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Halting the COVID-19 Widespread: A Audit on the Progresses of Determination, Treatment, and Control Measures

B.BABU [1], K.MATHEVAN PILLAI [2], S.THIRUVAZHIMARBA PILLAI [3], S.SURIA PRAKASH [4]

[1] Associate Professor,Department of Mechanical Engineering,Amrita College of Engineering And Technology,Nagarcoil

[2]Assistant Professor,Department of Mathematics,Francis Xavier Engineering College,Tirunelveli

[3]Associate Professor,Department of Mathematics,Loyola Institute of Technology and Science,Thovalai

[4]Assistant Professor,Department of Mathematics,Amrita College of Engineering And Technology,Nagarcoil

e-mail-babuamr11@gmail.com

Abstract

Efforts to prevent the transmission of the SARS-CoV-2 infection are critical in light of the ongoing worldwide spread of COVID-19. Recently developed diagnostic tools include CRISPR, IgG tests, spike protein detection, and artificial intelligence. RT-PCR has been replaced with point-of-care assays, which may be performed at the patient's bedside (RT-PCR). All of these options are available to treat the disease: antivirals and other antiparasitic agents, anti-inflammatory medications like interferon or convalescent plasma, monoclonal antibodies like gamma-globulin, and RNAi treatments like mesenchymal stem cell therapy are among the options (ECMO). More than a dozen different types of vaccines are now being tested in clinical studies. Furthermore, breakthrough technologies that are easily deployable and transportable.In addition, vaccination delivery technologies are being developed. The threat of a second wave of infection needs strict and reasonable control mechanisms to keep mortality to a minimal when governments begin to loosen their lockdown tactics. Research into COVID-19's advances in diagnostics and treatment may serve as a platform for future research that can lead to improved containment strategies.

Keywords:Covid 19,Vaccination,Diagnostic tools,Treatment

Introduction

China's health officials detected a strange pneumonia with no known cause in late December 2019. Based on the results of a rapid genome investigation, the illness was caused by an unknown coronavirus. It was inevitable that on March 11, 2020 WHO will classify the outbreak as a pandemic because of its fast spread at that point in time. Coronavirus SARS-CoV-2 is responsible for COVID-19. It is the sixth time a coronavirus has infected a human being. Previous coronavirus outbreaks that attracted worldwide concern were SARS in 2002–

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2003 and MERS in 2012. SCF (symptomatic case fatality risk) is projected to be 1.4 percent (0,9–2,1%) for a novel virus that has already killed over 200,000 people[1,2]. Between 10% and 15% of SARS patients died, whereas up to 35% died with the MERS virus, making it the worst human sickness. SARS-CoV-2, on the other hand, has been shown to be much more transmissible to humans [3]. There are many asymptomatic carriers of the illness, which makes reporting and control a challenge for public health officials [4]. The WHO recommends reverse transcription polymerase chain reaction (RT-PCR) as the primary diagnostic approach for COVID-19 detection because of its accuracy [5]. As a result, in order to carry out the test accurately, the method requires laboratory conditions and highly trained staff. Developing a reliable point-of-care test is essential in order to improve the number of tests that can be conducted each day. Serological study has recently indicated that the number of persons infected with COVID-19 may be substantially larger than previously thought. The only solution to an overwhelmed healthcare system and an increasing number of medical workers infected with infectious diseases is to find a vaccine. The research and development of vaccines or medications, on the other hand, is a laborious process that typically takes a decade to complete. As a result, it appears that repurposing current medications to treat COVID-19 is a logical scientific strategy. The lack of particular medications has restricted the therapeutic options for COVID-19 so far.Repurposing the appropriate antiviral treatment from a number of existing antiviral medications remains a difficulty. A few medications were found to be useful in small-scale investigations, but no substantial change in clinical outcomes was found later [6–8]. Antiviral drug development and repurposable possibilities are being investigated using high-throughput virtual screening and in vitro research.Because the virus is spreading at such a rapid rate, different regions have examined a variety of control techniques. Rethinking decisions and their consequences can help to tackle disease containment problems even more effectively. We intended to summarise the current literatures in order to compile a compendium of knowledge on the scopes of diagnostic instruments, therapies, vaccinations, and control measures for COVID-19 in this study.

Diagnostics

The Polymerase Chain Reaction of Reverse Transcriptase in Real Time (rRT-PCR)

As part of rRT-PCR or qRT-PCR, the NAAT procedure is employed to convert viral RNA into the cDNA that is amplified for detection [9].Currently, viruses are trying to silence the N, E, S, and RdRP genes. Each of these genes may be amplified using suitable forward and reverse primers that are readily available. When it comes to E and SARS coronaviruses,

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PCR amplification of the RdRp genes is 99% accurate, according to one research. Diagnosing COVID-19 using an RT-PCR assay is an excellent way to diagnose the disease early and with high specificity. The test's sensitivity may range from 71% to 98 percent depending on the severity of the illness and the viral multiplication, while its specificity is stated to be 95% [11]. A few of the RT-PCR drawbacks include the need for careful handling, long PCR cycles, and the need for a minimum RNA concentration at the beginning of the experiment. SARS-CoV-2 RNA may be detected by RT-PCR in up to 23 copies per millilitre of blood. In samples with low viral loads, it has been shown that heat inactivation may lead to false-negative nucleic acid tests [13]. This does not always indicate that the COVID-19 virus is not present in a COVID-19-infected person, since a range of variables, such as viral mutation, PCR inhibition and incorrect sample processing as well as specimen collection time and low viral RNA, may all contribute to a negative result [14]

Specimens of Various Types

Samples from the nasal and oropharyngeal regions of the throat, such as sputum, endotracheal aspirate, and/or bronchoalveolar lavage, should be considered [5]. Blood and faeces samples may also be taken for clinical testing. On the other hand, the most common positive results were discovered in the following samples: bronchoscopic brush biopsy (46%), bronchoalveolar lavage fluid (93%) and faeces (29%) as well as a single drop of blood (1%) from the finger prick. Even though urine samples have been shown to contain SARS-CoV-2, the test results are frequently negative. Autopsy materials, such as lung tissue, should be obtained in the case of dead persons [5]. Antibodies from a past illness may be detected using serological testing in a patient who has survived the current outbreak.

The creation of point-of-care tests

Emergency use permission has already approved some point-of-care molecular diagnostic technologies (EUA). There are other PCR methods that can yield results in 30 minutes or less, such as Accula's SARS-CoV-2 testing, which can be seen visually. Testing for the RdRp gene utilising Abbott ID NOW COVID-19 technology may provide a positive result in as little as five minutes, employing isothermal nucleic acid amplification. [17, 18].

Rapid Viral Protein Detection Tests

Additional research is underway to create a rapid test for the identification of viral proteins, as well. Nucleocapsid (N) and spike are the two most immunogenic proteins found

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in virus (S). Viral spike (S) protein is distinct from nucleocapsid protein, which shares 90% of its sequence with SARS-CoV, and it elicits a strong immune response [19]. Spike protein, however, has been shown to have two distinct subunits: one that is exclusive to SARS-CoV-2 and the other that is shared by the other coronaviruses [20]. An antibody that recognises the spike protein might help prevent cross-reactivity between the four human coronaviruses endemic to humans. Virus culture for detection is not suggested at this time due to the time and biosafety level 3 requirements.

Antibody-targeting serological tests

Developing effective antibody testing is a huge task, and hundreds of trials are now underway. It is important to keep in mind that the timing of the test, previous infection, the individual's immunological status, and cross-reaction all have a bearing on the test outcome. Cellex's COVID-19 IgG Antibody Test, which has a sensitivity of 93%, and Mount Sinai Laboratory's qSARS-CoV-2 IgG/IgM Rapid Test, which has a sensitivity of 92.5 percent, were given emergency authorization by the FDA. ELISA-based antibody tests employ a recombinant viral antigen that can bind to IgG, and this binding assay method is used in that test as well. Immunoassays, for example, may be used to test the presence of an analyte (such as an antibody) in whole blood, serum, or plasma samples. recombinant SARS-CoV-2 antigen is used to coat gold nanoparticles (AuNPs), and the IgG antibodies attach to them. Rabbit IgG gold conjugates are used as a reference, and these antibodies bind to anti-rabbit antibodies. A human glycoprotein is not detected; instead, antibodies are detected. The test appears similar to a lateral flow pregnancy test. A human glycoprotein is not detected; instead, antibodies are detected. The test appears similar to a lateral flow pregnancy test. The 99.6% specificity of Abbott's IgG antibody test has earned it a CE mark [23]. Electricity from Roche. The FDA has approved the use of an in-solution double-antigen sandwich construction for the AntiSARS-CoV-2 antibody test. Antibodies may be detected with a 99.8% specificity and a 100% sensitivity in human serum or plasma samples after PCR confirmation [24].

CRISPR Technology

The CRISPR gene editing technology was used to create a SARS-CoV-2 detection test that is accurate, quick, and easy to use. The DETECTR (DNA Endonuclease-Targeted CRISPR Trans Reporter) test is based on CRISPR–Cas12 and can detect SARS-CoV-2 from similar coronavirus strains in 40 minutes using N gene gRNA [25]. The results are shown using a FAM-biotin reporter molecule and lateral flow strips to collect fluorescent nucleic

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acids. Also using an Alicyclobacillus acidiphilus thermostable Cas12b enzyme, the SHERLOCK COVID-19 is a POC diagnosis based on CRISPR technology. [26] The FDA recently gave it the go-ahead for emergency use authorizations. It takes less than an hour to conduct the test using patient samples to extract RNA and read the findings with a dipstick. To develop a CRISPR-based technology, many techniques were tried in India. Nucleotide sequences may be accurately read out using the FnCas9 Editor Linked Uniform (FELUDA) Detection Assay (readout) [27].The test yields data swiftly and may be used to provide an accurate diagnosis more quickly than ever before.

Imaging

Additional information may be obtained from a chest CT scan, including the patient's illness condition and severity as well as the presence of virus. In a recent research, CT scans were shown to be more accurate than PCR tests [28]. Early signs of pulmonary peripheral pneumonia, which is rare, include small patches of shadow and alterations in the interstitial fluid. [29, 30] This condition has been described as bilateral multiple ground-glass opacity with infiltrating shadows as well as pleural effusion consolidation. Other lung abnormalities such as pneumonia cannot be distinguished from COVID-19 by CT scans[32].

Artificial Intelligence

Deep convolutional neural network architecture has recently been used to identify COVID-19 from chest radiography images [33]. The software is more efficient and becomes better as more data is fed into it. Machine learning may also predict the severity of a patient's condition. For early detection of COVID-19 patients, certain AI-inspired mobile application-based solutions are currently being explored. [35].

Differential Diagnosis

Finding out which sickness or condition has similar symptoms is known as differential diagnosis. As a consequence of co-infection, patients with COVID-19 may also be infected with other viruses or bacteria. We must be able to tell out a SARS-CoV-2-induced sickness from other types of respiratory infections such as bacterial or mycoplasmal pneumonias. Diagnosing COVID-19 may be challenging because to the wide range of symptoms it exhibits. Patients with COVID-19-associated fever and rash in Thailand were first misdiagnosed as dengue [36, 37]. It may be possible to narrow down the right cause in areas with a high prevalence of disease by using a combination of symptoms, medical history, and physical examinations. Infection with bacterial pneumonia is characterized by a high fever, a prolonged cough, and thick, blood-tinged mucus or yellowish-green sputum that includes pus. A blood culture or a serum antibody determination may assist differentiate

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between mycoplasmal pneumonia and other types of pneumonia that are seasonal in nature. [35].

ECMO and mechanical ventilation

Rest and supportive therapies such calorie and water intake, water electrolyte balance preservation, and maintaining homeostasis are effective for the majority of patients with mild to severe symptoms. The use of a noninvasive positive airway pressure ventilator for hypoxic individuals might be considered. Patients who are critically ill may need invasive mechanical breathing by endotracheal intubation if their condition is severe. Mechanical ventilation is only necessary for around 25 percent of patients with severe and critical conditions, according to a joint WHO-China research. The rest may be treated with oxygen alone. ECMO might be used to treat critically sick patients with acute respiratory distress syndrome (ARDS) who have failed to recover with mechanical ventilation and are in need of a new treatment. To put it another way, the patient's blood vessels are opened, oxygen is administered, and the patient's blood returned to them when the patient's carbon dioxide levels have been reduced. According to research [39], ECMO may reduce mortality in patients with the most severe forms of ARDS. Aside from that, it is an expensive and time-consuming treatment that requires the expertise of highly-trained professionals. The lymphocyte counts of COVID-19 patients were low, but the IL-6 levels were high [40]. ECMO may decrease lymphocytes and raise IL-6 levels, hence the patient's immune status must be taken into consideration before the procedure is started [41].

Antiviral Drugs

It has been suggested by the WHO that Remdesivir, a prodrug initially developed to fight the Ebola virus, has the most promise as a treatment for COVID-19. FDA approval of remdesivir under an EUA is based on the fact that the drug has been demonstrated to shorten recovery time. As an adenosine analogue, Remdesivir blocks viral RNA production by inhibiting viral RdRp. The medication also works to circumvent ExoN's proofreading abilities, causing the chain to break irreversibly [45]. Resivir's Phase III study indicated that patients who had a 10-day course of treatment prior to needing mechanical breathing saw a significant improvement [46]. For now, the efficacy of remdesivir in critically sick ICU patients has yet to be shown since it is only available as an intravenous fluid (IVF).

Combining danoprevir and ritonavir showed promise in a phase-IV clinical study for the treatment of HIV. Danoprevir increases the action of danoprevir by inhibiting the NS3/4A HCV protease while ritonavir inhibits cellular CYP3A4. danoprevir with ritonavir helped eleven patients in a clinical trial in China recover completely [47]. As a result, lopinavir and

ritonavir, which were first believed to be beneficial for COVID-19 therapy, were subsequently shown to be unsuccessful [47].

For its unique ability to block the viral RNA polymerase enzyme, Favipiravir distinguishes apart from the other repurposable antiviral medications on the market. As an emergency therapy in China, the drug has been approved and has been confirmed to have substantial antiviral effectiveness against SARS-CoV-2. Phase III clinical trials of Darunavir, an antiviral protease inhibitor previously used to treat HIV, are currently underway for COVID-19 (NCT04252274). Cobicistat or ritonavir might be used in conjunction with the antiviral drug to treat HIV. Studies are also being done on the efficacy of ribavirin and penicillin, two FDA-approved broad-spectrum antiviral medications.

SARS-CoV-2 may be prevented from entering host cells by a powerful MERS-CoV inhibitor, Nafamostat. One study [52] advocated the use of nelfinavir mesylate to avoid viral fusogenicity [53].In the lungs, SARS-CoV-2 may induce multinucleated giant cells with considerable syncytial growth, making it difficult for neutralizing antibodies to detect the virus' presence there. There was no significant improvement in individuals treated with umifenovir (a viral envelope membrane fusion inhibitor), a retrospective research from China found [53].

Anti-Inflammatory Drugs

There are several anti-inflammatory medications that are often used to treat the illness. Recombinant GM-CSF, such as Sargramostim, is an immunostimulant that enhances the body's natural defenses against diseases [54]. IL-6 (interleukin-6) and its receptor (IL-6R) binding is competitively inhibited in tocilizumab, a novel monoclonal antibody [55] that lowers immunological hyperactivity. At least in the severely sick, tocilizumab was shown to have a strong neutralizing impact. Sarilumab, a potential IL-6 inhibitor, is now being investigated in nations including Italy, Spain, Germany, France, Canada, and Russia.

Steroids, which may be used to alleviate inflammation, are another option for repurposing therapy. Methylprednisolone has been shown to reduce death rates in patients with ARDS, however corticosteroids should not be administered on a regular basis until their usefulness is shown. An inhibitor of the Janus kinase known as ruxolitinib has already reached the phase-III stage of clinical testing, thus it is possible that it might be a viable option in the future. However, researchers have warned that the use of these drugs to treat COVID-19 may have limits [56]. It is possible to repurpose drugs like amiodarone and verapamil (ion channel blockers) as well as CCR5, At1R inhibitors, mTOR inhibitors, sialic acid cleavers, and more [57–61].

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Antiparasitic Drugs

Patients with COVID-19 may benefit from a combination of chloroquine/hydroxychloroquine and azithromycin, according to preliminary studies. In vitro studies have shown that chloroquine inhibits the human ACE2 receptor [63]. In epithelial cells, azithromycin, despite its status as an antibiotic, may exert antiviral actions [64]. Research has shown that the medicine does not work [6]. The combination of antimalarial medicine and azithromycin in the United States and France did not demonstrate any significant benefit [7, 8].

Recent studies have shown that Suramin, an antiparasitic medicine that has been shown to block viral entry, may provide a potential treatment option [65]. Vero E6 and Calu-3 cells were shown to have a lower viral load when exposed to Suramin in an in vitro study. Another cell culture-based study found that ivermectin, an anti-parasitic drug traditionally used to treat external parasites and skin diseases, reduced SARS-CoV-2 by 5000-fold at 48 hours [66]. In spite of these concerns, the authors called for a more complete research of the drug's compassionate use.

Interferon Therapy

A laboratory experiment showed that IFN-1a might reduce SARS-CoV in the Vero E-6 cell line, which was used to treat patients during the SARS epidemic [68]. COVID-19 may benefit from treatment with interferon. It was shown that IFN-I treatment reduced viral protein and replication in SARS-CoV-2. As a result, the IFN-I therapy did not entirely eradicate SARS-CoV-2 from the body. This discovery may shed light on the mystery of why so many individuals have clinical symptoms yet show no signs of illness.

Development of New Drugs

CoV-2 proteins are being targeted by a therapeutic medicine being developed. One study used a deep docking technique to find 1000 potential ligands for the SARS-CoV-2 Mpro protein from among ZINC15's 1.3 billion molecules. Researchers [71] employed a structure-based drug design approach to find antiviral leads such ebselen and the antiviral compound thiadiazolidinone-8 (TDZD-8).

As well as these four viral proteins, helicase, RNA-dependent polymerase, and three-chymotrypsin protease, other viral proteins may be targeted for therapeutic study [72]. New COVID-19 drugs might be created by using SARS and MERS inhibitors as a starting point. [73]

As the name suggests, this technique, sometimes called "RNA interference," works by interfering with the translation of certain mRNA molecules. It might lead to the creation of novel medicines. It was found that SARS-CoV could be researched extensively utilizing

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RNAi, including small interfering RNA (siRNA). According to one research, siRNA-based RNAi technology may reduce viral multiplication in Vero E6 cells by up to 90% [74].

Plasma Treatment

Recovering COVID-19 patients' blood for convalescent plasma (CP) treatment may help critically sick patients recover more quickly. Preliminary findings from several clinical studies are encouraging [75], and more are planned to establish the treatment's safety and effectiveness. Researchers found that one 200-mL CP dosage could significantly increase or maintain neutralizing antibody concentrations at high levels, which helped eliminate viremia within seven days in 10 seriously sick adult patients [76]. According to the most recent European Commission guidelines, the ideal neutralizing antibody titer is 1:320 [77]. A scarcity of supplies means that CP therapy may not be accessible to everyone, despite its promise. In order to donate blood, patients who have recovered must produce sufficient neutralizing antibodies.

Monoclonal Antibody and Hyperimmunoglobulin

Additionally, SARS-CoV-specific monoclonal antibodies (mABs) are now being investigated on the SARS-CoV-2 virus. SARS-CoV and SARS-CoV-2 spike glycoprotein have been reported to interact to the human monoclonal antibody CR3022, which has been proven in laboratory trials to bind to the receptor binding domain (RBD) of mAb 47D11.

Hyperimmunoglobulin (H-Ig) is currently being developed and produced, with the hope that it will be more effective and simpler to use than convalescent plasma. As part of the convalescent serum, it includes human IgG. To increase production and efficacy, SAb Biotherapeutics is creating SAB-185, a recombinant polyclonal H-Ig cocktail that will be more widely available.

Mesenchymal Stem Cell Therapy

It is possible to utilised mesenchymal stem cells (MSCs) in the therapy of pulmonary epithelial cell injury and alveolar fluid damage because of their anti-inflammatory and anti-apoptotic properties [80]. A lung-specific MSC was produced by researchers at Lund University in Sweden, and it has been shown to prevent lung tissue damage[81]. Patients who received MSC therapy in a pilot study in China saw considerable improvements [82]. There has been some evidence that the use of ACE2-mesenchymal stem cell transplantation may lower the amount of hyperactive T cells while raising the immunosuppressive IL-10 [83]. It has been discovered that MSCs are resistant to SARS-CoV-2 infection and that they express more anti-inflammatory genes than normal.

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Vaccine Trials in Progress

Although work on a vaccination is well underway, it will be at least 12–18 months before a fully functional, safe vaccine is ready for broad use [84]. Replicating or nonreplicating viral vectors, nucleic-acid-based vaccines (RNA or DNA), and protein-based vaccine strategies are all options for eliciting an immune response in COVID-19 vaccine recipients. There are over 90 vaccines in development, some of which have already began their safety tests. A majority of vaccines are intended to target the viral spike protein since it is the key antibody-inducing agent [86].

It is now in phase II testing for Ad5-nCoV in China, and for ChAdOx1-nCoV in the United Kingdom. Because it boosted humoral immunity and was both safe and tolerable, the spike glycoprotein-expressing Ad5-nCoV vaccine was an important success storey [87]. There have been many additional major vaccination studies as well, including aAPC vaccine, LV-SMENP-DC, INO-4800, and mRNA-1273 [88]. Immune responses to viral antigenic proteins may be induced by injecting RNA from the antigenic protein into individuals. This is a novel vaccination type. The viral spike protein vaccine mRNA-1273 entered phase 1 clinical trials on March 16 [89], less than 10 weeks after viral genetic sequences were made public. A major advantage of mRNA vaccines is that they can be developed more quickly than other vaccines because of their ability to be translated into protein inside the cell. One of the vaccinations being studied is BCG (Bacille Calmette-Guérin). Tuberculosis was the primary reason for its creation. Humans are not protected against SARS-CoV-2 infection by BCG vaccination.

Systems for Vaccine Delivery

Certain restrictions apply to liquid intramuscular needle-and-and-syringe injections. Keeping and transporting them may be costly, and many of their qualities are temperature-sensitive. The Langerhans cell targeted delivery system (LC-TDS) is now being developed for COVID-19 [90].An immune response is triggered when Langerhans cells in the skin ingest ligands contained in liposomes from microneedle patches. Because the microneedle patches dissolve quickly, administering the vaccination is neither painful or dangerous.

The mucosal route, which delivers antigens to lymphoid tissues associated to the mucosa, is another option for administering a vaccine in the form of a solid dosage (MALT). As of this writing, oral vaccines for rotavirus, cholera, typhoid, and poliovirus are available. There is now an oral capsule version of the live attenuated typhoid vaccine Ty21a, which makes it much more convenient to take. Children and the elderly with difficulty swallowing may benefit from the use of fast dissolving tablets (FDTs) [92]. Dry vaccine coated on beads is

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used in needle-free powder injection (NFPI), such as ballistic powder injection or intradermal powder injection. There are a number of ways in which this vaccine might be delivered to individual cells [93].

Citizens' Protection Measures

It is recommended that people wash their hands often, apply disinfectants, utilise proper coughing technique, and wear a facemask in order to assist ease the problem. According to recent study, masks may assist to decrease the spread of disease. Because of this, the CDC now advises wearing a facemask or at the very least a homemade cloth cover in areas where there is widespread community-based transmission [95]. Homemade DIY masks produced using four layers of paper and a single layer of fabric were found to be able to block 95.15 percent and up to 97.14 and 99.98 percent of the virus, respectively [96]. There is no need to use surgical or N95 masks unless you are ill; they are essential supplies for front-line healthcare workers.

Touching your mouth, nose, or eyes after handling infected hands might result in the spread of COVID-19. When you consider how often people touch their faces, it is easy to see how rapidly viruses may infect a human host [97]. Hand cleanliness is the most efficient technique of infection prevention since SARS-prone CoV-2s may survive on plastic and steel surfaces for up to three days [98]. Disruption of an enveloped virus, like SARS-CoV-2, may be caused by soaps and alcohols, which break down the virus' orderly wrapping. The use of hand sanitizers containing at least 60 percent alcohol is permitted in situations when soap and water are unavailable. When making DIY hand sanitizers, you should pay particular attention to the water content since a lack of water limits the alcohol from evaporating too quickly, allowing it to interact with the virus and effectively inactivate it.

Personnel Protection in the Healthcare Industry

It is recommended that health care workers take the following measures in accordance with European standard EN 149 + A1:2009: Contact, droplet, and airborne precautions [99] are all examples of this. Doctors and nurses who come into touch with patients within a distance of two metres must wear protective gloves, masks, and aprons. People working within two metres of the aerosol generator must wear a surgical mask and eye protection (e.g. goggles or visors), while health professionals performing AGP must wear gloves, a fluid-repellent long sleeve gown, eye protection, and an FFP2/3 mask [100, 101]. Polypropylene microfibers with an electrostatic charge are used to make high-performance filtering masks FFP2, FFP3, and N95.A ten- to twenty-fold reduction in hazardous substance concentrations may be achieved using both the FFP2 and the FFP3 [102]. Prior to using PPE, healthcare

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personnel should be trained on how to use it properly and dispose of it properly, since poor practise has been linked to a high prevalence of infection among healthcare providers [100].

Lockdown

In order to contain the infection, Wuhan was put under lockdown. Lockdown enables for rapid reduction in the number of infections, giving the healthcare system more time to plan and mobilise resources in response to the pandemic [103]. One study found that without social distance, the frequency of infections in Mainland China could be significantly greater [104]. According to a modelling research [105], the R0 in Wuhan decreased from 2.35 to 1.05 in two weeks. Lockdown in the United Kingdom had a similar impact, with the R0 decreasing by 73%. As a consequence of Singapore's school closures and workplace social isolation, 99.3 percent of the population avoided infection.

It was also stated that the lockdown strategy, as well as the entire shutdown of businesses and the cancellation of domestic and foreign flights, should be implemented. In one study, researchers found that an internal travel ban or lockdown in Hubei, China, may not have been responsible for the decline in epidemics. An further analysis indicated that the complete lockdown approach used by France, Italy, Spain, and the United Kingdom did not deliver the expected effects.

The on-off lockdown strategy, however, was applied in Brazil by allowing for temporary lockdown relaxation [109]. "Smart lockdown" plans were used in the Netherlands, where many stores and companies remained open while schools, museums and other key events were shut down. People were told to keep a safe distance from one another but allowed roam around freely [110]. Sweden took a similar strategy, but with less restrictions: People could nevertheless go about their daily lives in conventional establishments like shops, cafes, and restaurants, even if athletic events and large gatherings were outlawed [111]. Since the number of deaths in Sweden remained greater than in its Nordic neighbours, the "Swedish Model" has been both hailed and criticised.

Dealing with the Second Wave

As governments throughout the world continue to relax previously imposed limitations, such as opening companies and stores and allowing travel, the danger of a second wave of infection, which would be difficult to contain, has risen. A second outbreak of disease might occur if strict restrictions are lifted too quickly. If the lockdown is eased too soon, the R0 may grow over 1 and spread throughout China according to one scenario. Epidemiologic disease modelling may play a crucial role by evaluating the likely infection

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rate status. In order to analyses and construct better models from massive volumes of data, machine learning may be utilized. [112]

Numerous countries saw an increase in disease transmission despite lockdown measures; this shows how crucial it is to do extensive testing, trace contacts and implement strict physical quarantine measures in high-risk areas in order to ensure lockdown's efficiency [113]. For the sake of addressing privacy issues, AI-derived urban intelligence models might be employed to construct an extensive surveillance programme that encrypts all collected data. To find out how many persons are immune to the virus, antibody-based serological testing should be used. The development and implementation of a "immune passport" might have a substantial impact on the transmission of disease.

Combating the Epidemic

During the epidemic, there is a flood of misinformation about COVID-19 protection and treatment. Misinformation is spreading like wildfire, causing panic and jeopardising public health efforts to contain the infection. There is an increased risk of health issues and social unrest as a result of panic purchasing, false treatments, and the propagation of disinformation. EPI-WIN (World Health Organization Epidemic Information Network) [114] is a new platform developed by Who is risk communication team to offer accurate information on COVID-19. Each of these groups has an obligation to help spread the word about the dangers of breaching the law by disseminating factual information and raising public awareness about these issues.

Conclusions

The COVID-19 pandemic has put our existing knowledge, rules, and regulations to the test, forcing us to take drastic steps in some regions of the world, including complete lockdown. COVID-19's high mortality toll has highlighted the importance of quick research and distribution of current knowledge. COVID-19 diagnostic and treatment options were summarized in this study, which also reviewed preventative and control measures in light of a projected second wave of infection.

As governments hunt for a solution, they should use current scientific approaches to create models that forecast community-based consequences before making choices. It is essential that healthcare workers and public alike have access to relevant resources and are kept up to speed on new developments. More testing and contact tracing, prompt distribution of epidemic information, and the provision of supportive medicines for patients are all crucial at the government level.

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