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COVID-19 pandemic: Review of impediments to public health measures in Sub-Saharan Africa

Atieme Joseph Ogbolosingha¹, Ayesha Singh²

¹School of Life Sciences, Keele University, Keele, UK

²School of Pharmacy and Bioengineering, Keele University, Keele, UK

ABSTRACT

The first coronavirus disease 2019 (COVID-19) case in Sub-Saharan Africa was reported in Nigeria on 27th February 2020, and within weeks the disease spread to all African countries, except Lesotho as of 1st May 2020. In this review, we have evaluated the public health measures initiated in sub-Saharan African countries to mitigate the spread of COVID-19, highlighted the impediments to these measures, and provided recommendations. We reviewed the strategies initiated in Nigeria, South Africa, Rwanda, and Burundi. It was found that the governments of these countries initiated several measures, including hand and respiratory hygiene, maintaining a distance from other people, quarantining travellers, and isolating symptomatic cases. Moreover, the lockdown was instituted to further reduce the spread of COVID-19 in Nigeria, South Africa, and Rwanda, while in Burundi there was no lockdown. However, the fragile medical infrastructure, poor living conditions, lack of social welfare system, draconian lockdown implementation strategies, and inconsistent information from authorities have impeded the success. The lockdown and social distancing measures have not reduced the rate of infection in these countries, and the implementation of the measures was sporadic and not backed up with increased capacities of diagnostic tests. It is strongly recommended that sub-Saharan African countries increase testing and follow scientific evidence in cautiously easing the lockdown, and develop postpandemic plans to revitalize the medical and socioeconomic infrastructure. In conclusion, the governments of these countries should look inward for solutions to their problems and avoid implementing western anti-COVID-19 policies without consideration of the peculiarities in African societies.

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Introduction

The novel severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), the causative agent of coronavirus disease 2019 (COVID-19), was declared a pandemic by the World Health Organization (WHO) in March 2020. Globally, there are over 3.5 million clinically confirmed cases, resulting in over 248,000 confirmed deaths from 213 countries and territories [1]. The virus was first identified in Wuhan, the capital city of the Hubei province of China, following a report of clusters of pneumonia of unknown etiology on 31st December 2019 by the Wuhan Municipal Health Commission [1].

The African continent has confirmed over 47,000 cases leading to over 1,800 confirmed deaths. The first case of COVID-19 in sub-Saharan Africa was reported in Nigeria on 27th February 2020. According to Nigeria's Ministry of Health, the initial case was an Italian who worked in Nigeria and returned from Milan to Lagos, Nigeria [2]. As of 1st May 2020, the viral infection had been confirmed in all African countries, except Lesotho.

The novel coronavirus is a highly contagious virus and it is a threat to global health and economy. The initial cases of COVID-19 were linked to a local seafood market in Wuhan city, suggesting animal to

Contact Ayesha Singh ✉ a.singh@keele.ac.uk 🏢 School of Pharmacy and Bioengineering, Keele University, Keele, UK.

human transmission [3,4]. It is now commonly recognized that the *Rhinolophus affinis* species of bats and Malayan pangolins may be the natural reservoir of SARS-CoV-2, although it remains unclear which animal served as an intermediate host, as direct human to bat contact is rare [5–8]. Nevertheless, the current spread of the virus is a consequence of human-to-human transmission. The major symptoms infected patients present at the onset of infection are fever, tiredness, shortness of breath, and dry cough [9]. Some patients have also reported headaches, nasal congestion, sore throat, sputum production, and diarrhoea [10]. The elderly, obese individuals, and people with underlying medical conditions, such as hypertension, kidney disease, type II diabetes, or cancer, are in the high-risk group [5,11]. The high rate of human-to-human transmission of the virus has resulted in many countries initiating public health measures.

The COVID-19 pandemic is a huge public health challenge to the world, especially developing countries in sub-Saharan Africa. Poor medical infrastructure and shortage of specialist equipment remain a threat to combating diseases in most developing countries. The governments in sub-Saharan African countries have initiated several measures, including hand and respiratory hygiene, maintaining distance from other people, quarantining travellers, and isolating symptomatic cases. The above-mentioned mitigating measures are critical to stop the spread of the virus; however, many sub-Saharan African countries have further implemented a complete lockdown of cities and entire countries. In Nigeria, the most populous country in Africa, the government announced a complete lockdown of three major cities (Lagos, Ogun, and the nation's capital, Abuja) on March 30. The initial 14 days lockdown in the three areas were extended for another 14 days. A similar lockdown strategy was announced in South Africa for 21 days commencing from March 26, with a further 14 days extension. In Rwanda, the government announced a 14 days lockdown on March 21, with further extensions to April 30, while in Burundi there was no lockdown. In this review, we comparatively assess the public health measures initiated for mitigating the spread of COVID-19 by countries in sub-Saharan Africa focusing on Nigeria, South Africa, Rwanda, and Burundi. We also highlight the impediments to these measures and provide recommendations.

Assessment of Lockdown Implementation Strategies

The four sub-Saharan African countries, excluding Burundi, commenced stringent lockdown measures in March 2020. During the lockdown in Nigeria, South Africa, and Rwanda, businesses and government offices remained closed and people were expected to stay at home. There were limited exemptions, such as hospitals and healthcare facilities, and some commercial establishments in the food, energy, financial, and security sectors [12–14]. The imposed lockdown measures were similar in these three countries, although in Nigeria the financial sector was also closed but only reviewed days after the lockdown to allow limited financial services. Prior to commencement of lockdown, the governments of Nigeria, South Africa, Rwanda, and Burundi encouraged frequent hand washing, social distancing, created awareness about the infection, and instituted compulsory temperature screening at international airports [2,15]. In Nigeria and South Africa, suspected cases were isolated at designated hospitals, while in Rwanda and Burundi, international travellers from endemic areas were quarantined for 14 days. These measures were effective in tracking the initial cases in these countries but became ineffective when the number of cases started increasing.

The lockdown of cities and entire countries is alien to many countries. China took the first drastic step in locking down Wuhan in the heat of the ravaging effect of the virus. The implementation strategies of the lockdown geared toward mitigating the spread of coronavirus in Nigeria, Rwanda, and South Africa are closely related. The police and the military were deployed to enforce the lockdown in these three countries, sometimes applying maximum force and inflicting bodily harm to noncompliant citizens. The efficacy of the lockdown has been grossly limited by the existing infrastructural and economic deficits inherent in these countries.

In China, the introduction of the lockdown in Wuhan city was largely successful in mitigating the spread of the virus to other regions. The success of the lockdown in China on human-to-human transmission and mortality was evident within a period that ranged from 7 to 17 days and 10 days, respectively [16]. The United States, United Kingdom, Germany, Italy, Spain, France, India, and several other countries also carried out lockdowns [17]. In fact,

as of 30th April, an estimated 3 billion of the global population was under different levels of lockdown [18,19]. However, there has been differential success in these countries dependent on the availability of social amenities, use of technology, age demographics of the population, social welfare schemes, freezing of taxes and mortgages, and the disease curve at the time of lockdown introduction. In Nigeria, South Africa, and Rwanda, the citizens generally adhered to the lockdown measures in the first week; however, the lack of income and government failure to provide palliatives hindered total compliance [20,21].

The number of new cases and mortality in Nigeria, South Africa, and Rwanda has not declined since the commencement of the lockdown in these countries (Fig. 1). As of 30th April 2020, Nigeria, South Africa, and Rwanda have been under lockdown for 28, 35 and 41 days, respectively. At the early stages of infection, Nigeria carried out an average of two tests per million each day, whereas Rwanda and South Africa carried out an average of 50 tests per

million each day. Currently, the average number of tests per million carried out each day has increased to an average of around 7, 120, and 360 in Nigeria, Rwanda, and South Africa, respectively. As of 30th April 2020, Burundi had only carried out 284 tests [22]. Lack of testing at the early stages of lockdown and increased testing at later stages of lockdown had initially concealed the true rate of infection, and obscured the real success of the lockdown, if any. On the contrary, some countries have taken a milder approach and have not implemented a lockdown. For instance, Burundi has confirmed 15 cases of the virus with one death; however, authorities have spread conflicting information to the public as seen in the conduct of general election without social distancing measures during the pandemic [23]. Like the Burundian government, Tanzanian authorities massively downplayed the lethality of the virus and took a mild approach, as it did not discourage its residents from congregating in religious houses and attending funerals [24]. From the foregoing, it is evident that these countries either used

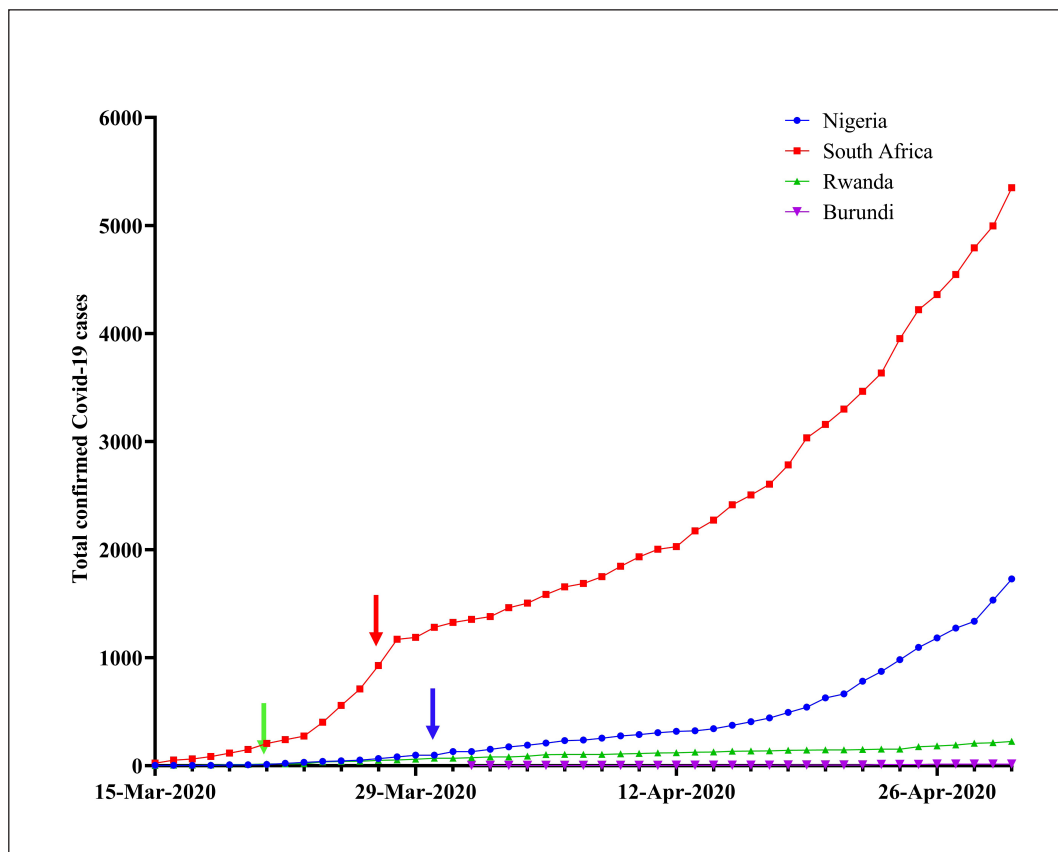


Figure 1. Graph representing the total number of confirmed COVID-19 cases (from 15th March to 30th April 2020) in Nigeria, South Africa, Rwanda, and Burundi. Color-coded arrows represent the day the lockdown was initiated by the governments of Nigeria, South Africa, and Rwanda. These countries started easing the lockdown on 1st May 2020. There was no lockdown in Burundi.

an extreme approach of lockdown or completely neglected the public health impact of the virus. The lack of coordination and limited medical infrastructure portends grave danger for confirmed COVID-19 patients who need medical care.

Medical Intervention Measures for COVID-19 Patients

COVID-19 has had a large impact on the healthcare systems of many countries. The pandemic exposed the deficiency in the healthcare systems of developed economies, such as the USA and Italy with better healthcare systems than most African countries. There already exist various shortfalls in the healthcare systems in sub-Saharan Africa, such as lack of trained medical personnel, lack of infrastructure to deliver healthcare, inadequate funding, and poor leadership/management [25]. There is a shortage of healthcare workers (doctors, nurses, and laboratory workers) in sub-Saharan Africa due to limited educational institutions, outbreaks of various infections, and emigration of workers [26]. Sub-Saharan Africa has 25% of the global disease burden but only 3% of the world's healthcare force [1]. Most of the countries have significantly less than the minimum threshold of one doctor per thousand.

Most countries in sub-Saharan Africa have integrated universal health coverage (UHC) in their national health strategies; however, not everyone is covered. Most patients are required to spend their own income on health services. In 2005, Nigeria launched the National Health Insurance Scheme, which currently covers less than 5% of the Nigerian workforce, mainly comprising federal government workers [27]. South Africa consists of a large subsidized public health sector serving around 84% of its population and a small but high-quality private sector serving the rest [28]. Rwanda currently follows the UHC system and insurance covers around 90% of its population [29]. Burundi has also integrated the UHC system as a national health development policy.

The government-funded organizations, clinics, and hospitals are responsible for most of the testing, quarantine, and treatment for COVID-19, with exceptions in South Africa where some private pathology labs also offer testing. The collected samples are sent to public testing facilities [such as the National Health Laboratory Service, South Africa, and the Nigeria Centre for Disease Control (NCDC)]. Similar to tuberculosis (TB) and HIV/

AIDS, COVID-19 is diagnosed by molecular reverse transcription polymerase chain reaction; therefore, the existing infrastructure and expertise will be advantageous to ramp up testing. According to the NCDC, Nigeria currently has around 15 functional testing facilities with a total capacity of 2,500 tests per day. South Africa has a capacity of 5,000 tests per day and Rwanda has a capacity of 1,000 tests per day [30]. As of the 30th of April, Burundi, Nigeria, Rwanda, and South Africa have conducted 24, 60, 2,290, and 3,500 tests per million, respectively [22]. In comparison to western countries, testing in most of the countries in sub-Saharan Africa remains relatively low. Limited testing has resulted in significant underestimation of the extent of the spread of COVID-19. Mobile testing units recently introduced in South Africa [31] and Nigeria [32] play a significant role in improving the accessibility and boosting COVID-19 testing.

In sub-Saharan African, there is a high prevalence of various conditions, such as malnutrition, anemia, hypertension, diabetes, and cancer, most of which remain undetected and poorly managed [33,34]. There is also a prevalence of diseases affecting the immune systems, such as HIV/AIDS and TB. Seventy-one percent of people living with HIV resided in sub-Saharan Africa in 2017 [35]. Africa accounted for 25% of new TB cases and TB-related deaths worldwide [36]. Additionally, during the rainy season, there is a rapid rise in cases of malaria, which will coincide with the ongoing pandemic. The various existing comorbidities can result in a worse COVID-19 treatment outcome. On the contrary, the expertise of the frontline workers in dealing with various infectious diseases, such as Ebola, yellow fever, HIV/AIDS, and TB, can be leveraged to support the COVID-19 response.

Most of the countries in sub-Saharan Africa allocate only 1% of its gross domestic product for healthcare [26]. These countries lack ventilators, intensive care unit (ICU) beds, and constant electricity supply that is essential for the treatment of severe forms of COVID-19; for example, Nigeria has 0.8 ventilators per million. According to the World Bank, there are 0.5, 0.8, 1.6, and 2.8 hospital beds per thousand in Nigeria, Burundi, Rwanda, and South Africa, respectively, which is far below the WHO recommendation of at least five per thousand. Due to the limited capacity, the fragile healthcare systems will be easily overwhelmed during the peak of the pandemic.

Impact of COVID-19 on Socio-Economic or Socioeconomic Factors

According to the World Bank, the average poverty rate for sub-Saharan Africa stands around 41% [37]. There is a large housing inequality depending on the social class, widely divided into wealthy people with brick houses and access to amenities and poorer people living in much smaller houses with limited access to basic amenities.

The majority of the population in these countries live in overcrowded accommodations (slums, shanties, and squatter settlements), and in close contact with each other. In 2010, around 2,700 slums were accommodating 1.2 million households in South Africa. According to the World Bank, in 2014, 50% of Nigerians lived in slums [37]. Additionally, the majority of the homeless people in these countries were shifted into cramped makeshift shelters in empty schools and open fields to contain the spread of COVID-19. In the rural areas of these countries, around 40% of the population do not have access to clean running water and 70% lacked proper sanitation [38]. The two main measures to mitigate the spread of COVID-19, social distancing and hand washing, are very difficult in areas with such living conditions.

COVID-19 pandemic has had a large economic impact around the world, significantly affecting the economies of sub-Saharan African countries. The key sectors driving the economies of these countries are aviation, tourism, and export, which have been affected by COVID-19. Additionally, crude oil exporting countries, such as Nigeria, Tanzania, and Democratic Republic of the Congo, are severely affected due to falling demand. According to the World Bank, 66% of employment in sub-Saharan Africa is in the informal sector; consisting of daily wage earners and casual labourers, such as farmers, informal traders, street vendors, and many more [37]. These workers depend on their daily earnings for food. The increasing rate of unemployment and lack of food has further increased the crime rate.

The pandemic has strained the agricultural sector that has already been suffering from severe drought in South Africa and locust invasion in East Africa. Although agricultural activities are still ongoing, the lockdown measures have reduced labour and disrupted the transportation of goods to the buyers/markets. Border closure has also affected trade and supply of food between countries. The disruption of the food supply chain has resulted in price hikes, implicating cost of living, health, and nutrition. In

contrast to supermarkets, most Africans buy food and essentials from traditional, large, open-air markets. The markets are crowded and have limited space, wherein maintaining social distancing is not feasible. Some countries, such as Nigeria, have shut-down large markets, whereas in other places, such as Rwanda and Burundi, the markets are still open.

Future Perspective, Recommendation, and Conclusion

The governments of these countries have taken commendable steps in combating COVID-19 so far; however, increasing the daily testing capacity and incorporating mobile testing facilities is key to contain the spread of the virus. Delayed detection of COVID-19 has led to widespread community transmission in several countries; therefore, we recommend testing to be extended to all symptomatic individuals and their contacts. Additionally, testing individuals crossing borders, such as truck drivers, is recommended, as is currently done in Uganda and Rwanda.

We recommend increased funding to develop the medical infrastructure in these countries. In the interim, governments should prioritize the provision of ICU beds, protective gear, ventilators, and train healthcare professionals on effective handling and treatment of COVID-19 patients. Moreover, the postpandemic era should see governments building fully equipped hospitals and resuscitating existing health insurance schemes. The COVID-19 pandemic has been a litmus test for the healthcare system in these countries, and the leadership should ensure an improved healthcare system to contain the virus and manage other diseases ravaging the region.

Education and public sensitization will be a vital tool for the successful repression of the number of COVID-19 cases. The governments of Nigeria, South Africa, Rwanda, Burundi, and other sub-Saharan African countries should make public enlightenment a priority. Community-based dissemination of information, where village heads pass information directly to members of the community, has always proven useful [39,40]. The mainstream media and social media should also be deployed maximally, with a special unit set-up to reduce misinformation. The governments should eschew ignorance, avoid unguarded utterances, and be guided by sound scientific advice in handling the coronavirus pandemic and future health challenges. The traditional African value of hand washing and sanitation should be reemphasized, and citizens should be encouraged to

maintain distance from people of other households [41]. Noncompliant citizens should be given fines and community service as a deterrent to others.

The governments should also deploy technology to combat the spread of the virus. Technological development has accounted for much of the economic and social progress recently; therefore, the governments are encouraged to invest in technology. Like the US, India, and China, the sub-Saharan African governments should develop software to assist with digital contact tracing and notifying high-risk groups [42,43]. COVID-19 has negatively impacted the education of students in sub-Saharan Africa, and the majority of educational institutions will remain closed for the rest of the academic year [44]; therefore, governments need to provide widespread access to remote-learning opportunities in rural and urban areas to support students. Additionally, the private sector should be encouraged to support online/remote working wherever possible.

The primary aim of lockdown models in countries such as Italy, Spain, Germany, France, and the United Kingdom was to reduce the spread of the virus beyond the holding capacity of the medical systems in those countries. A plateau in the rate of infection as evidenced in reduced number of new infections and significant reduction in deaths provides the early signs for easing of lockdown [45]. The application of a similar lockdown strategy without significant modifications to reflect the infrastructural deficit, socioeconomic factors, and consideration of the peculiarities in Nigeria, South Africa, and Rwanda defeats the essence of the lockdown. Moreover, given the few number of cases and lack of adequate testing in these countries, the commencement of the lockdown is not directly linked to any available scientific evidence in these countries [46–48].

As of 1st May 2020, Nigeria, South Africa, and Rwanda started to gradually ease the lockdown, without apparent success in reducing the number of cases. The number of coronavirus cases in these countries has increased more than five-fold since the lockdown, without any evidence of a peak in the rate of transmission at the time of easing the lockdown (Fig. 1). The rate of infections continues to rise and portends grave danger for public health. It is recommended that governments ease lockdown cautiously. The private sector should be incorporated in decision-making to ensure sustained social distancing measures at workplaces. The open markets and public transport system should be regulated to avoid congestion. Till date, the effectiveness of face masks against the virus

has not been examined; however, limited evidence from studies of other respiratory infections, such as influenza, shows that homemade masks confer to some degree of efficacy [49,50]. However, a preliminary study shows that SARS-CoV-2 transmission by infected persons is not prevented by wearing surgical and cotton masks [51].

In conclusion, there are several impediments to the public health measures initiated by the governments of Nigeria, South Africa, Rwanda, and Burundi. The application of lockdown, although useful in mitigating the spread of the virus, does not address the infrastructural and healthcare deficits in most sub-Saharan African countries. The lack of a social welfare system to support citizens during the lockdown in these countries predisposes the populace to hunger. The governments of these countries should look inward for solutions to their problems and avoid implementing western anti-COVID-19 policies without consideration of the peculiarities in African societies. An early stepwise implementation of social distancing in the epicentre, followed by surrounding cities before proceeding to the other regions of the country, would be practical and cost-effective.

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