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Review Article

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A Global Perspective on the COVID-19 Pandemic: Analyzing Symptoms, Spread, and Countermeasures: A Review

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Abstract
An infectious disease called coronavirus disease (COVID-19) is brought on by the SARS-CoV-2 virus. In December 2019, Wuhan, China, reported the first instance of its kind. The COVID-19 pandemic was caused by the disease's rapid global spread. The symptoms of COVID-19 might vary, but most frequently include fever, exhaustion, coughing, dyspnea, taste and smell loss, and breathing difficulty. After being exposed to the virus, symptoms can appear one to fourteen days later. Many tests, including RTR-PCR and chest scanning, are carried out for the diagnosis. Initially for the treatment drugs like remdesivir, ritonavir, favipiravir, tocilizumab.Several Numerous COVID-19 vaccinations have been authorised and made available in a number of nations, and they are highly recognized for their contribution to slowing the virus's spread as well as lessening its severity and fatality. The COVID-19 vaccination has two main side effects: myocarditis and thrombosis. Other side effects include headache, fever, discomfort, and dyspnea.

Keywords: Coronavirus, RT-PCR, Vaccine, Myocarditis, Thrombosis

Introduction

The family Coronaviridae contains coronaviruses, which infect the respiratory systems of birds and animals like camels, bats, and masked palm civets [1]. The severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is the virus that causes the highly contagious coronavirus disease 2019 (COVID-19). The globe has suffered greatly as a result of COVID-19 [2]. World Health Organisation (WHO) issued a global emergency declaration on January 30, 2020, in response to the new coronavirus epidemic in Wuhan, China's Hubei province [3]. The WHO announced on February 24, 2020, that SARS-CoV-2 might potentially spread over the world and spark a pandemic outbreak [4,5]. Afterwards, the WHO announced the COVID-19 pandemic on March 11, 2020 [6]. A member of the coronavirus family, coronaviruses are positive single-stranded RNA viruses that fall into four genera based on genetic classification: α, β, γ and δ coronavirus [7]. Since the start of the epidemic, five SARS-CoV-2 VOCs have been discovered, according to the WHO's epidemiological bulletin:

- **Alpha (B.1.1.7):** The first version of concern, which was reported in late December 2020 in the UK [8].
- **Beta (B.1.351):** December 2020 saw the first reports of it in South Africa [8].
- **Gamma (P.1):** Initially reported in early January 2021 in Brazil [8].
- **Delta (B.1.617.2):** December 2020 saw the first report of this in India [8].
- **Omacron (B.1.1.529):** Initially detected in November 2021 in South Africa [9]

Humans have been exposed to four corona viruses: HKU1, NL63, 229E, and OC43. These viruses often cause moderate respiratory illnesses [10].

Symptoms

The most typical symptoms include myalgia, dyspnea, fever, dry cough, pneumonia, and lower respiratory tract infection. It is less frequent to experience headache, disorientation, sore throat, haemoptysis, runny nose, chills, muscle and chest discomfort, rhinorrhea, diarrhoea, nausea, and vomiting [11]. When the illness first started, fever (40 [98%] of 41 patients), cough (31 [76%]), and myalgia or exhaustion (18 [44%]) were the most frequent symptoms; Sputum production (11 [28%] of 39), headaches (three [8%] of 39), haemoptysis (two [5%] of 39), and diarrhoea (one [3%] of 39) were less frequent symptoms. More than half of patients (22 [55%] of 40) developed dyspnoea. The median duration from illness onset to dyspnoea was 8·0 days (IQR 5·0–13·0). The median time from onset of symptoms to first hospital admission was 7·0 days (4·0–8·0), to shortness of breath was 8·0 days (5·0–13·0), to ARDS was 9·0 days (8·0–14·0), to mechanical ventilation was 10·5 days (7·0–14·0), and to ICU admission was 10·5 days (8·0–17·0;) [12]. It is now understood that individuals might have the virus yet not exhibit any symptoms. Nonetheless, the majority of COVID-19 cases have favourable prognoses, minimal symptoms, and recovery after 5-7 days in the hospital with supportive care [13].

Spread of COVID-19

Every age group is vulnerable. Large droplets released by symptomatic patients when they cough and sneeze can spread the infection, however asymptomatic individuals can potentially contract the infection before symptoms appear [14].

A single person directly infecting a huge number of others is referred to as "superspreading"; in the Singapore outbreak, out of the first 201 probable cases identified, 103 were infected by just five source cases [15].Exposures from a single sick healthcare worker from Guangdong Province, China, have been linked to a global outbreak of severe acute respiratory syndrome (SARS). [16]. The Wuhan Municipal Health Commission (WMHC) announced 27 instances of viral pneumonia on December 12, 2019, seven of which were considered seriously ill [17]. Between January 7 and January 26, 2020, 14 patients with fever (≥37.3°C) who had just returned from Wuhan were diagnosed with Covid-19 (the SARS-CoV-2 disease) [18].

Diagnosis

SARS-CoV-2's emergence and spread have created a serious threat to public health around the world. Tests that are quick and accurate are required to confirm infections. Clinical chest CT scanning, which includes chest X-rays, laboratory diagnosis (Nucleic acid RT-PCR, RT-LAMP, qRT-PCR), protein testing, point-of-care testing, and fluorescence-based biosensors assays are now employed as diagnostic techniques to confirm COVID-19 [19].

RT-PCR- The primary goal of the RT-PCR test is to identify any viral nucleic acid or fragments in the patient's upper respiratory tract. Reducing false-positive or false-negative situations requires increasing test sensitivity and specificity [20].

Chest CT - A novel coronavirus (COVID-19) pneumonia diagnosis was suggested by the peripheral, multilobar patches of ground-glass opacity sign seen on chest CT scans [21].

rqRT-PCR - Since it has a higher sensitivity than traditional RT-PCR and a higher specificity, real-time quantitative reverse transcription-PCR, or rqRT-PCR, is widely used for coronavirus identification. Researchers have used a variety of techniques to enhance real-time RT-PCR assays. One-step rqRT-PCR tests are used by the US Centres for Disease Control and Prevention (CDC) to identify SARS-CoV-2. The fluorescence quenching probe is broken during amplification, resulting in the real-time production of a fluorescent signal [22].

Treatment

The National Institutes of Health (NIH) states that the two primary mechanisms underlying the pathogenesis of COVID-19 are the virus's replication during the early stages of the illness and the immune system's dysregulated reaction to SARS-CoV-2, which results in systemic tissue damage during the disease's later stages. Therefore, the

guidelines recommend using immunomodulators later in the illness and antiviral drugs to stop viral replication in the early stages. [NIH COVID-19 Treatment Guidelines]

Remdesivir - Broad-spectrum antiviral nucleotide prodrug Remdesivir (RDV, GS-5734) exhibits strong in vitro antiviral activity against a variety of RNA viruses, including respiratory syncytial virus (RSV), Nipah virus (NiV), Marburg, MERS-CoV, SARS-CoV, and Hendra virus. [23].

Favipiravir - Favipiravir is a prodrug of a purine nucleotide that inhibits viral replication and is an RNA polymerase inhibitor. It has shown action against SARSCoV-2 with a high EC50 of 61.88 μM/L. Different dosing schedules have been suggested according to the kind of infection indicated; for COVID-19 treatment, a loading dose of 2,400–3,000 mg every 12 hours (two doses) has been examined, followed by a maintenance dose of 1,200–1800 mg every 12 hours. [24].

Tocilizumab - For the therapy of COVID-19 patients, tocilizumab (TCZ), a humanised monoclonal antibody that targets the interleukin-6 (IL-6) receptor, has been suggested. Infections with bacteria or fungi were noted in 13% of tocilizumab patients and 12% of patients receiving standard therapy. Continuous controlled trials will be necessary to confirm safety and efficacy [25].

Vaccination

As of August 13, 2021, there were 138 COVID-19 vaccine candidates under development; of them, 21 were authorised globally for use in emergencies. The way these vaccine candidates work depends on the immune system's reaction to the virus's essential components, which include DNA, RNA, or protein [26]. The Spike protein, which is present on the surface of SARS-CoV-2, is the primary antigenic feature that causes the virus particle to begin its pathogenicity [27].

In the seven days following a two-dose vaccination, the vaccine was 90.5% effective in preventing COVID-19, compared to 52.4% effectiveness between two doses [28].

Table 1: List of authorized COVID-19 Vaccines

S. No	Adenovirus Vector Vaccines	Inactivated Virus Vaccines	Subunit Vaccines	RNA and DNA Vaccines
1	Oxford–AstraZeneca	Sinopharm BIBP	Novavax	Pfizer–BioNTech (original)
2	Janssen	CoronaVac	Sanofi–GSK	Pfizer–BioNTech (omicron)
3	Sputnik V	Covaxin	Abdala	Moderna (original)
4	Sputnik Light	Valneva	EpiVacCorona	Moderna (omicron)
5	Convidicea	Sinopharm WIBP	Zifivax	
6	iNCOVACC		Soberana 02	

Side effects of COVID-19 Vaccines

The COVID-19 vaccination has side effects that include tinnitus, anaphylaxis, myocarditis, pericarditis, blood clots, and hearing abnormalities. Anaphylaxis is a relatively rare occurrence, with just a small fraction of individuals experiencing adverse symptoms following immunization [29].

Cardiovascular Effect

Myocarditis/pericarditis is the most commonly documented cardiovascular comorbidity for mRNA vaccines among reported adverse responses, especially after the second vaccination. The illness can cause mild, asymptomatic heart inflammation, severe heart failure, or even death [30].

Myocarditis cases after new Emergency Use-Authorized vaccines were reported recently, raising concerns about a potential pattern of side effects [31]. 573 cases of myocarditis and pericarditis following two doses of an mRNA have been reported, with a preference for affecting young teenage men, according to reports from the Centres for Disease Control and Prevention and data from the Vaccine Adverse Event Reporting System (VAERS) (data through May 31, 2021). VAERS is notified of a rate of 16.1 per 1 million vaccination doses, or 0.00161%, in the 16–39 age range.

Although estimates vary from 7 to 23%, the actual rate of cardiac involvement in SARS-CoV-2 infection is unknown [32].

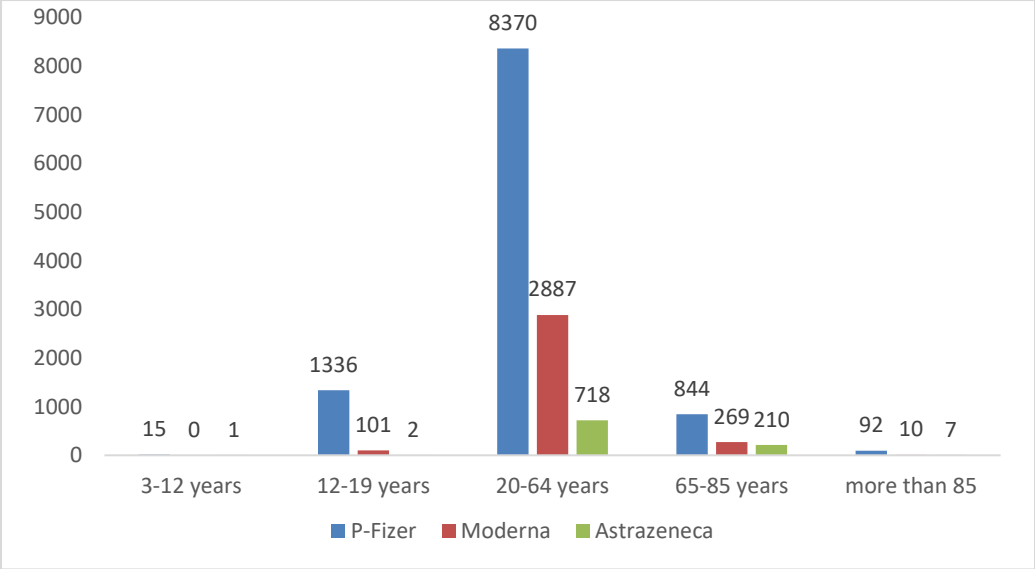

Figure 1: Myocarditis cases after COVID 19 vaccination

Overall, more than 36 million vaccine doses were administered in the reported studies. In these reports, 1026 patients were identified to have developed myocarditis after being vaccinated against COVID-19: 85 % were male, and 15 % were female. Out of 1026 patients, data regarding the vaccination dose time point (first or second dose) was available for 781 patients. Based on that, 19 % of patients (n = 146) developed myocarditis after receiving the first dose of the vaccine, while 81 % (n = 635) received the second dose of the COVID-19 vaccine in the included study population [33].

Thrombosis and Thrombocytopenia

Specifically within the adenoviral platform, COVID-19 vaccinations have been linked to the development of thrombotic thrombocytopenia. Among 604 million doses of SARS, VAERS recorded 5052 cases of unexplained thrombosis, 4144 cases of pulmonary embolisms, 3001 cases of deep veinous thrombosis, 1195 cases of thrombocytopenia's, and 233 cases of cerebral venous sinus thrombosis. -Vaccines against CoV-2 in the US [34].

Conclusion

Global health, economy, and communities have been greatly affected by the COVID-19 pandemic, which was caused by the SARS-CoV-2 virus. The clinical symptoms, transmission patterns, and worldwide response activities of the pandemic have all been well covered in this review paper. We have reviewed the most recent studies on the virus's immunology, pathophysiology, and epidemiology, and we have looked at how effectively certain public health treatments, like as testing, vaccination, and contact tracing, have worked.

The COVID-19 pandemic has shown how critical it is to react to new infectious illnesses by working together, doing research quickly, and basing decisions on evidence. As part of the international reaction, vaccinations have been developed and distributed in large quantities; millions of doses have been provided throughout the globe, and many vaccines have been approved for emergency use.

Concerns about cardiovascular comorbidities such myocarditis and pericarditis, which might be adverse effects of COVID-19 vaccinations, have been brought to light by the pandemic. Although these adverse effects are not common, they show how important it is to keep an eye on COVID-19 vaccinations and do study to make sure they are safe and effective.

Finally, although the COVID-19 pandemic has posed serious threats to world health, it has also spurred more international cooperation and scientific advancement. To minimize its effects and safeguard public health, the pandemic must be closely monitored, adjusted to new information, and decisions must be founded on evidence.

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