Scientific Research Publishing

Pharmacology & Pharmacy, 2022, 13, 11-33
https://www.scirp.org/journal/pp
ISSN Online: 2157-9431
ISSN Print: 2157-9423

Zambia's Response to the COVID-19 Pandemic: Exploring Lessons, Challenges and Implications for Future Policies and Strategies

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How to cite this paper: Mudenda, S., Chileshe, M., Mukosha, M., Hikaambo, C.N., Banda, M., Kampamba, M., Mwila, K., Banda, D.C., Mufwambi, W. and Daka, V. (2022) Zambia's Response to the COVID-19 Pandemic: Exploring Lessons, Challenges and Implications for Future Policies and Strategies. *Pharmacology & Pharmacy*, **13**, 11-33.
https://doi.org/10.4236/pp.2022.131002

Received: December 6, 2021
Accepted: January 27, 2022
Published: January 30, 2022

Abstract

The coronavirus disease 2019 (COVID-19) pandemic is a global public health problem that has affected the globe in different ways. There is little information published on the challenges and lessons learnt in responding to the COVID-19 epidemic in Zambia. **Objective:** To establish Zambia's response, lessons and the challenges experienced in the fight against COVID-19. **Results:** Since the emergence of COVID-19, Zambia has experienced three waves, with the third wave being the most severe. The Zambian government responded positively and effectively to all three pandemics with the help of cooperating partners. Zambia adopted the World Health Organization (WHO) recommended prevention methods such as hand hygiene, masking up in public, physical distancing, avoiding crowded areas and staying at home to prevent the further spread of the disease. Additionally, surveillance of COVID-19 was strengthened, which led to the early detection of cases. Besides, there has been a strong call for all Zambian adults to receive the COVID-19 vaccine as a way of controlling the epidemic. However, since the launch of the COVID-19 vaccination programs, there has been a high level of vaccine hesitancy, causing Zambia to fall below the 10% of the adult population required to be vaccinated. **Conclusion:** The Zambian government put in place effective strategies in the fight against COVID-19. However, a lack of resources, misinformation, myths and vaccine hesitancy posed challenges in the fight against COVID-19 in Zambia. There is a need for continuous public education and sensitization on COVID-19 and the importance

of vaccinations.

Keywords

COVID-19, COVID-19 Vaccines, Vaccine Hesitancy, Pandemic, Wave, Surveillance, Zambia

1. Background

Like many other African countries, Zambia, a developing country in the southern part of Africa, is plagued by infectious diseases such as HIV/AIDs, tuberculosis, malaria, and diarrhoeal diseases [1]-[7]. The infectious disease burden has continued to negatively affect the healthcare system of Zambia. Besides, Zambia faces a burden of non-communicable diseases such as cancer, diabetes, and hypertension [8] [9] [10].

Disease outbreaks are a major concern for public health globally because they cause devastating effects on humans [11]. Previous respiratory tract infections that were declared pandemics include the Middle East Respiratory Syndrome (MERS) of 2003 and the influenza A H1N1 of 2009 [12] [13]. MERS was caused by a coronavirus that was transmitted via inhalation of respiratory droplets from a sick person [12] [13]. Similarly, influenza is transmitted mainly via inhalation of respiratory droplets from infected individuals [14] [15]. The previous pandemics caused increased morbidity and mortality globally.

The coronavirus disease 2019 (COVID-19) is a global public health problem found in China in 2019 and is caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) [16] [17]. It was declared a global pandemic by the World Health Organisation (WHO) on 11th March 2020 after it had affected several countries [18] [19] [20] [21]. SARS-CoV-2 is transmitted mainly via inhalation of droplets or aerosols produced by infected persons after they cough or sneeze [22]. It presents with many clinical features, including headaches, fever, cough, sore throat, sneezing, body weakness, general malaise, diarrhoea, nausea, vomiting, and loss of taste [23] [24] [25]. Similarly to previous pandemics caused by respiratory tract infections, COVID-19 has caused increased morbidity and mortality. As of 29th November 2021, there have been 210,150 confirmed cases and 3667 deaths in Zambia. Despite recording fewer cases and deaths than other countries, this still shows the burden that COVID-19 has inflicted on the Zambian healthcare system and public health.

This paper was written to provide a perspective that with different COVID-19 waves, a modification in response mechanisms may be required to account for the different presentations of each wave to the following [26]. Many lessons have been learnt through the challenges experienced during the first, second and third waves of COVID-19 in Zambia. This paper may be used in the preparation and response to future COVID-19 waves and related pandemics.

2. Outbreak and Response to the First Wave of COVID-19 in Zambia

Zambia reported its first case of COVID-19 on 18th March 2020, which marked the beginning of the first wave of COVID-19 in Zambia [18] [27]. Following the first two cases that were reported, an increase in community transmission was recorded. Due to the fear of the pandemic worsening, the government of the Republic of Zambia enforced a partial lockdown that led to the closure of schools, colleges, and universities on 20th March 2020 [28]. This was instituted as a way to contain the pandemic. Similar measures were reported in other countries [29] [30] [31] [32] [33]. The closure of schools, colleges, and universities meant that learners had to learn via online platforms [34]. However, the majority of learners could not afford ICT devices such as smartphones, laptops, and tablets [34]. Furthermore, limited access to the internet and power outages made online learning difficult for many students, particularly in rural areas.

Lockdown involves a set of measures aimed at reducing the transmission of COVID-19 that are mandatory, applied indiscriminately to a general population, and involve restrictions on the established pattern of social and economic life [35]. Lockdowns are beneficial in preventing the spread of diseases because the risk of exposure to pathogens is reduced [36]. Lockdowns are one of the key methods used to reduce the transmission of SARS-CoV-2 by cutting person-to-person interactions and hence transmission [37] [38] [39] [40] [41]. Studies have revealed that lockdowns are an effective way of controlling the spread of COVID-19 in communities [42] [43] [44] [45]. This also suggests that lockdowns are an effective measure to stop both the increase in the number of new cases and the number of deaths [45]. People significantly adjust their behaviour in response to partial or regional lockdowns, which are as effective as stricter measures [46] [47]. In Zambia, a lockdown was well implemented and helped in the response to the first wave of the pandemic [48]. Therefore, the move by the government of the Republic of Zambia to institute a partial lockdown was necessary and effective in containing the epidemic.

Further strategies by the government of the Republic of Zambia included the implementation of wearing of face masks in public, physical distancing, washing of hands adequately, hand sanitising, wearing of personal protective equipment, mass testing, self-isolation for those who experienced symptoms, and quarantine for those that tested positive for the disease. Following the global increase in cases of COVID-19, Zambia took a proactive stance by implementing measures thought to prevent the spread of the disease, even before a single case was reported in the country. In their press briefing held on the 17th of March 2020, the Zambian Ministry of Health encouraged enhanced hygiene practices in public places with high human traffic (such as in the transport sector, shopping malls, schools, and places of worship), as well as social distancing [49].

On the 25th of March 2020, the Zambian Republican President, His Excellency, Dr Edgar Chagwa Lungu, announced additional prevention measures against

COVID-19. These included the restriction of gatherings such as weddings, funerals, and conferences to a maximum of 50 people, the quarantine of travellers entering the country for a period of 2 weeks, whether they exhibited symptoms or not, and the suspension of non-essential foreign travel to countries that had reported cases of COVID-19. By the 9th of April 2020, COVID-19 cases stood at 39, with only one death and no new cases recorded in the previous week. Despite the recorded success, the Republican President announced further COVID-19 prevention measures, which included wearing face masks at all times, particularly in crowded places [50].

Mass testing had proved to be effective in a small town in Italy where the number of people with COVID-19 symptoms fell by more than 90% in 10 days and was further eliminated [51]. The Zambian government consequently implemented mass testing to stop the spread of the virus, with thousands of tests conducted among high-risk individuals in Lusaka, Kafue and Chirundu by the 21st of May 2020 [52]. Moving forward, we recommend continuous mass testing in Zambia as a way of detecting COVID-19 cases and initiating treatment as early as possible [53]. Besides, mass testing must be decentralized so that many people are tested for SARS-CoV-2 and decisions are made based on the results.

Truck drivers carrying essential goods were subjected to mandatory health screening, had their trucks disinfected, and were escorted by security personnel to their final destination. Further, environmental cleaning and fumigation at all points of entry and the provision of personal protective equipment (PPE) were other measures implemented to prevent the spread of the virus [52]. Disinfection or fumigation of high-risk areas such as universities, colleges, markets, government offices, healthcare facilities, and churches has been very helpful in controlling the epidemic. The implementation of the preventive measures led to a reduction in the number of COVID-19 infections in Zambia and hence containment of the first wave of the epidemic. Despite the implementation of these preventive measures, non-adherence remains a key problem in the fight against COVID-19. However, it is important to note that approximately 20,462 cases and 386 deaths were recorded during the first wave of the pandemic. Besides, a prevalence of 9.3% among healthcare workers [54] and 10.6% among the general population [55] was reported in Zambia during the first wave.

3. Collaborations in Response to the COVID-19 Pandemic

To contain the pandemic, the Zambian government did not work in isolation. The COVID-19 pandemic has been described as a disease without borders, and as such, it requires national and international coordination and collaboration to fight it [56]. Collaboration between public and private sectors, as well as international entities, entails collaborating to deliver products and services based on risk, resource, cost, and benefit-sharing [57] [58]. The Zambian government has leveraged both local and international support in combatting the COVID-19 pandemic. A great contribution in the form of personal protective equipment

(PPE), sanitisers, disinfectants, oxygen cylinders, and others came from the Non-Governmental Organisations (NGOs), the Muslim community, and various institutions such as banks, universities, professional bodies, churches, and business people. For example, on November 3, 2020, the Centre for Infectious Diseases Research in Zambia (CIDRZ), in collaboration with Standard Chartered Bank, donated 2250 COVID-19 testing kits to the Ministry of Health (MOH) worth $50,000 [59]. Additionally, collaboration has been seen in the education and sensitisation of Zambian citizens about the pandemic and how to protect themselves through messages and adverts distributed via telephone companies, radio and TV stations. This has helped in mitigating disease transmission, as it has elsewhere [60]. Therefore, a multisectoral and collaborative approach was very important in the containment of the first wave by July 2020. Zambia has also seen great international collaboration and support in fighting the pandemic. For example, the US government, through the US embassy in Zambia, donated critical medical equipment to fight the pandemic in September 2020 [61]. The Government of the Republic of Korea, in partnership with the World Health Organization, donated COVID-19 test kits valued at $200,000 to strengthen the Government of the Republic of Zambia's national response to the pandemic on 20th October 2020 [62]. All such contributions were invaluable in fighting the first and second waves of the pandemic in Zambia. As the country started experiencing its third wave of the pandemic, it further received donations in the form of vaccines from various countries, among them the USA, China, France, and others. International organisations also continued to render their support in the form of vaccine donations. For example, on June 29, 2021, the World Bank approved $24 million in additional financing for the Republic of Zambia for the acquisition and equitable distribution of COVID-19 vaccines [63].

International cooperation and collaboration are evident not only in assistance in the form of emergency medical supply assistance but also in medical technical assistance. For instance, the WHO's website has provided detailed documents and evidence-based recommendations for governments, hospitals, health workers, members of the public, and others to follow in fighting the pandemic [64]. Indeed, there is clear evidence that without both local and international collaboration and support, the Zambian government would have been overwhelmed by the pandemic. Zambia has continued collaborating with other countries and organisations to contain COVID-19 [65]. Therefore, there is a need to continue strengthening international relations as well as encouraging local organisations to continue supporting government efforts to strengthen the health sector in its response to the COVID-19 pandemic and future disease outbreaks.

4. Surveillance of COVID-19 and Other Respiratory Tract Infections

Surveillance of COVID-19 and flu-like infections has been strengthened in Zambia. Surveillance is essential when monitoring and evaluating disease outbreaks

[66]. Both physical diagnosis and laboratory investigations play a vital role in identifying COVID-19 cases. Zambia utilises some testing platforms that include real-time Polymerase Chain Reaction (RTPCR), Gene Xpert, Hologic Panther, and Roche Cobas 6800 [65]. Using diagnostic techniques such as PCR, laboratories have played a critical role in the identification of COVID-19 [55] [67]. The surveillance of COVID-19 infections in Zambia define cases as follows: a patient presenting with an acute respiratory infection (fever and at least one sign/symptom of respiratory disease e.g. cough, shortness of breath), AND with no other aetiology that fully explains the clinical presentation AND a history of travel to or residence in a country/area or territory reporting local transmission of COVID-19 during the 14 days before symptom onset, OR, a patient with an acute respiratory illness AND having been in contact with a confirmed or probable COVID-19 case in the last 14 days before symptom onset, OR, a patient with a severe acute respiratory infection (fever and at least one sign/symptom of respiratory disease e.g. cough, shortness of breath), AND requiring hospitalization AND with no other aetiology that fully explains the clinical presentation [65].

Therefore, these screening strategies have helped the Zambian healthcare system identify and diagnose many COVID-19 cases. We recommend strengthened surveillance strategies across the country, especially at entry points such as border points and airports. The healthcare system must continue conducting both active and passive surveillance of COVID-19 cases in hospitals, schools, universities, colleges, markets, border points, airports, and communities. This facilitates the early detection of infected people. Besides, there must be continuous general public education on how to recognize COVID-19 signs and symptoms and how to report them to healthcare officials. This, in a way, will add to the surveillance system and early management of detected or diagnosed cases.

5. Outbreak and Response to the Second Wave of COVID-19 in Zambia

After the containment of the first wave, there was a relaxation in the adherence to the COVID-19 preventive measures. Besides, evidence has shown that a relaxation in the lockdown measures led to the second wave of COVID-19 [68]. Therefore, by December 2020, Zambia started experiencing the second wave of COVID-19 that led to increased morbidity and mortality compared to the first wave. In December 2020, the number of confirmed cases of COVID-19 started increasing appreciably leading to a declaration of the second wave by 30th December 2020. By the end of February 2021, the number of confirmed cases of COVID-19 kept increasing. It was during the second wave of the pandemic that the Republic of Zambia launched its COVID-19 vaccination programs. Zambia received its first 228,000 doses of Oxford AstraZeneca on 12th April 2021 and began administration on 16th April 2021 [69]. However, due to many myths and misinformation about COVID-19 vaccines, there was a significant level of hesi-

tancy against COVID-19 vaccines [69]. Besides, the COVID-19 pandemic was less severe when the vaccines were introduced in Zambia. Thus, very few people were willing to be vaccinated as they opted to continue adhering to preventive measures rather than getting a vaccine. This could have been due to the low number of COVID-19 infections in Zambia compared to other countries. Even though the government launched vaccination programs, the mandatory wearing of face masks, physical distancing, adequate washing of hands, quarantine for cases, and no mass gatherings must always be adhered to. However, the burden of disease increased during the second wave with over 95,821 cases and 1282 deaths recorded by 1st June 2021.

6. Outbreak and Response to the Third Wave of COVID-19 in Zambia

The third wave of the COVID-19 pandemic in Zambia was declared in June 2021 [70]. In contrast to the previous two waves, the third wave started slowly with low morbidity and mortality but quickly progressed with comparably higher positivity rates, hospitalisations and deaths. This coincided with reports of the emergence of a more deleterious Delta variant, which had been attributed to higher infections and deaths in other countries [71]. Other reasons postulated included the relaxation of COVID-19 preventive measures driven by perceptions and myths [55] [72]. Further, a high number of community deaths had been reported, implying poor health-seeking behaviour among the population, precluding quick medical attention where needed [19]. Additionally, Zambia was scheduled to hold presidential and parliamentary elections, and political campaigns included large crowds without strict adherence to masking and social distancing. To mitigate the potential health fallout, the government restricted social gatherings and suggested alternative means of campaigning such as virtual rallies [73]. Despite vaccination being a key intervention in preventing serious illness and death from COVID-19 infection, low vaccination rates were noted in Zambia's vaccination campaign. This could be due to negative perceptions of the efficacy and safety of the vaccines [74].

The morbidity and mortality rates in Zambia during the 3rd wave have almost doubled the number of all cases since the first case was detected in Zambia. On June 1, 2021, there were 95,821 confirmed COVID-19 cases, and 1282 deaths, of which 722 were classified as COVID-19 deaths and 560 as COVID-19 associated deaths [75]. However, by 27th August 2021, only three (3) months into the third wave, these numbers had risen to 205,704 confirmed cases with a total death toll of 3587, with the majority of these deaths, 2691, being COVID-19-related [75]. As of 30th September 2021, there were 209,046 confirmed cases of COVID-19 and 3648 deaths in Zambia [75]. Unfortunately, the shortage of testing kits continues to be among the factors that have contributed to escalating cases of COVID-19, leading to increased mortality. When almost all countries faced the challenge of combating COVID-19 and experienced its detrimental repercus-

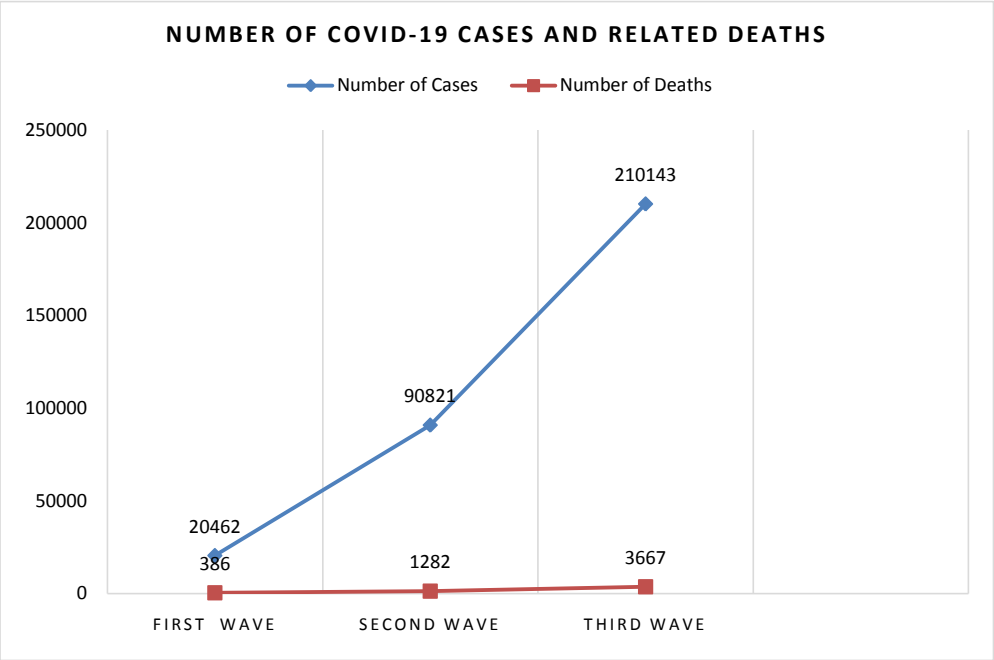
sions, Zambia lacked testing equipment or kits, intensive care unit beds, and other resources. All of these limitations accelerated the spread of the virus as infected people could not be diagnosed early and isolated. This shows that with COVID-19, delays in detecting infected individuals may lead to dire consequences [56].

On the 17th of June 2021, the government of the Republic of Zambia enhanced the public health preventive measures against COVID-19 were enhanced to prevent further transmission and spread [65]. The preventive measures that were enhanced included the mandatory masking up in public places, ii. closure of all schools, colleges and universities, online learning for all colleges, universities and other tertiary learning, restriction to places of worship to a maximum of two meetings in a week of 1-hour duration, all bars, night clubs, casinos, and taverns to open only from 18 - 22 hours on Friday, Saturday and Sunday, a maximum of 50 mourners to attend funerals, all social gatherings like weddings and kitchen parties to allow a maximum of 50 participants only subject to certification, amplification of awareness creation using various channels of communication countrywide, all eating places like restaurants to only operate on a takeaway basis, no conferences, workshops and general meetings should be held until further notice, all public places such as markets, shops, malls, bus stations to be fumigated at least once per week, all public transporters to ensure adherence to physical distancing and mandatory masking up by all passengers [65]. All individuals should adhere to the five golden rules of COVID-19 prevention.

The Government of the Republic of Zambia is implementing a nine-pronged strategy in response to the COVID-19 pandemic that includes the strengthening of surveillance and case finding, case management, infection prevention and control, risk communication and community engagement, laboratory diagnosis, logistics and supply chain management, an appropriate, competent and adequate workforce, routine essential health services, and increased vaccinations [65]. These strategies will help to identify COVID-19 cases at an early stage and provide treatment before the disease worsens. Further, the resources and services required in the response to COVID-19 will be planned for and allocated accordingly. Furthermore, increasing vaccinations against COVID-19 will help many people develop immunity against COVID-19 [76]. However, the burden of disease increased during the third wave with over 210,143 cases and 3667 deaths recorded by 29th November 2021. The number of COVID-19 confirmed cases and deaths have been increasing with each new wave as shown in **Graph 1**.

7. COVID-19 Vaccination Programmes in Zambia

The COVID-19 vaccines are an important part of the strategy to contain the pandemic [77] [78]. Vaccines are substances that stimulate the immune system and aid in the fight against infectious agents [79]. There is evidence that indicates that vaccines are very effective in containing disease outbreaks [80]. Similarly, studies have shown that COVID-19 vaccines are very effective and safe in



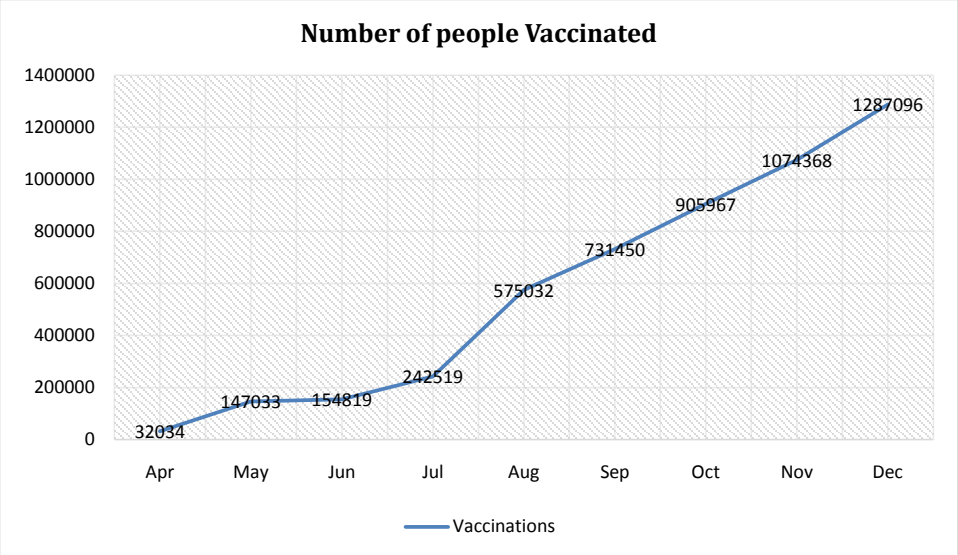
Graph 1. Number of COVID-19 confirmed cases and deaths in Zambia from the first to the third wave of the pandemic.

containing the pandemic [81]. In Zambia, five vaccines have been approved for emergency use in humans, including AstraZeneca's COVISHIELD, which is manufactured in India, AstraZeneca's COVID-19 vaccine produced in South Korea, Sinopharm, Janssen (Johnson & Johnson), and the Pfizer-BioNTech vaccine [70]. As of 30th September 2021, approximately 731,450 doses of COVID-19 have been administered in Zambia, representing about 2% of vaccinated adult Zambians [75]. As of 29th November 2021, the number of vaccinated Zambian adults rose to 1,074,368 due to the governments' emphasis on having many Zambians vaccinated. The number of adult Zambians vaccinated against COVID-19 is still very low because it is still below the 10% recommended by the WHO. This is according to a list of 15 African countries with more than 10% of their population fully vaccinated against COVID-19 as published by the WHO [82]. The 15 countries that have reached the target population fully vaccinated against COVID-19 include Seychelles, Mauritius, Morocco, Tunisia, Comoros, Cape Verde, Eswatini, Lesotho, Botswana, Zimbabwe, South Africa, Mauritania, Equatorial Guinea, Rwanda, and Sao Tome & Principe [82]. As of 31st December 2021, the prevalence of COVID-19 vaccinations in Zambia was at 3.55% [83]. There is a need for further COVID-19 vaccination campaigns that will make people aware of the benefits of vaccination against COVID-19. When the majority of individuals receive the vaccine, the transmission of SARS-CoV-2 and the severity of future COVID-19 infections will be minimised [76]. This may help to prevent the severity of COVID-19 in exposed individuals. Besides, this will prevent the increased morbidity and mortality that the country experienced during the third wave of the pandemic. Hence, improving COVID-19 vaccine accep-

tance and uptake is a useful strategy for containing the epidemic in Zambia. Similarly, future infectious disease outbreaks can be contained by implementing the use of vaccines. Graph 2 shows the number of doses of COVID-19 vaccines administered in Zambia. The graph shows that individuals have steadily been accepting the vaccine.

Zambia, like many other developing countries, experiences high COVID-19 vaccine hesitancy [69] [74] [84]. Vaccine hesitancy is the refusal or delay of vaccination despite the availability of vaccines [85]. Vaccine hesitancy is a multifactorial issue that requires many players to handle. COVID-19 vaccine hesitancy has been reported to be due to many factors, such as myths and misinformation about COVID-19 and COVID-19 vaccines, fear of adverse side effects and concerns about their effectiveness [69] [74] [81] [86]-[92] [93] [94] [95].

Nevertheless, there is a need to fight COVID-19 vaccine hesitancy using different platforms, such as the media. The role of the media in disseminating COVID-19 information in Zambia is multifaceted and critical in addressing vaccine hesitancy and improving uptake. The local media's role has mainly centred on information dissemination on the outbreak's progress, preventive measures and sensitising the community on the need to get vaccinated. However, in most instances, international social media has been controversial due to misinformation and conspiracy theories. Wilson and Wiysonge found that using social media to organise offline action was highly predictive of the belief that vaccinations are unsafe [96]. Social media platforms are internet-based applications that enable communities of users to interact, create, and share content types in real-time with others. There is an urgent need to explore how social media may be used to improve health literacy and build public trust in vaccination as it has a broader influence on the population globally [97].



Graph 2. Number of COVID-19 vaccine doses administered in Zambia from April 2021 to December 2021.

Strategies for addressing vaccine hesitancy and increasing uptake are still poorly understood. The challenge is that most interventions identified operate from an assumption-based rather than an evidence-based approach due to a lack of appropriate evaluation [98]. The World Health Organisation (WHO) contends that vaccine hesitancy is a complex issue, and no single strategy will be able to address it single-handedly [99]. In a systematic review, the WHO SAGE working group dealing with vaccine hesitancy identified reminder-recall interventions, non-financial incentives, and dialogue-based interventions as the main strategies for addressing vaccine hesitancy and improving uptake of vaccination programmes [100] [101]. These strategies proposed by the WHO SAGE working group have proven to be effective in many countries. Hence, Zambia can adopt or adapt these strategies to suit the Zambian setup.

Dialogue-based interventions address misconceptions and community distrust regarding vaccines [102]. This strategy attempts to address these barriers using a variety of engagement and communication channels and gives attention to all aspects of community life that might influence vaccination decisions irrespective of age. Non-financial incentives by addressing basic needs simultaneously build confidence and reduce vaccine hesitancy because the target population most often feels that their other critical needs are being recognised and not superseded by vaccines alone [99]. This symbiotic approach could be fundamental for more marginalised groups. However, reminder-recall interventions quality of evidence to date remains low from published literature. Additionally, reminder-recall on its own is not enough to tackle contexts where there are multiple determinants at play. Besides, the Zambian government can strengthen community education and sensitization on the benefits of vaccinations against COVID-19, provide training and education programs for HCWs on addressing vaccines hesitancy and promoting vaccine uptake, sensitizing communities on the safety and effectiveness of vaccines, engaging community members of vaccine policy development, promoting collaborations between HCWs and community members regarding the use, safety and effectiveness of vaccines, providing adequate information regarding the available vaccines and sites of vaccinations, targeting certain segments of populations such as the youths, elderly, people with chronic conditions, HCWs, employed members of the community, entrepreneurs, and engaging celebrities and prominent citizens in promoting vaccine uptake [84]. Therefore, the Zambian government should promote the uptake of COVID-19 vaccines and address the highly reported COVID-19 vaccine hesitancy by using the strategies outlined above. Fortunately, the current President of the Republic of Zambia, Mr Hakainde Hichilema, emphasised on the need for increased vaccinations among adults while observing the recommended COVID-19 preventive measures as a way of conquering the pandemic.

8. Negative Impacts of COVID-19 on Self-Medication, Economy and Mental Health

The COVID-19 pandemic has caused many challenges in different sectors [103].

In Zambia, the Ministry of Health warned individuals about the dangers of self-medication [104]. This is because pandemics may predispose people to practice self-medication using different medicines. COVID-19 has been associated with an increase in self-medication with drugs such as azithromycin, ivermectin, hydroxychloroquine, chloroquine, and other antimicrobial agents [105] [106] [107] [108]. Self-medication can lead to antimicrobial resistance (AMR), treatment failure, organ damage, prolonged hospitalisations, and increased health costs [109] [110] [111] [112] [113]. Therefore, self-medication against COVID-19 has negatively affected global economies and many sectors that contribute to economic growth [114] [115]. There is a lot to learn from this, and it calls for the government to put in place measures that prevent individuals from practising self-medication. Negative impacts on global economies were exacerbated by lockdowns that were instituted to prevent the further transmission and spread of COVID-19. The government must put in place policies that will help businesses thrive even during the pandemic. Further, evidence has shown that COVID-19 has negatively contributed to mental health challenges among different populations [116]-[121]. A previous study in Zambia reported that students experienced mental health challenges due to the COVID-19 pandemic [122]. Mental health experts must offer support to individuals who have experienced mental health challenges due to the COVID-19 pandemic. Ministries responsible for health and other stakeholders should educate people on the dangers of self-medication. Responding to the COVID-19 pandemic should also include providing mitigating measures to the different sectors that have been affected.

Based on the above information, there are a lot of challenges that Zambia and many countries have been experiencing during the COVID-19 pandemic. Zambia experienced increased morbidity and mortality rates due to and associated with COVID-19 as evidenced from the statistics reported during the first to the third wave of the epidemic. Besides, restrictions on movement and conducting businesses negatively affected all nations. Therefore, countries must always have a functional emergency preparedness and response plan and mitigation measures to contain pandemics. The Zambian government must also set aside adequate resources meant for responding to epidemics. Further, there is a need to increase awareness, acceptability, and uptake of COVID-19 vaccines to prevent the severity of future waves of the epidemic in Zambia.

9. Conclusion

The three waves of the COVID-19 epidemic presented differently in Zambia, with varying degrees of morbidity and mortality. The Zambian government responded effectively to the COVID-19 pandemic despite the initial lack of the needed resources to curb the epidemic. However, the number of confirmed COVID-19 cases and deaths increased in the third wave of the pandemic. There is a need to strengthen the surveillance of COVID-19 and other respiratory infections and to ensure continuous adherence to the COVID-19 preventive meas-

ures. Besides, individuals must be encouraged to get vaccinated so that the pandemic and its devastating effects are controlled. Besides, vaccinations can prevent the severity of COVID-19 future waves.

10. Authors' Contributions

SM conceptualized the study. SM, MC, MM, CNH, MB, MK, KM, DCB, WM and VD participated in the literature search and commentary write up. All authors participated in the initial draft of the manuscript. All authors approved the final version of the manuscript.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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