susceptible to different infections. With the growing rate of the COVID-19 widespread, the subject reemerged as the specialists consider that normal users of abuse of manhandling such as opioids or METH are at expanded hazard due to the probability that they as of now endure from existing diseases, weakened immunity, weak decision making, and

impaired judgment. Moreover, all of these may increment their powerlessness to COVID-19 infection. Normal administration of METH is related to different neurological symptoms such as depression, anxiety, psychosis, psychiatric impairment, cardiac, respiratory complications, and overall diminished immune wellbeing. Acute and chronic utilize of METH has basic immunological implications in people because it influences both the natural and adaptive immune system so that the person gets to be progressively defenseless to opportunistic microorganisms. The intrinsic immune system, which is the primary line of defense, evacuates pathogens by phagocytosis, whereas the versatile immune system presents the outside pathogens to immune cells to produce antibody agent and T cell reactions; however, METH utilizes, incredibly impacts the advancement of appropriate immunity against pathogens. METH can diminish the generation of antibodies by modifying the productivity of B cells. METH can moreover change the communication between the natural and versatile immune cells mediated by cytokines, and this may eventually delay reaction to pathogens. To be more particular, METH is able to diminish the number of important immune cells such as dendritic cells, monocytes, normal killer cells, and macrophages that are vital for giving immunity against pathogenic attack.

These inevitably result in weaker immunity and as such, METH consumers are more defenseless to disease, counting SARS-CoV-2 disease, causing COVID-19 (Fig. 43) [81].

In addition to the effect of METH on the immune system, its effect on the respiratory system is also critical here, as COVID-19 mainly affects the respiratory system. Many studies report that METH causes lung injury due to the over production of free radicals in animal models. Pulmonary hypertension, pulmonary edema, and eosinophilic pneumonia are the most common types of lung injury reported from METH exposure. Pneumonia can be caused by adulterated drug use, significant negative changes in the resident bacterial population, or aspiration [81].

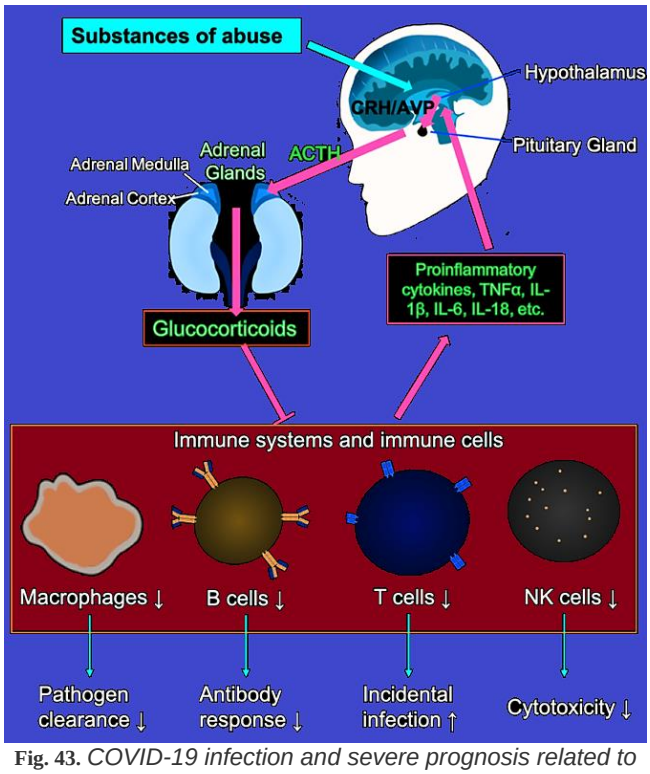

Fig. 43. *COVID-19 infection and severe prognosis related to METH users.*

19.15 COVID-19 vaccine magnet challenge

Some people are asserting on social media that magnets property will stick to your arm after you've gotten the COVID-19 vaccine injected into that arm. It has nothing to do with you yourself being so attractive though. Instead, the claim is that COVID-19 vaccination injects metal into your arm, apparently enough metal to make magnets stick to your arm.

This has included photos and videos posted on social media. Some people tell that may be a microchip or Chip Kelly-d. Instead, in this case, "chipped" probably referred to a metallic microchip, the kind that supposedly can be used to track you. Yes, this whole magnet-sticking-to-arm thing seems to be an extension of the old "tracking microchip in the COVID-19 vaccine" conspiracy theories that have been circulating for a while now. The corona vaccine may contain a small amount of aluminum and mercury, which is also not very magnetic; Elements such as nickel, cobalt, etc. that may be attached to the magnet must also be in the amount of one gram, which can absorb iron; However, the total amount of vaccine injected is so small that this is not possible. So far, none of these claims and hypotheses have been substantiated.

19.16 The effect of COVID-19 on pregnant women

According to the problems of COVID-19, pregnant women are anticipated to be at high risk of creating extreme COVID-19 compared to non-pregnant women. It should be noted that the simple spread of viral respiratory illnesses, such as flu, during pregnancy shows that pregnant women are more defenseless to COVID-19 and need more medical care. Normally, mechanical and physiological changes in pregnancy picked up defenselessness to COVID-19, altogether when it influences cardiorespiratory and gravida, and it increments the rate of progression in respiratory failure.

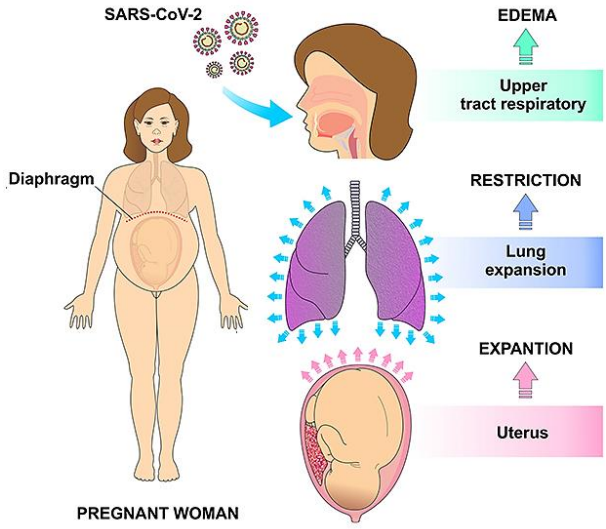

Fig. 44. *A shematic representation of the COVID-19 infection in pregnant woman.*

Because of physiological changes within the immune and cardiopulmonary system in pregnant women (e.g., expanded oxygen consumption, enhanced diaphragm, and respiratory mucosal edema), they are exceptionally susceptible to respiratory pathogens extreme pneumonia. Furthermore, pregnant people with COVID-19 can be at a high risk of adverse pregnancy results, such as preterm births. A wide limit of vaccines is routinely and securely managed during pregnancy. The Pfizer-BioNTech vaccine has been an effective vaccine against COVID-19 so far. In any case, given the component and performance of these vaccines (mRNA vaccine), specialists accept that it is unlikely to posture a risk to pregnant women and the breastfed newborn child. It ought to be famous that mRNA immunizations don't contain a live virus that causes COVID-19 and thus, cannot give an individual COVID-19. Moreover, mRNA vaccines don't associate with genetic DNA since mRNA does not enter the cell core. Concurring to the CDC, Acetaminophen may be

suggested as an alternative for pregnant women encountering other post-vaccination symptoms as well [83]. The past researches on the severe acute respiratory syndrome (SARS) virus have spoken to that the virus can cause intrauterine fetal demise, premature birth, and intrauterine growth restriction, subsequently, testing suspected cases and persistent control of the patients their newborn children are imperatively essential. Also, there's no proof of mother-to-child transmission risk through cesarean and conveyance segment [83].

19.17 New virology findings

The SARS-CoV-2 infection is composed of four basic proteins, containing nucleocapsid (N), spike (S), membrane (M), and envelope (E) (Fig. 45). Protein M plays an imperative role in presenting the virus into the body and shaping envelopes. Protein E is dependable for the proliferation, germination, envelope arrangement, and spread of the infection. Expanding translation and gathering of infections is the obligation of multipurpose N protein. Moreover, the virus binding to host cells is the obligation of the Spike (S) protein. In this manner, it includes a special rank in pharmaceutical and vaccine inquire about. It ought to be famous that, due to the need for reaction to neutralizing or immune antibodies, proteins N, M, and E are not considered as medicate targets. As delineated in Fig. 45, the S glycoprotein of the recently
found SARS-CoV-2 is composed of two subunits, S1 and S2, and is commonly spoken to as a sword-like spike. The main structure of this protein, however, can be seen by means of crystallography [83].

The Protein Data Bank (PDB) model of this glycoprotein uncovers how the subunits are comprised of distinctive districts that are crucial to the infection preparation. S1 and S2 are connected together by a polybasic amino acid bridge, which may be vital for examining viral focusing. The virus binds to the host cell with the assistance of an S-protein and enters the cell. After the penetration stage, the transcript process starts, and the virus duplicates until the host cell is entirely infected and removed [83].

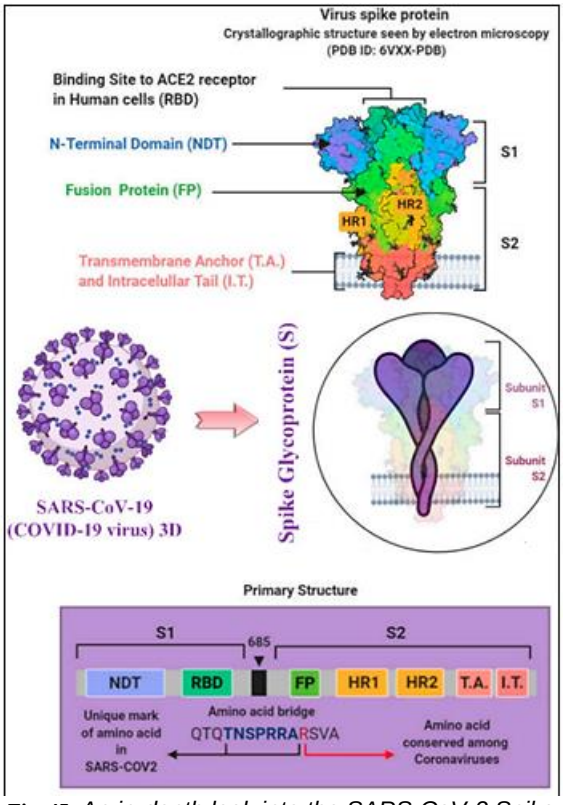

Fig. 45. *An in-depth look into the SARS-CoV-2 Spike Glycoprotein.*

Generally, when the virus enters the body through the mouth or nose, SARS-CoV-2 makes its way into the lungs and utilizes its unmistakable spike proteins to contaminate alveolar cells. In reaction, the immune system assaults the contaminated zone, killing healthy alveolar cells during this event. Reduced surfactant from alveolar epithelial type II cells, besides liquid accumulation, because of the devastation of cells within the alveoli, causes decreased or extremely prevented gas exchange. In any case, when cytokines are activated without breaks, they can cause harm to the cells' reactions to the cytokines and closed down the organs' performance. Usually known as a cytokine storm, which mediates extreme infection, containing Covid19. The following steps explain how a cytokine storm happens within the lungs (Fig. 46) [83].

(1) COVID-19 Infects the lung cells.
(2) Cytokine generates through virus detection by immune cells (macrophages).
(3) A cycle of inflammation in lung cells is created by further absorb of immune cells (white blood cells) through the cytokine phenomenon.
(4) Fibrin formation and further hurt.
(5) Filling of the lung cavities, because of the infiltration of liquids into the weak blood vessels, followed by respiratory harm.

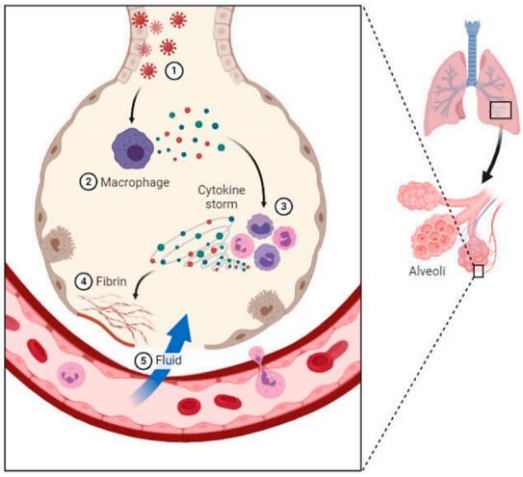

Fig. 46. *A cytokine storm in the lungs due to COVID-19 disease: (1) infection, (2) Cytokine production, (3) Creating a cycle of inflammation in lung cells, (4) Fibrin formation and (5) Filling of the lung cavities [83].*

19.18 Artificial Intelligence (AI)

Within the COVID-19 widespread, the advancement of new technologies to screen and control the outbreak of COVID-19 may be a critical step taken by therapeutic analysts. Artificial intelligence (AI) in pharmaceutical has recently caused important progress, in diagnosis, biotechnology, and medicate generation. AI innovation has appeared promising prospects for different epidemics (EBOLA, SARS, and HIV). Fortunately, the COVID-19 crisis and the fast increment within the number of suspected cases have driven the rise in AI innovation utilized to control and analyze the illness. Artificial intelligence can rapidly distinguish the symptoms of the disease and alarm patients and health specialists. In this way, it can decrease the choice time in conventional disease determination forms. In this researches, artificial intelligence mainly uses medical imaging innovations such as computed tomography (CT), X-ray imaging (X-ray), and magnetic resonance imaging (MRI) to detect infected cases. Additionally, AI can take viable steps in tracking the coronavirus's spread, distinguishing high-risk patients, satisfactorily analyzing patients' previous information, and foreseeing the risk of death [83].

20. Future Perspectives

COVID-19 is the third profoundly pathogenic human Coronavirus illness to date. In spite of the fact that less dangerous than SARS and MERS, the fast spreading of this profoundly infectious illness has posed the severest risk to worldwide health in this century. The SARS-CoV-2 outbreak will last for more than a year, and it is probably that this developing virus will set up a specialty in people and coexist with us for a long time. There's no superior way to ensure us from SARS-CoV-2 than individual preventive behaviors such as social separating and wearing masks, and open health measures, containing active testing, case following, and limitations on social occasions. Additionally, genomic observing of SARS-CoV-2 in new cases is needed around the world, because it is important to instantly detect any mutation that will result in phenotypic changes of the virus. At last, COVID-19 is challenging all human beings. Tackling this epidemic is a long-term job that requires the efforts of every individual, and international collaborations by scientists, authorities, and the public.

As the Coronavirus (COVID-19) pandemic spreads, technological applications and initiatives are multiplying in an attempt to stem contagion, treat patients in an effective way, and ease the pressure on overworked healthcare workers, while also racing to develop new vaccines. It also sheds light on the main legal and regulatory challenges, and on the key socio-ethical dilemmas that these technologies pose when used in a public-health emergency context. Technology in itself cannot replace or make up for other public policy measures but it does have an increasingly critical role to play in emergency responses. COVID-19, as the first major epidemic of the 21st century, represents an excellent opportunity for policy-makers and regulators to reflect on the legal plausibility, ethical soundness, and effectiveness of deploying emerging technologies under time pressure. Striking the right balance will be crucial for maintaining the public's trust in evidence-based public health interventions [79]. This new virus outbreak has challenged the economy, medical and public health infrastructure of the world. More so, future outbreaks of viruses and pathogens of zoonotic origin are likely to continue. Therefore, apart from curbing this outbreak, efforts should be made to devise comprehensive measures to prevent future outbreaks of zoonotic origin [80].

20.1 Anti-COVID-19 pills will be sold in pharmacies

knowing how to remedy it is still crucial, even if prevention is better than remedy. It takes some years for the vaccine to become available everywhere. And even if the vaccine is broadly distributed, some people don't accept the injection yet. Or a few vaccinated people, even a little number, get sick again. Antiviral medicines are already available to battle other viruses, such as HIV or the flu virus. We know, viruses are small machines that require specific components to replicate. Small chemical molecules are generally included in Antiviruses that are produced to interfere with these machines. Antiviruses generally make a mutation in the virus, and when this occurs a few times, these mutations decrease the virus's ability to replicate. In this manner, the disease process slows down, the severity of the illness, hospitalization, and death can be
protected. Moreover, antivirals treatment is followed by medicines that influence the immune system and antibodies that can target the virus. But scientists say antiviral medicines should be prescribed at the start of treatment and immunosuppressive medicines in the last stages. A few pills work by binding to a viral enzyme and preventing it from duplication. It also prevents the COVID-19 virus from multiplying in the

respiratory tract by assaulting it. This tablet is classified as a protease inhibitor. The sooner you are cured with an antiviral, the better the results. Once these tablets become accessible, the most challenge will be early Diagnosis of the disease.

20.2 Some patients have permanent immunity

A number of studies to date have shown that people with mild or asymptomatic COVID-19 infection can have antibodies in their bodies that can protect them against the virus for the rest of their lives. People with mild coronary heart disease usually clear the virus two to three weeks after infection. Therefore, 7 or 11 months after infection, no virus will be able to bypass the body's active immune system, and antibody-producing cells (called long-term plasma cells) will not divide. They sit slowly in the bone marrow and secrete antibodies. They do this indefinitely from the time the infection clears up.

20.3 Some reasons about making COVID-19 in the laboratory

Some researchers claim COVID-19 'has NO credible natural ancestor' and has created by Chinese scientists who then tried to cover their tracks with 'retro-engineering' to make it seem like it naturally arose from bats, explosive new study claims. In 2019, the Chinese military engineered mice with humanized lungs to test for a variety of viruses. This project was carried out a few months before the COVID-19 pandemic (Dailymail, 2021).

A new study claims researchers found 'unique fingerprints' in COVID-19 samples that they say could only have arisen from manipulation in a laboratory [82]. To discover exactly how to attack SARS-CoV-2 safely and efficiently, our vaccine candidate Biovacc-19 was designed by first carefully analyzing the biochemistry of the Spike. We ascertained that it is highly unusual in several respects, unlike any other CoV in its clade. The SARS-CoV-2 general mode of action is as a co-receptor-dependent phagocyte. But data shows that simultaneously it is capable of binding to ACE2 receptors in its receptor-binding domain. In short, SARS-CoV-2 is possessed of dual-action capability. The spike has six inserts which are unique fingerprints with five salient features indicative of purposive manipulation. Henceforth, those who would maintain that the COVID-19 pandemic arose from zoonotic transfer need to explain precisely why this more parsimonious account is wrong before asserting that their evidence is persuasive, most especially when, as we also show, there are puzzling errors in their use of evidence [82].

The study showed there's evidence to suggest Chinese scientists created the virus while working on a Gain of Function project in a Wuhan lab Gain of Function research, which was temporarily outlawed in the US, involves altering naturally occurring viruses to make them more infectious in order to study their potential effects on humans. According to the paper, Chinese scientists took a natural coronavirus 'backbone' found in Chinese cave bats and spliced onto it a new 'Spike', turning it into the deadly and highly transmissible COVID-19 The researchers, who concluded that COVID-19 has no credible natural ancestor, also believe scientists reverse-engineered versions of the virus to cover up their tracks, we think that there have been retro-engineered viruses created, Dalgleish told DailyMail journal. 'They've changed the virus, then tried to make it out was in a sequence years ago [82]. The study also points to deliberate destruction, concealment, or contamination of data in Chinese labs and notes that scientists who wished to share their findings have not been able to do so or have disappeared'.

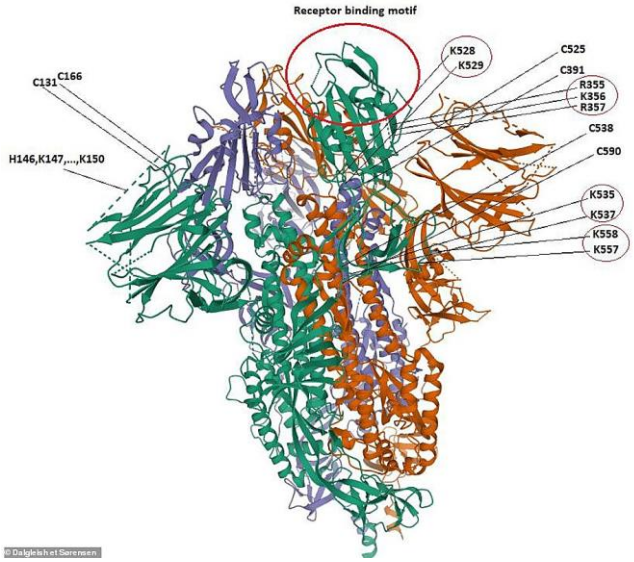

Fig. 47. *A second diagram showed how a row of four amino acids found on the SARS-Cov-2 spike have a positive charge that clings to human cells like a magnet, making the virus extremely infectious [82].*

Until recently, most experts had staunchly denied the origins of the virus were anything other than a natural infection leaping from animals to humans. Dalgleish and Sørensen have authored a new study, which concludes that 'SARS-Coronavirus-2 has no credible natural ancestor and that it is 'beyond reasonable doubt that the virus was created through 'laboratory manipulation'. Dalgleish and Sørensen claim that scientists working on Gain of Function projects took a natural coronavirus 'backbone' found in Chinese cave bats and spliced onto it a new 'spike', turning it into the deadly and highly transmissible SARS-Cov-2. One tell-tale sign of alleged manipulation the two men highlighted was a row of four amino acids they found on the SARS-Cov-2 spike [82]. A 'GenBank' table included in the paper lists various coronavirus strains, with the dates they were collected and then when they were submitted to the gene bank, showing a delay of several years for some [82].

Table 4 shows that isolates 7,8 and 9 were collected between 2003 and 2013 and submitted to GenBank between 2003 and 2016. The other isolates 1-6 were isolated from 2013 onwards and submitted to

GenBank between 2018 and 2020. The collection dates stated must be considered as indicative only. There is also a lack of clarity about exactly what was collected and when by Dr. Shi Zheng-li and her colleagues including Dr. Peter Daszak, and what was submitted to GenBank. This research continues [82]. In this article, section 19.3 discusses the similarities between the Coronavirus and the HIV virus, its replication and transmission to the respiratory tract, such as the Influenza virus, and the similarities in the dimensions and structure of the Coronavirus to both of the two viruses. In the future, more clues and evidence of manipulation and artificial fabrication of this dangerous virus will be found.

Table. 4. GenBank details for the named strains [82].

Seq	Origin of sequence	GenBank	Collection date	Submitted date
1	Human-SARS-Coronavirus-2 (COVID-19)	MN908947.3	Dec-2019	Jan-2020
2	Pangolin	MT084071.1 A complete virus has still not been verified	Mar-2019	APR-2020
3	Bat-SARS like Coronavirus SZ45	AVP78031.1	Feb-2017	Jan-2018
4	Bat SARS like Coronavirus ZXC21	AVP78042.1	Jul-2015	Jan-2018
5	Bat-RaTG13	MN996532.2	Jul-2013	Jan-2020 Mar-2020
6	RmYN02	MW201982.1	Jun-2019	Nov-2020
7	WIV16	KT444582.1	Jul-2013	Jan-2016
8	Bat-SARS like Coronavirus LYRa11	AHX37558.1	2011	Aug-2013
9	Human-SARS-Coronavirus	AY278741.1-Urbani	2002-2003	Apr-2003

Sørensen said the amino acids all have a positive charge, which causes the virus to tightly cling to the negatively charged parts of human cells like a magnet, and so become more infectious. But because, like magnets, the positively charged amino acids repel each other, it is rare to find even three in a row in naturally occurring organisms, while four in a row is 'extremely unlikely,' the scientist said. The laws of physics mean that you cannot have four positively charged amino acids in a row. The only way you can get this is if you artificially manufacture it, Dalgleish told
DailyMail. Their new paper says these features of SARS-Cov-2 are unique fingerprints that are indicative of purposive manipulation, and that 'the likelihood of it being the result of natural processes is very small [82].

Recent studies show that vaccines produced by the mRNA system can provide permanent protection without the injection of booster vaccines. According to a scientific study published in the journal Nature, modern vaccines and biotech-Pfizer vaccines provide lasting immunity in the body and will protect us against the coronavirus for years to come. New studies confirm the long-term effectiveness of both vaccines. Most people vaccinated with the mRNA system may not need a booster dose, as long as the virus and its various strains do not progress beyond their current form. However, the researchers said it was not conclusive.

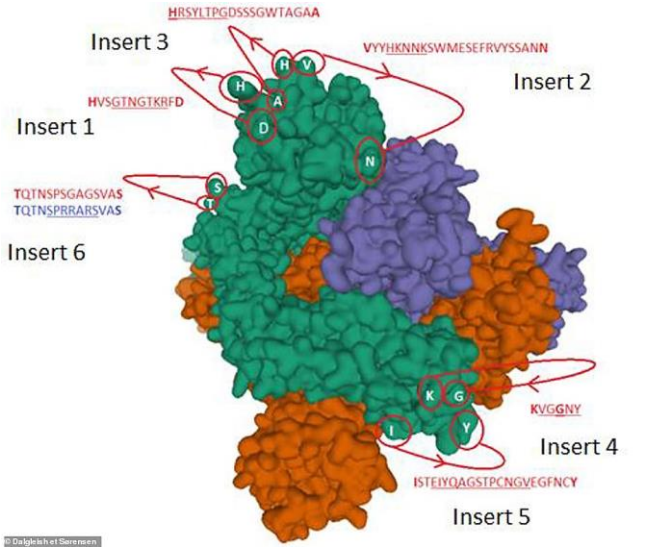

Fig. 48. *One diagram of the coronavirus shows six 'fingerprints' identified by the two scientists, which they say show the virus must have been made in a lab [82].*

21. CONCLUSION

In the present study, various aspects of the Coronavirus pandemic and its impact on the world were investigated and solutions to reduce the spread of the virus, new therapies, and the use of new methods to reduce the duration of quarantine were presented. Here are some basic points about the Coronavirus, which are explained. The widespread of COVID-19 has recently been distinguished as a worldwide health crisis. The economy is an important concern. In spite of the fact that researchers are trying to find an utterly effective medicine for the conclusive treatment of COVID-19, no 100% effective medicine has been found for complete recovery. Luckily, because of researchers' and pharmaceutical companies' efforts, many effective vaccines to prevent the prevalence of dangerous diseases have been approved by the World Health Organization. Anyway, it takes a long time for these effective vaccines to reach all the world's people and all people to be vaccinated. Until then, all the points prescribed by the World Health Organization to prevent the prevalence of this disease must be fully considered and observed.

Recent research on the Coronavirus and its effects on the body of patients has shown that the virus remains in the body of a significant number of COVID-19 patients for much longer than normal and in some cases even causes disability; This has led the World Health Organization to warn about the resistance of some strains of the virus in patients. It is not clear why some patients continue to have COVID-19 for months. These people have some of the symptoms of the disease for months, such as excessive fatigue,

respiratory problems, neurological disorders, and heart problems, even after being treated for Coronary artery tests. There are concerns about the mutated virus, and every month we may encounter a new mutation of the virus, but the only solution is to create a database and software of the mutated viruses, which will be examined and discovered, if possible, by vaccination or common treatments in the future.

In the context of the current pandemic, numerous data-collection and location-tracking technological applications have been launched on the basis of emergency laws that involve the temporary suspension of fundamental rights and authorization of medical devices and vaccines via fast-tracked procedures. Although the main concentration of this analysis is on technological applications and presenting solutions to pressing pandemic-related problems, this research does not aim to reinforce ideas of techno solutionism. In other words, technological applications in their own right cannot solve complex societal challenges, such as those associated with the current pandemic. Rather, this work's main findings indicate that technology in itself cannot replace or make up for other public policy measures but it does have an increasingly critical role to play in emergency responses. COVID-19, as the first pandemic of the century, represents an excellent opportunity for policy-makers and regulators to reflect on the legal plausibility, ethical soundness, and effectiveness of deploying emerging technologies under time pressure. Striking the right balance will be crucial for maintaining the public's trust in evidence-based public health interventions. In the coming years, the coronavirus will spread as a seasonal disease, like a common cold, and more in the cold seasons of the year, so there should be a database for mutated viruses and seasonal vaccination must be done. The use of nanoparticles to produce vaccines and robots to reduce the quarantine period must also be considered to save the World from negative effects such as economic and social crisis that is basically related to Global health.

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