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South Africa's Battle Against COVID-19 Pandemic

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Abstract: South Africa is one of the countries heavily impacted by the COVID-19 pandemic. As of 9 January 2022, over 3.5 million confirmed cases of COVID-19 have been reported, and 93 551 deaths have been recorded in the country. The South African healthcare system faced a lack of essential resources and financial burdens by outbreaks and its new variant of concern (VOC), the Omicron. The local government has done as much as possible to control the spread of the virus in the local communities by quickly implementing lockdowns and enforcing movement restrictions. An eight-stage program to combat COVID-19 and a national vaccination strategy was also developed soon to manage the Coronavirus spread in the country better. As the country struggles to secure and administer COVID-19 vaccines to its people, the Coronavirus has been rapidly mutating and causing new waves of infections within the nation. The COVID-19 experience in South Africa demonstrates the great importance of equitable access to medicine, medical equipment, and vaccines globally. Equitable access to these essential resources is critical to prevent the virus spread across borders and reduce mortality rates worldwide.

Keywords: South Africa; COVID-19; coronavirus; vaccination, pandemic

1. Introduction

In 2019, a deadly virus causing a debilitating respiratory disease was discovered in Wuhan, China, causing the country to lockdown with strict rules and regulations[1,2]. The virus was later identified as the novel Coronavirus, SARS-CoV-2, which is now widely known as COVID-19[3]. When diagnosed with COVID-19, the individual could present asymptomatic or present symptoms similar to the flu. For instance, the individual may experience mild to severe symptoms such as fever, cough, difficulty breathing, fatigue, myalgia, sore throat, and loss of taste or smell[4,5]. Since the emergence of the coronavirus, countries across the globe have put in vigorous efforts to overcome the pandemic. However,

the rapid spread of the virus and its subsequent mutations has had detrimental effects on public health globally[6–12]. At the time of writing, over 296 million confirmed cases of COVID-19 have been reported worldwide, with over 5.4 million deaths recorded[13]. Nevertheless, effective vaccines against the Coronavirus have been deployed internationally to reduce the severity of the disease if infected and prevent the further spread of the virus[14–16]. Although, to date, over 3.8 billion individuals are fully vaccinated globally, data shows that vaccination rates in the African continent are significantly lower than in its neighboring regions[13]. Vaccine access is still a challenge in the continent as global equity in vaccine distribution is yet to be achieved[17]. In addition, there is a lack of capacity to manufacture large quantities of vaccines within the continent, even though it is essential to maintain public health. Countries in Africa currently heavily rely on external donors such as GAVI or UNICEF to supply COVID-19 vaccines[18]. These vaccines could only provide a limited number of vaccinations as a supply for inoculations was already scarce[19]. Pharmaceutical companies were under public scrutiny as they prioritized richer countries to supply the vaccines, which indirectly led to the vaccination programs in poorer countries such as those in Africa being delayed [17, 19]. Among all the countries in the African continent, South Africa is most heavily affected by the COVID-19 pandemic as over 3.5 million individuals have been infected, and over 93,000 deaths have been recorded[20,21].

Since the first case of COVID-19 in South Africa, the local government took quick action in closing its borders and implementing lockdowns with strict rules to break the chain of the virus spread. Despite the challenges faced by the local government in controlling the disease, they continue to be transparent when keeping the people informed on the latest COVID-19 situation within the country. Testing for the SARS-CoV-2 virus has also increased to detect the virus at earlier stages. Individuals are encouraged to register for the national vaccination plan to get the vaccine as soon as possible. The past two years have been tumultuous for the people in South Africa as they have experienced multiple waves of the coronavirus. Disease management has been complex due to the shortage of vaccines and new virus variants[22,23]. The consequential effects of COVID-19 in South Africa and the distribution of vaccines within the region show the importance of equitable access to vaccines for all global citizens.

2. Combating COVID-19 in South Africa

Once COVID-19 was announced a global pandemic, the South African government had planned to combat the pandemic in an overlapping eight-stage program[24] (Figure 1) before any cases were detected within the country. During the preparation stage, the public was educated on the coronavirus disease and ways to prevent the spread. Surveillance was also being done to detect any active cases within the country. The first reported case of COVID-19 in South Africa involved a citizen returning from Italy to Gauteng with his wife and eight others on 1 March 2020[25] (Figure 2). The patient experienced the typical symptoms of COVID-19 and was practicing self-isolation. A few days later, a woman from the same traveling group as the first patient also tested positive[26]. The local government quickly traced down any contacts of the traveling group, performed COVID-19 swab tests, and implemented home-based

quarantine for these individuals[26]. Ten days after the first incidence, stage two of the national COVID-19 response began, focusing on primary prevention of the disease.

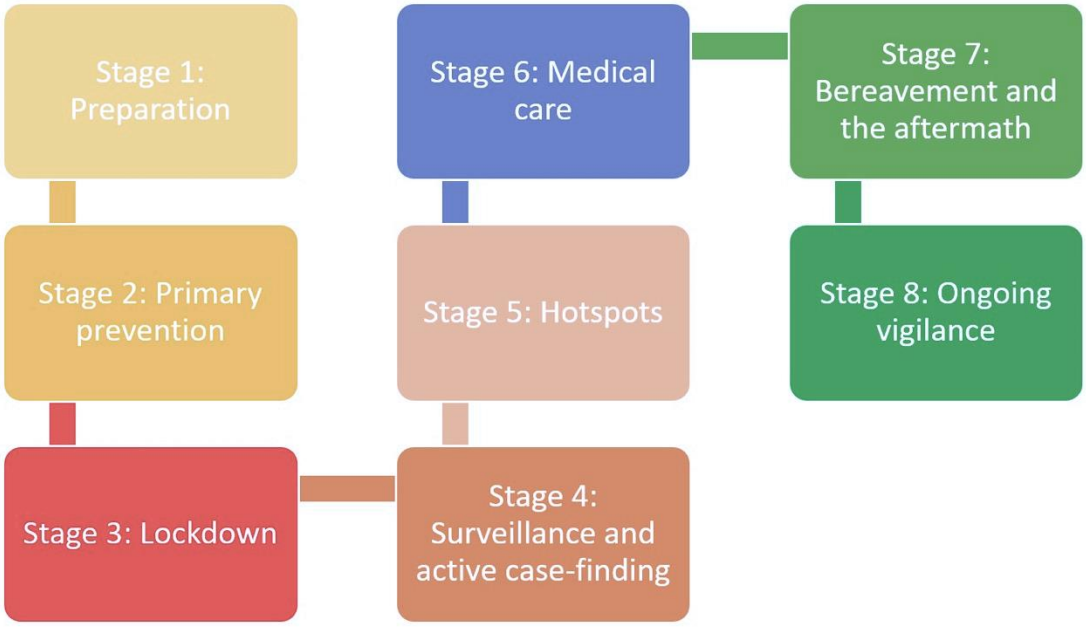

Figure 1. South Africa eight-stage program to combat COVID-19[24].

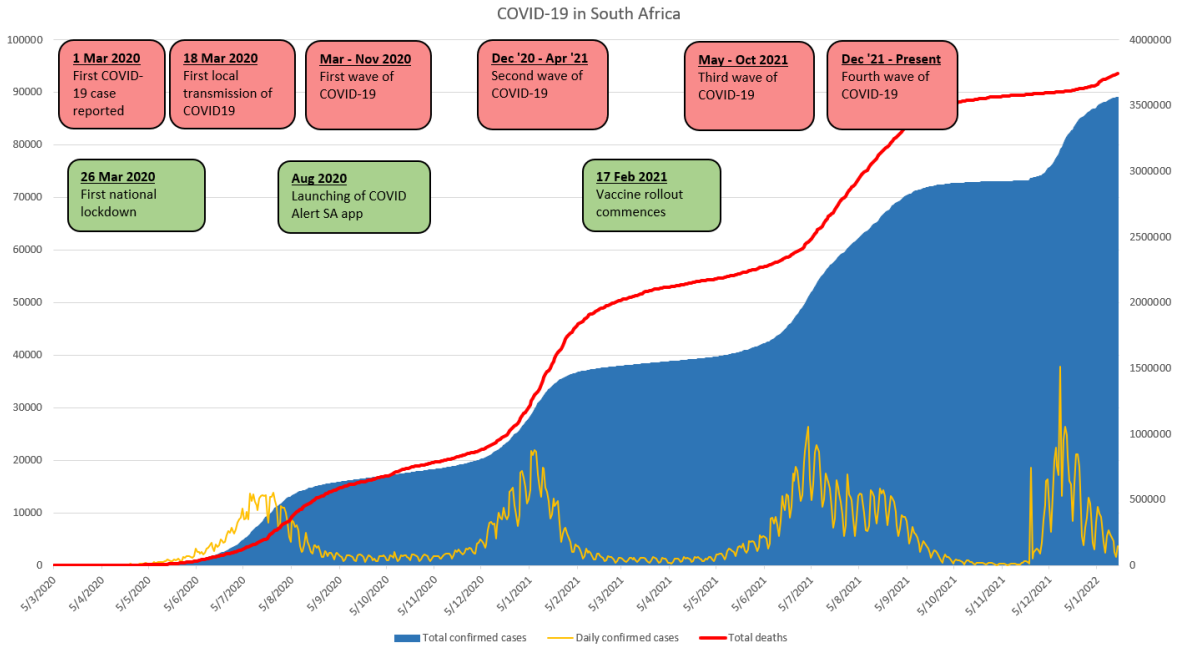

Figure 2. COVID-19 timeline in South Africa [20].

The public was urged to practice social distancing and hand-washing, closed schools, and international travel was prohibited[24]. More confirmed cases unrelated to the traveling

group from Italy began to emerge in other provinces in South Africa, and these cases involved individuals returning from other countries[27]. Confirmed cases of COVID-19 continued to rise, and on 18 March 2020, the first local transmission of the respiratory disease was documented[28]. By the end of March 2020, the virus had spread across all nine provinces in South Africa[20]. The authorities are working round the clock towards tracking and tracing the source of the infection within the community. International flights were suspended as a preventative measure to limit the entry of travelers from abroad into South Africa. The government then implemented stage three of the COVID-19 response, a strict level five (L5) lockdown in South Africa to control the spread of the virus in the country[29]. Every individual who was not an essential service worker was to stay at home, and they were only allowed to leave home to buy food or medicine, seek medical care, or collect a social grant. Those who tested positive for the virus would be placed in quarantine, and all businesses were closed, with essential services being the exception[29]. The primary purpose of the lockdown was to flatten the transmission curve of COVID-19 to minimize the negative impacts of the disease in terms of public health and the country's economy. Since the lockdown, testing for the SARS-CoV-2 virus was done in over 47,000 individuals, and mobile testing units have been organized for easier access to testing facilities. There was also an increase in army patrols to enforce the rules during the lockdown, and free hand sanitizer was being distributed to the citizens. In April 2020, South Africa had commenced stage four of the program, which is active case-finding via contact tracing for contacts of COVID-19 positive individuals. Lockdown measures started to loosen to level four in May 2020, whereby curfews were implemented for each individual and permitted businesses were only allowed to open until 8 pm. Interprovincial travel was still restricted, schools remained closed, and social gatherings were prohibited except for funerals, workplaces, or buying goods[30]. Later in June 2020, the lockdown measures would be further eased to level 3, permitting more businesses to open within specific hours, and schools would be open. Stringent social distancing measures were still in place socially and in workplaces to address the high risk of transmission in these settings[31,32].

The confirmed cases of COVID-19 continued to rise and reached their first peak in July 2020, when more than 450,000 cases were reported, and the death toll had reached 8,005 (Figure 2). At this point, stages five to eight of the COVID-19 response started as hotspots were quickly identified, medical care was promptly given to those infected, and the nation was prepared to deal with deaths due to COVID-19. The country was also on high vigilance to detect any new outbreaks or virus variants and ready to distribute vaccines whenever they became available[24]. The number of confirmed cases decreased with the lockdown measures in place, and the curve flattened in August 2020. Thus, it was decided that the lockdown restrictions were to move to level two, but the national state of disaster was extended by another month[33,34]. During this phase, individuals had more mobility for family visitations, gatherings, and leisurely activities. More businesses, including bars and taverns, were allowed to open within pre-determined hours, and occupants of these premises were to maintain social distancing and mask-wearing practices. Inter-provincial travel was now permitted, and national

borders were only partially open to those who complied with the specified protocols[34]. The COVID Alert SA app was also launched in August to trace individuals who tested positive for COVID-19[35]. The restrictions were further lowered to level one when the COVID-19 situation in South Africa became more stabilized[36,37]. Larger gatherings were now allowed as long as attendees were less than 50% of the venue capacity. Venues for social or leisurely activities were also allowed to operate at 50% of the total capacity. In addition, international travel was now permitted for business purposes, and travelers would need to be COVID-19 negative to cross country borders.

Towards 2020, yearend school parties were held frequently, and the festive season increased travelers between provinces[38,39]. The parties were later identified as super-spreaders events for the Coronavirus, which subsequently led to a spike in COVID-19 cases in South Africa and initiated the second wave of infections. Hotspots for the Coronavirus were once again put under stricter restrictions, and although participants of the yearend school parties were immediately put in quarantine, the damage had already been done. The situation was worsened as a new variant of SARS-CoV-2, the B.1.351 (Beta) variant with higher transmissibility, was detected in South Africa[40]. COVID-19 cases and deaths continued to climb, overwhelming the local healthcare facilities, and finally, over one million patients were recorded on 27 December 2020[20]. The South African president quickly announced a partial level three lockdown for two weeks to reduce the virus spread during the holiday season. A curfew was implemented between 9 pm to 6 am, sales and transport of alcohol were banned, public amenities were to be closed, and masks were to be worn at all times in public[41]. Shortly after the temporary lockdown, a vaccine rollout strategy was announced in early January 2021, with vaccines sufficient only to be administered to 10% of the population in South Africa.

Nevertheless, the government secured more vaccines to be delivered as soon as possible. Frontline healthcare workers were prioritized for the vaccination during the first phase. In contrast, phase two would prioritize essential workers, persons in congregate settings, elderly over 60 years old, and adults above 18 years old with co-morbidities. Lastly, phase three would distribute the vaccines to individuals above 18 years old. The vaccine rollout aimed to vaccinate approximately 67.25% (40.35 million) of the population by the end of phase three[42]. In February 2021, the first shipment of one million doses of the Oxford-AstraZeneca vaccine (Vaxzevria) arrived in South Africa. Still, the rollout was put on hold as the vaccine only provided minimal protection against the Beta variant of the virus, which accounted for most infections in the country[43,44]. The Johnson and Johnson (Janssen) vaccine arrived in South Africa. Hence, the vaccine rollout commenced on 17 February as planned, with nine million more vaccine doses to arrive in the months to come[45]. As the second wave of COVID-

19 infections began to dwindle and more vaccines were administered, the government decided to scale back lockdown restrictions to level one[31]. By the end of March, the country had successfully vaccinated 100,000 people against COVID-19, and the number of daily confirmed cases was not fluctuating wildly. This continued up until May 2021 when new variants, B.1.1.7 (Alpha) and B.1.617.2 (Delta) of the Coronavirus were detected in South Africa[46], and a spike in COVID-19 infections soon followed.

South Africa was now facing its third wave of COVID-19, and the government quickly implemented tighter lockdown restrictions at level two, beginning on 31 May 2021. In May, Pfizer delivered its first COVID-19 vaccines (Comirnaty) to South Africa. These vaccines were quickly administered to the public as per the vaccination plan, and over 960,000 people have received one vaccine dose by the end of May[47]. However, the lockdown restrictions escalated to level 4 in June as the virus spread and cases rapidly surged[48]. The level four lockdown continued into July as the virus spread within the local communities[49]. As of July 2021, over two million individuals tested positive for COVID-19 in South Africa, and over 70,000 deaths have been recorded since the pandemic in 2020[20]. By enforcing the lockdown restrictions, South Africa managed to control the third wave of infections, and the number of daily cases gradually decreased. This prompted the government to ease the rules to level 1 in October[50]. The Minister of Health then announced a reduction in cases and hospitalizations, and there were only 5000 people in the hospital with COVID-19 as of 15 October 2021. Positivity rates and reported deaths also decreased across the country, putting the country on the right trajectory towards recovery from COVID-19 outbreaks.

The vaccination program had delivered 20 million doses of vaccines to individuals, with at least 13.8 million people receiving the first dose of vaccines. The vaccines currently used in South Africa's national vaccination program against COVID-19 are Janssen from Johnsons and Johnsons and Comirnaty from Pfizer. The Janssen vaccine consists of adenovirus, which acts as the viral vector to deliver a gene coding for the spike protein of SARS-CoV-2 into the host cell. In contrast, Comirnaty utilizes the mRNA from SARS-CoV-2 that codes for the vaccine's spike protein, which is injected into the host. As the genetic information is delivered to the host cells, spike proteins of the Coronavirus will be produced and detected by the host's immune cells, triggering an immune response. During this process, the immune system recognizes the spike proteins, and in future infections, antibodies and immune cells will be deployed to protect the host from the virus[51]. These vaccines have been proven to reduce the severity of the disease and control the virus spread in South Africa[52–54].

The Ministry of Health was also ready to open up vaccinations for children between 12–17 of age to control the virus in schools. However, scientists in South Africa discovered a new heavily mutated coronavirus, now known as the B.1.1529 (Omicron) variant, in late November 2021[55]. President Cyril Ramaphosa of South Africa later announced that despite the presence of the Omicron variant, there would be no changes to the current alert level. However, everyone should still abide by the enforced restrictions to prevent the transmission of the virus. The country was now taking a new approach towards combating the Coronavirus by increasing vaccination rates instead of reimplementing stricter restrictions[56]. 45.84% of the adult population have received at least one vaccine dose, and 40.52% of adult South Africans are fully vaccinated against COVID-19. Even with the vaccine rollouts, the emergence of the Omicron variant still led to the fourth wave of COVID-19 infections in Africa, with a record high of over 20,000 confirmed cases within a day in December[20,57]. A study done in South Africa found that during the fourth wave of infections, there were significantly fewer hospital admissions for COVID-19. The conditions were less severe than the cases from previous waves in the country[58,59]. By the end of December 2021, the peak of the fourth wave had passed and daily confirmed COVID-19 cases were declining. Thus the government lifted more restrictions, including removing the curfew[60]. As the fourth wave continues to die down into the new year, South Africa has amassed over 3.5 million COVID-19 cases and 93,551 deaths since the start of the pandemic[61].

3. Conclusion

The South African government took the necessary measures to prevent the spread of the virus, such as implementing lockdowns and restrictions to the public. COVID-19 tests were being done diligently at a mass scale to detect infections and new variants at an earlier stage. Individuals who tested positive for the virus were also put in quarantine, and medical care was also given. Moreover, contact tracing via the COVID Alert SA app was also influential in detecting the close contacts of infected individuals, and the connections were notified to get themselves tested for the virus at nearby testing facilities[35]. A national vaccination strategy was also quickly planned to achieve herd immunity within South Africa as soon as possible. Although continuous efforts have been put to control the virus, the emergence of new variants and super-spreader events still caused multiple outbreaks. Now, almost a year has passed since the first COVID-19 vaccine rollout in South Africa, but only 40.52% of the adult population has been fully vaccinated[62]. This low percentage of people with immunity against the disease can be attributed to the issues surrounding procuring enough vaccines, logistical obstacles of delivering them, and vaccine hesitancy among the population[63–65]. Besides, the lockdowns during the pandemic in South Africa greatly affected the already weak public health care and further burdened the healthcare management systems with pre-existing problems.

The country was already dealing with other infectious diseases such as HIV and malaria pre-covid. HIV transmission has accelerated among the poor and young women during the lockdown. Psychological problems have also been more frequently reported during the long-term lockdowns[66]. The government has also been scrutinized for easing restrictions because of the lack of available resources and financial means to keep the country in lockdown[66]. The negative impacts of COVID-19 on the healthcare system in South Africa depict the importance of having a good and well-prepared health system. With well-managed healthcare systems, it becomes less likely the system would get overwhelmed during an outbreak, and patients with other chronic or debilitating diseases can still receive necessary healthcare. The COVID-19 situation in South Africa also highlights the importance of sharing knowledge, technology, resources, medical equipment, and medication among countries worldwide. This global pandemic cannot be eradicated if any country is behind in vaccination rates. SARS-CoV-2 has been rapidly mutating, and the equal distribution of vaccines globally is the solution to prevent the emergence of new variants and outbreaks that could potentially cause severe disease and high mortality rates shortly.

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