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Challenges Affecting African Countries in the Fight against the COVID-19 Pandemic: Implications for Interventional Strategies in Low- and Middle-Income Countries

Steward Mudenda[1*], Kennedy Mwila[2], Christabel Nang'andu Hikaambo[1], Victor Daka[3], Godfrey Mayoka[4], Maisa Kasanga[5,6], Michelo Banda[1], Moses Mukosha[1], Ruth Lindizyani Mfune[3], Martin Kampamba[1], Lungwani Tyson Muungo[1], Ronald Kampamba Mutati[1], Webrod Mufwambi[1], Misheck Chileshe[7]

[1]Department of Pharmacy, School of Health Sciences, University of Zambia, Lusaka, Zambia
[2]Graduate School of Education, Peking University, Beijing, China
[3]Michael Chilufya Sata School of Medicine, Copperbelt University, Ndola, Zambia
[4]Department of Pharmacology and Pharmacognosy, School of Pharmacy, Jomo Kenyatta University of Agriculture and Technology, Nairobi, Kenya
[5]College of Public Health, Zhengzhou University, Zhengzhou, China
[6]Department of Pathology and Microbiology, University Teaching Hospitals, Lusaka, Zambia
[7]Mary Begg Health Services, Ndola, Zambia
Email: *freshsteward@gmail.com

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Abstract

The coronavirus disease 2019 (COVID-19) has caused many global challenges, especially in resource-constrained countries. Africa, a continent with a large number of low-and middle-income countries (LMICs), shares this burden disproportionately compared to developed countries. Here we review some of the major challenges African countries face in the fight against COVID-19 and propose some mitigation measures. Studies have reported low adherence to COVID-19 prevention measures in most African countries. Additionally, there has been a shortage of healthcare workers, inadequate surveillance and diagnostic tools, unavailability of drugs in healthcare facilities, increased wrong beliefs, myths, misinformation and misconceptions about COVID-19 and vaccinations, and an already existing burden of infectious and non-infectious diseases across the African continent. Despite being very challenging to implement across African countries, telehealth is a critical solution to offer healthcare services during disease outbreaks. Many African countries have faced challenges in the fight against COVID-19. The training of healthcare workers (HCWs) must be strengthened to help address the shortage. In

addition, African countries should strive to invest in research and capacity-building to be self-reliant regarding diagnostic tests. Thus, there is an urgent need to address the challenges faced by African countries in this fight, which may even include increased collaborations with other countries.

Keywords

Africa, African Countries, Challenges, COVID-19, COVID-19 Vaccines, Pandemic, Telehealth, Vaccination

1. Background Information

The ongoing coronavirus disease 2019 (COVID-19) pandemic has caused many global challenges. Africa remains the world's most resource-constrained continent, burdened by many health challenges such as malnutrition, poor health systems, and an increased burden of disease [1] [2]. The continent has been disproportionately affected due to existing health challenges, including malnutrition, poor health systems, and communicable and non-communicable diseases (NCDs) [3]. Challenges in tackling the COVID-19 pandemic have been compounded by shortages such as a lack of qualified healthcare workers (HCWs), severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) testing kits, and drugs in healthcare facilities. To compound this, the poor adherence to COVID-19 preventive measures, myths and misconceptions about COVID-19 and COVID-19 vaccines, and COVID-19 vaccine hesitancy have led to an overall poor response to the pandemic [4]-[13].

There has been an increased morbidity and mortality rate in Africa due to COVID-19, especially among individuals with comorbidities [14]. In addition, many African countries are burdened by NCDs such as diabetes mellitus, hypertension, heart failure, cancer, and asthma among others [15]. Studies have also shown that most people who succumb to COVID-19 suffer from one or more NCDs [16] [17].

Additionally, the burden of infectious and re-emerging diseases has continued to affect many African countries [18] [19] [20] [21]. These include malaria, HIV/AIDS, cholera, meningitis, hepatitis, SARS, tuberculosis, lymphatic filariasis, trypanosomiasis, and Ebola [19]. Furthermore, the dual burden of infectious and NCDs may be of major concern to the disease sequelae of COVID-19 patients in the African context [22] [23]. Thus, Africa needs the New Public Health Order to address its disease burden [24].

COVID-19 has impacted individual lifestyles in various ways such as restrictions on movement and travel, a limitation on social interaction with other people, and enforced changes in lifestyle, leading to boredom, monotony and anxiety over an uncertain future [25] [26] [27]. This has negatively impacted the economy of the African continent [28]. Additionally, many African studies have reported that COVID-19 has had an impact on their education sector [29] [30]

[31]. Thus, there is a need for interventional programs across African countries.

As countries on the African continent grapple with managing the impact of COVID-19 on their social, economic, and cultural lives, it is imperative to highlight continental challenges that may have contextual similarities beyond an individual country's geographical borders. Here, we review the challenges faced by African countries in the fight against COVID-19 and their implications for instituting interventional strategies.

2. Adherence to COVID-19 Prevention Measures across Populations in Africa

The World Health Organization (WHO) has recommended preventive measures against COVID-19. These measures include wearing face masks when in public, practising hand hygiene, covering the mouth and nose with a bent elbow when coughing or sneezing, physical and social distancing, self-isolation when experiencing COVID-19 symptoms, and avoiding overcrowded places [32] [33] [34] [35].

Studies have revealed variations in adopting the advised COVID-19 guidelines in Africa [7] [8] [34] [36]. Despite showing a high level of awareness of the disease, most individuals have been reported to have poor practices regarding infection prevention and adherence to the recommended measures [37] [38]. Similarly, there have been reports of a lack of translation of being knowledgeable regarding COVID-19 and adherence to the recommended preventive measures [39]. Non-adherence to these guidelines predisposes individuals to contracting COVID-19 [34] [37].

A study among underprivileged populations in Ethiopia reported low adherence to the recommended measures [36]. The low adherence was due to a lack of awareness regarding COVID-19 and the prevention measures, poor access to transport and a shortage of well-equipped facilities [36]. This meant that the underprivileged populations did not have access to sources of information about COVID-19 and the prevention measures. Similarly, another study in Ethiopia reported low adherence to the COVID-19 prevention measures due to unemployment, lack of education, and the occurrence of social events among participants [8]. In the Democratic Republic of Congo, low adherence to wearing face masks, practising physical and social distancing, and hand washing was reported to be due to low education levels, not being healthcare workers, being unemployed, staying with other people, or staying with a partner [7]. In Zambia, a study reported good knowledge of COVID-19 prevention measures but sub-optimal adherence levels among the general population [34]. Similar low adherence levels have been reported in Ghana [40] [41], Uganda [38], and Egypt among medical students [42]. Another study conducted in South Africa reported low adherence to social distancing across populations [43]. These findings indicate the need for increased educational activities on the importance of adhering to COVID-19 prevention measures.

Empowering communities to be aware and knowledgeable about COVID-19

prevention measures may improve their adherence levels [44]. This calls for continued sensitisation on the importance of adhering to the recommended measures and access to COVID-19 information to address the pandemic [45]. Therefore, governments through healthcare authorities must increase and promote the continuous dissemination of information regarding COVID-19 prevention measures. This can be done using a variety of platforms, such as mass media and social media. Additionally, fliers can be stuck in areas such as markets, shopping malls, healthcare facilities, churches, and stadiums.

3. Human Resources for Health in Africa

The shortage of HCWs in African countries is a persistent public health challenge [46] [47]. This problem has contributed to the failure to achieve goals of improving quality of life across African populations, attainment of the sustainable development goals (SDGs), and universal health coverage (UHC) [48] [49] [50] [51]. This is worsened in times of emergencies like the ongoing COVID-19 pandemic [52] [53] [54]. Thus, this calls for building resilient healthcare systems across Africa during and beyond the COVID-19 pandemic [55]. The healthcare system has long been the foundation for setting procedures to deal with risks, disasters, and outbreaks like the COVID-19 pandemic. Management and leadership, health information and technologies, the health workforce, and health information managers are all interconnected building components in a normal and functional healthcare system [56]. Other compositions are health finance and health delivery services, all of which work together to ensure adequate health provision. An efficient healthcare system tends to efficiently prepare for and adequately respond to outbreaks and also recover appropriately after the outbreak. Unfortunately, the experiences derived from recent international public health issues have exposed the weakness of the African healthcare system [57]. This has been worsened by poor governance and financial challenges across the African continent [52].

The shortfall of medical workers from the required number in sub-Saharan Africa has been previously reported to stand at about 1.8 million and is projected to reach 4.3 million by 2035 [58]. The WHO data for 2015 after the Ebola outbreak shows that doctor-to-patient ratios in Liberia and Sierra Leone were 0.1:1000 and 0.2:1000, respectively. A more recent report found that less than 40,000 registered medical doctors were practising in Nigeria, with a doctor-to-patient ratio of 1:2500. This implies that about 300,000 more doctors are required to meet the 1:600 ratio recommended by the WHO [59]. The sequel of this situation is the poor remuneration and motivation of healthcare workers by the government and the inadequate provision of kits and protective materials. The consequences are lower commitment and work apathy among doctors and healthcare workers [60].

Mwila *et al.* (2021) reported that the WHO assessments of response capacity to pandemics in most African counties were severely affected during the pandemic [61]. Human resources, critical care beds, and laboratory capacity, in par-

ticular, are all in short supply [61]. For example in 2018, the number of nurses or midwives per 10,000 people in Côte d'Ivoire and Mozambique was approximately 6, while in the Democratic Republic of the Congo and Kenya was 11. In Germany, the corresponding statistics were 81.7 and 132.4 in the United Kingdom [62].

Drawing from the aforementioned, further healthcare training institutions are urgently needed in Africa. Strengthening the training for HCWs in African countries will greatly help address the healthcare human resource shortages [63]. Such institutions must be appropriately equipped with state-of-the-art facilities and highly qualified people, including local specialists, whom global experts can support in the offering of additional training. Furthermore, these training institutions should admit an appropriate number of students, and state or local government scholarships should be made available to talented but needy students [64] [65]. In addition, because health and safety are critical, employees' and scientists' training in this field should be given equal priority. This way, Africa will become more competent in developing its solutions to the problems it faces and halt the continent's present brain drain.

Lessons learned from previous occurrences reveal that experienced HCWs are the driving force behind assuring proper support, planning, coordination, and supervision of successful public health service delivery, as well as efficiency in controlling risks and epidemics, as witnessed presently [66]. Therefore, they should be given special attention, with appropriate investments in training, seminars, and workshops, to effectively and efficiently prepare for, respond to, and recover from public health emergencies [30]. This training can be stratified into short, medium, and long term depending on the need and objectives. This way, the most urgent training needs would be met and sustained, while long-term needs that would alleviate the continent's personnel shortage would be addressed [52] [62].

Furthermore, there is a need to enhance the flexibility of professional practice by removing barriers that prevent the adoption of additional activities, as this is critical to significantly improving service delivery and cost-effectiveness [53]. Additionally, there is a need to prioritise investments in the healthcare systems and implement strategic plans that help maintain the required HCWs to achieve UHC across African countries [52] [67]. Alongside this, applying the WHO COVID-19 workforce tools is essential in maintaining the number of HCWs required in the fight against the pandemic [68]. Subsequently, African governments must increase the budgetary allocation for employing adequate HCWs and circumvent the issue of human resource shortages.

4. Availability of Surveillance and Diagnostic Tools for SARS-CoV-2 in African Healthcare Facilities

One of the fundamental ways to combat contagious infectious diseases is by identifying those affected and isolating them. This has been the practice with COVID-19 as well. The WHO encourages countries to carry out widespread test-

ing and quarantine those who test positive to prevent infection from spreading [69]. In most African countries, COVID-19 patients are quarantined in designated COVID-19 isolation centers. The challenges faced by most African countries in testing for SARS-CoV-2 borders around the availability of testing kits, laboratory capacity for molecular work, and staffing [70] [71]. Early in the pandemic, most African countries relied on molecular testing such as Reverse-Transcriptase PCR (RT-PCR) which is slower, and reagents are costly [13]. Further, very few PCR laboratories were available in most African countries. For instance, in Zambia, in most facilities, the turnaround time for SARS-CoV-2 results was 7 days or more due to limited capacity for RT-PCR in the public sector [72]. Struggling in testing was observed in other African countries; for example, as of April 2, 2020, Zimbabwe had tested only 316 people for the virus, while as of April 1, 2020, Namibia, whose testing was being done locally and in South Africa, had conducted only 306 tests [12]. In the pandemic's initial stages, Ethiopia referred samples to South Africa for testing [73]. This was not the case in Western countries such as the USA, Germany, and South Korea, where mass community testing was carried out successfully. When similar mass community testing was attempted in South Africa, Zambia, and other African countries, the success rate was poor as huge backlogs were experienced; it took weeks for the results to be ready, rendering them meaningless for treatment and quarantine purposes [74]. Therefore, this made it difficult to identify infected individuals who were asymptomatic, pre-symptomatic, and symptomatic, and to enable contact tracing and isolation [73]. This shows that African countries need to invest heavily in disease diagnoses, such as setting up molecular laboratories that would aid the continent in quickly characterising infectious diseases and help their prevention and control. The other challenge faced by African countries was the scarcity of testing kits emanating from the global shortage of diagnostic tests for SARS-CoV-2 due to increased global demand and restrictions on the distribution of testing kits and reagents [75]. For example, Zambia experienced shortages of testing kits during the third and fourth COVID-19 waves, which led the government to revise the testing criteria following the increased community transmission with priority given to people with severe symptoms, healthcare workers, and people admitted to health facilities with various ailments [76]. Similar situations were found in Kenya, Rwanda, and other countries [77]. This experience shows that there is a need for African countries to be self-sufficient when it comes to diagnostic tests. Besides, there must be an adequate budgetary allocation for purchasing test kits and reagents. Moreover, diagnostic tests should be conducted in a decentralised manner to ensure that most people have access to these services. Alongside this, there must be a heightened investment in research and capacity-building across Africa.

5. Drug Availability in Healthcare Facilities during the COVID-19 Pandemic in Africa

A steady supply and assured availability of drugs are essential for managing and

treating diseases, especially during a pandemic, to avoid its adverse effects, as we have seen with the COVID-19 disease. Access to medicine is an important component of good health systems, and with uninterrupted access to medicine, improved health outcome for the population is likely to be achieved [78].

At the start of the pandemic, to control and slow down the spread of the disease, countries came up with policies such as lockdowns, border closures, curfews, and social distancing measures that disturbed the drug supply chain leading to drug shortage [79]. Moreover, these border closures and the country's curtailing of exports reduced global access to essential medicines [80].

Furthermore, the uncertainties of COVID-19 brought to the fore the inherent challenges in the flow of the global drug supply chain, causing an upswing in demand for certain medicines [81]. This was due to several reasons. Firstly, COVID-19 affected the globe within a few months due to increased travelling and movement of people. This brought about stockpiling of medicines and panic buying of essential drugs not just among countries but also in households, thus causing a shortage [80] [81]. This was noticeable in the early months, especially in the developed world [80].

Moreover, the situation was also made worse because, normally, the drug manufacturers operate in a just-in-time model with no on-hand reserve of drugs to avoid incurring losses due to excess production. Hence, a shortage will occur when there is a sudden increase in the demand for medicines, as is the case in the pandemic [81]. Furthermore, the closing down and reducing the drug factory workforce to prevent the spread of COVID-19 also disrupted the supply chain contributing to further shortage [81]. Furthermore, in such uncertain and dire situations, due to the growing pandemic threat, drug-producing countries had first to think about meeting the local demand before exporting to other countries, as was the case with India and China, increasing the drug shortage in the market [81].

Due to inadequate resources, some African countries were already disadvantaged because of the pre-pandemic trend in drug classes between developed and developing countries. This is so because manufacturers tend to sell medication to economically advantaged countries, leaving the developing countries more vulnerable to the disturbing drug supply chain because of their already limited supply [81]. Therefore, African countries need to improve their pharmaceutical supply chain mechanisms and increase on manufacturing of a variety of medicines.

6. Beliefs, Myths, and Misconceptions about COVID-19 in Africa

The advent of the coronavirus pandemic has led to a myriad of misconceptions among communities in Africa [82]. These have been driven by cultural beliefs and social and scientific mal perceptions. In a study in Gondar, Ethiopia, the magnitude of misconception was found among more than half of the population [83] while a much lower percentage was reported in Nigeria [84]. A common

misconception in the early stages of the pandemic was that the coronavirus disease only affected colder climates as the virus could not survive in hot climates. This led to a relaxation of preventive measures in most African countries, which have predominantly warmer climates than in Europe, where the pandemic had greater morbidity and mortality [9]. Another common misconception was that black people were less likely to be infected and die as they were inherently immune to the virus [9] [82] [85]. Due to the high mortality in older adults, it was believed that COVID-19 would only cause mortality among this population group [9] [82]. While those with diabetes, hypertension and asthma were at greater risk of severe COVID-19 disease with poor outcomes, it became common among populations to believe that only this population would be infected with COVID-19. This led to non-adherence to preventive measures among persons without these predisposing factors as they thought they would not be affected by the disease [9]. In the early stages of the pandemic, a common misconception was that COVID-19 was a disease to spy on African populations by Western countries and caused by the 5G networks [9] [82] [84]. Other misconceptions include; that wearing masks can cause illness [86], COVID-19 is a disease created by politicians for their benefit and to silence dissenting voices [85] [87], drinking alcohol and hot water can kill the virus, vaccination was a tracking system and can cause actual COVID-19 disease in people who were vaccinated [82]. Thus, the general public needs adequate sensitisation on COVID-19 transmission, prevention, treatment, and the benefits of vaccinations against infectious diseases.

7. COVID-19 Vaccine Uptake and Hesitancy across Populations in Africa

Vaccination has been a highly effective and cost-efficient strategy for human disease prevention [88]. However, the success of a COVID-19 vaccine in preventing disease spread is determined by the vaccination's coverage, or uptake rate, across a community and the achievement of herd immunity. Herd immunity can be generated by a sufficiently high uptake of an effective vaccine that protects individuals who are still vulnerable to the virus [89]. However, vaccine uptake has been affected by the refusal of many people in Africa to receive a vaccine [6] [11] [70] [90]. Vaccine hesitancy is defined as the refusal, reluctance, or delay in receiving a vaccine despite the availability of vaccines and related services [91].

The WHO identified hesitancy to vaccinations as one of the ten global health hazards for the year 2019 [92]. Vaccine hesitancy is the result of a complex decision-making process influenced by a variety of contextual, individual, and group, as well as vaccine-specific factors, such as communication and media, historical influences, religion/culture/gender/socioeconomic, politics, geographic barriers, vaccination experience, risk perception, and vaccination program design [91].

A study conducted among pharmacy students in Zambia found a high level of

awareness about COVID-19 vaccines, but only 24.5% of the respondents were willing to be vaccinated [90]. Low vaccine acceptance was associated with concerns about their safety and efficacy [90]. A follow-up study reported a vaccine acceptance rate of 33.4% among adult Zambians [11]. Additionally, Mudenda *et al.* (2022) confirmed that there had been a high amount of vaccine hesitancy since the commencement of the COVID-19 vaccination initiatives, causing Zambia to fall short of the 10% adult population target to get vaccinated [6]. Contrary to the Zambian situation, the vaccine acceptance level among adult Ghanaians was seen to be better at 51%, although the respondents were also concerned about the safety and efficacy of the vaccines [93]. In Cameroon, of the 2512 participants in a study, the majority (84.6%) of them were not willing to take the COVID-19 vaccine [94]. Participants were concerned about the confusing information on social media encouraging Africans not to take the vaccines. Additionally, the participants believed that pharmaceutical companies' financial gains superseded the population's public health interest. Hence, the safety and efficacy of vaccines could not be guaranteed [94].

In Eastern Zimbabwe, more than half (55.7%) of the respondents in a study reported having the intention to receive the vaccine themselves or in their households. Acceptance of the vaccines was primarily associated with trust in vaccine safety and the availability of the vaccine for free [95]. A national survey also found that half the participants were willing to take the vaccine while the rest of them were concerned about its effectiveness and safety [96].

A study in Kenya found that only 36.5% of the respondents were unwilling to take the vaccine. In rural areas, perceived difficulties in conforming to government laws on COVID-19 prevention, little perceived COVID-19 infection risk, worries about vaccination safety and effectiveness, and religious and cultural reasons were all linked to vaccine hesitancy [97]. To alleviate vaccine hesitancy, community mobilisation should be used to debunk erroneous allegations about the COVID-19 vaccine and provide health education about the vaccine's benefits. Community healthcare workers, community pharmacists, and civil-based groups should all play a role in dealing with this challenge [98].

8. Burden of Communicable and Non-Communicable Diseases in Africa

Africa comprises close to 20% of the world population. However, the continent bears the brunt of many diseases compared to other continents [99]. The notable infectious diseases, including HIV/AIDs, TB, and malaria, are heavily domiciled in Africa, a trend that has persisted for decades [100] [101] [102] [103] [104]. Infectious diseases are highly prevalent and a leading cause of high mortality in Africa [103] [105]. Studies have indicated that people infected with SARS-CoV-2 and suffering from chronic conditions are at high risk of experiencing severe symptoms and complications associated with COVID-19 [106] [107]. Furthermore, the morbidity and mortality rates associated with COVID-19 are higher in patients with chronic diseases [108] [109] [110]. Both natural and human factors

contribute to Africa's particularly worrying disease status [21] [111]. Geoclimatic factors have been implicated in encouraging the flourishing of vectors and transmission of many diseases with a characteristic high burden in the tropic and subtropic regions of the African continent [112]. On the other hand, most African countries' generally low socioeconomic status, a reflection of financial and related resource constraints, has resulted in inadequate preventive measures for many preventable and avoidable infectious diseases. While only about 2% of European deaths can be traced to infectious diseases, 50% of all African deaths are directly linked to infections [18].

Although previously thought to be confined to wealthier countries, non-communicable NCDs have steadily risen in Africa [17] [103] [113] [114]. The upsurge of these NCDs threatens to further stretch the already fragile healthcare systems across the African continent [115] [116]. Previous analysis has projected that the morbidity and mortality due to NCDs such as diabetes and hypertension will likely supersede the scourge inflicted by infectious diseases by 2030 [15]. A major complication with NCDs is that they often co-exist with other diseases [116]. As a result, they pose challenges when it comes to optimising therapeutic management of comorbidities due to disease-disease, disease-drug, and drug-drug interactions. As unmasked by COVID-19, prevailing disease conditions can affect the vulnerability of individuals to current and emerging diseases and infections.

With the rise in co-infections and comorbidities, it's more important now than ever to look into the aetiological links between these two types of diseases and invest in horizontal health system approaches and healthcare worker training to manage multiple and chronic conditions [117]. Even though COVID-19-related mortality has been low in African countries, it is believed that deaths were underreported [14] [118] [119]. Therefore, the burden of infectious diseases and NCDs shows the need to provide interventions to protect patients who suffer from chronic diseases.

Some patients with chronic diseases can avoid hospital visits by using telehealth services [120]. In addition, telehealth can be used by individuals such as those suffering from chronic diseases, the elderly, and those in transit. Besides, telehealth is crucial in ensuring that all people receive the medical services and products they need. Thus, in a period like the COVID-19 pandemic, telehealth is critical in ensuring continuity of access to healthcare services without visiting the hospital premises [121]. Additionally, telehealth mitigates the risks of contracting diseases in hospital environments [122] [123]. However, a lack of resources and technology hinders telehealth practice across African countries. This has also been reported globally in resource-limited and low- and middle-income countries [124]. Besides, accepting technology in the delivery of certain healthcare services remains a major challenge [125] [126]. Additionally, there have been challenges in implementing policies and frameworks that support telemedicine [127]. Thus, there is a need to invest in this fast-growing and promising opportunity that might help handle future pandemics.

An important lesson from the COVID-19 pandemic is that the African continent must prepare to handle future catastrophic pandemics adequately. As part of these efforts, more focus must be placed on understanding and mitigating the potential negative impact of co-morbid conditions in their ability to modulate an individual's ability to overcome infectious assaults.

9. Conclusion

The COVID-19 pandemic has impacted the African continent disproportionately. The brunt of the pandemic in some African countries has been due to non-adherence to the recommended prevention measures, inadequate human resources for health, lack of surveillance and diagnostic tools, shortages of drug supply, beliefs, myths, and misconceptions about COVID-19, vaccine hesitancy, and the burden of communicable and NCDs. Thus, there is an urgent need for African countries to formulate strategies, learning from the current experiences, to address these challenges.

Conflicts of Interest

The authors declare no conflict of interest.

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