



Preparedness for Coronavirus Disease-19 and Strategies for Its Containment in African Countries

*L.S Mbuyisa¹, Cheng-Loong Liang², Cheuk-Kwan Sun^{1,3},
Seng-Feng Jeng¹, San-Nan Yang^{1,2}, Ru-yi Huang^{1,2,*}*

Objectives: The emerging coronavirus disease-19 (COVID-19) poses both epidemiological and clinical challenges to the world, especially in the developing countries of Africa. Although Africa was initially spared of COVID-19, the condition deteriorated rapidly. We reviewed the current literature on COVID-19 in Africa, focusing on the status of spread and how the continent prepared for and responded to the pandemic.

Methods: We searched PubMed, EMBASE, African Journals Online, and African Index Medicus for studies on COVID-19 published from database inception till July 1, 2020. We included all studies that elaborated on the factors that may exacerbate the spread of COVID-19 in Africa, whereas articles that may not be peer-reviewed and those that did not report primary outcomes of policies as well as studies focusing on diagnosis and treatments of COVID-19 were excluded. We obtained raw data from specific sites including the Africa Centers for Disease Control and Prevention, the dashboard from World Health Organization (WHO), and Johns Hopkins University.

Results: Literature review showed that factors contributing to the rapid spread of the pandemic in Africa included an immature healthcare system with existing disease burden, shortage of food and water, low health literacy, and poor infrastructure of information technology. The predominance of young population in the habit of social gathering as part of their culture (i.e., “super spreaders” defined by WHO) may also increase the risk of infection. In response to the growing pandemic, the African Union (AU) has adopted the concept of “One Health” that involves the development of synergistic international partnerships binding the technological potential of industrialized nations to the developing research capability and unique political cultures of Africa by following the WHO guidelines and mobilizing the community workforce.

Conclusion: The current study, which identified the potential contributors to the spread of COVID-19 in Africa and reviewed the measures taken to contain the pandemic, may shed light on the direction of future strategies for infection control on the continent.

Key words: COVID-19, policy, Africa, primary prevention

Introduction

The current pandemic of new coronavirus disease (COVID-19) has proven itself

From the ¹School of medicine for international students, I-Shou University; ²Department of Medical Education and ³Department of Medical Research, E-Da Hospital, Kaohsiung, Taiwan

Received: October 28, 2020

* Address reprint request and correspondence to: Ru-yi Huang, Department of Medical Education, E-Da Hospital, No.1, Yida Road, Yan-chao District, Kaohsiung City, 824, Taiwan.

Tel: 886-7-615-0011, Email: ruyi.star@gmail.com

to be one of the most devastating plagues in human history.¹ Researchers and public health professionals have collected important data to show the transmission route of the virus, how it affects the medical sector, and what we can learn from previous epidemics to prevent other emerging viral infections.² The information collected from all over the world could help avoid catastrophic events in certain resource-limited African countries.

Although the severe acute respiratory syndrome (SARS) outbreak in China in 2003 was successfully controlled and did not affect most countries in the world, Taiwan bore the brunt of the assault that subsequently overhauled its guidelines on infection control in the public healthcare setting. This may partly explain Taiwan's ability to survive the first wave of the COVID-19 pandemic³ and also the second global health crisis caused by MERS (Middle East respiratory syndrome coronavirus) after its first emerging from the Middle East in 2012 and affected 27 countries with a mortality rate of up to 32.97%.⁴

In West Africa between 2014 and 2016, the Ebola virus outbreak was also found to be deadly with a fatality rate ranging from 25% to 90%. According to the World Health Organization (WHO), its nature of droplet transmission and the process of globalization have posed a serious threat to endemic countries of which the governments have developed corresponding strategies for the prevention and containment of possible outbreaks.⁵

Therefore, such highly contagious and lethal viral infections have presented a unique global challenge² that requires the implementation of an effective vaccination program as well as improvements in infection control strategies especially in developing countries.⁶

According to the latest update of Johns Hopkins University, Coronavirus Resource Center, the most heavily affected countries were the United State of America, Italy, Spain, France, United Kingdom, Iran, Belgium,

Germany, China, and Netherlands. While some countries like the USA were still experiencing an increase in the number of confirmed cases, the curve for confirmed cases was flattening in others like the Netherlands.⁷ Researchers at Johns Hopkins University were seriously concerned about the possibility of viral spread to African countries which would suffer most if the pandemic propagates at the present speed with a similar death toll.⁸

The novel coronavirus (COVID-19) was first identified in Wuhan, China, in December 2019 when a cluster of patients presented with an unidentified form of viral pneumonia after visiting the Huanan seafood market.^{3,9} Human-to-human transmission of the newly identified coronavirus then became evident and the number of cases kept increasing outside China till March 2020 when WHO declared the coronavirus disease 2019 (COVID-19) as a pandemic. The tide of viral spread appeared unstoppable in many countries where community transmission spiraled out of control.¹⁰ The present study aimed at systematically reviewing the strategies adopted in African countries in an attempt to prevent the invasion and contain the spread of the virus.

Materials and Methods

Search strategy

For this systematic review, we searched PubMed, EMBASE, resources from John Hopkins University, Africa Center for Disease Control (CDC), WHO guidelines, African Journals Online, and African Index Medicus for studies on COVID-19 published from inception on February 1, 2020 to July 1, 2020 with a combination of research terms of "Coronavirus disease-19", "Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)", "Coronaviridae infection", "Healthcare policy", "Primary prevention", "Mask and handwashing", "Epidemiology of coronavirus disease", and "Africa".

We included all studies that investigated the factors that may exacerbate the spread of COVID-19, including mass gathering, close contact, and mechanical ventilation as well as those that reviewed the policies implemented to contain the spread of COVID-19 in Africa, such as quarantine for those arriving from a pandemic-affected country within 14 days, closing of borders and allowing only essential travels, prohibition of alcohol and social gathering (e.g., church congregation) as well as practice of social distancing.

We excluded studies that may not be peer-reviewed, those that did not report the primary outcomes of the policies involved, and those focusing on diagnosis and treatment of COVID-19. We used a standardized form to extract data including disease prevalence, primary prevention strategies (e.g., mask, social distancing, and quarantine), patient identification and tracking as well as factors affecting disease susceptibility. If the required information was not available in the published report, we retrieved raw data from websites including those of Johns Hopkins University, Africa CDC, and World Health Organization.

Results

Status of COVID-19 pandemic in Africa

According to the information from WHO released on March 15, 2020, 213 countries in the world reported new cases with the total number of new cases being 77,274. There were 1,848,439 confirmed cases with 117,217 deaths, and the numbers were expected to rise.⁷ Updated data from Africa CDC on the distribution of cumulative cases (i.e., percentage of global case) in COVID-19-affected countries identified by WHO (excluding Africa) were as follows: Europe 913,349 (52%), Eastern Americas 610,742 (34%), Mediterranean Region 94,995 (5%), Western Pacific 122,138 (7%) and South-East Asia 16,883

(1%). Although Africa was initially spared, the number of affected countries increased from nine to 41 within one week after the first confirmed case in Africa. As the world populations continue to travel, it may only be a matter of time before COVID-19 spreads to the rest of the 54 countries on the continent. According to Africa CDC, Africa already had 18,333 confirmed cases with 962 deaths in up to 52 out of the 54 countries. Surprisingly, countries seriously affected were the ones relatively well equipped. South Africa bore the brunt of the assault with 1,686 confirmed cases and 12 deaths, followed by Cameroon with 658 cases and 9 deaths, Burkina Faso with 364 cases and 18 deaths, Ivory Coast with 323 cases and 3 deaths, Nigeria with 238 cases and 5 deaths, Senegal with 226 cases and 2 deaths, the Democratic Republic of Congo with 180 cases and 18 deaths, Kenya with 156 cases and 6 deaths, Guinea with 121 cases and no deaths, and Rwanda with 105 cases and no deaths. Then one can only wonder what can happen to those countries with weak medical health system like the Kingdom of Eswatini, Mozambique, Zimbabwe, and Namibia which are neighboring one of the most seriously affected countries.

Factors that influence the spread of COVID-19 in Africa

Underlying condition

The continent's population and health system are the two major factors that distinguish it from other regions being affected by COVID-19 to date. The continent's unique demographic structure is the first factor that is different from that in other regions of the world. The median age of the 1.3 billion population in Africa is 19.7 years.¹¹ By contrast, the median age in China is 38.4 years, and the median age in the European Union is 43.1 years.¹² Experiences in Asia, Europe, and America showed that people over 60, and those with significant health problems are most

vulnerable to COVID-19-associated mortality and morbidity.¹³ The other factor that may adversely affect the spread of the pandemic in Africa is its health care system. The continent is experiencing a double burden of diseases: in addition to dealing with endemic infectious diseases, the health systems in Africa are in constant struggle with non-communicable diseases, including malnutrition and cancer. As a result, the overstretched health systems have little capacity to deal with the major health threat imposed by the pandemic.

We may therefore anticipate a higher incidence of severe forms of COVID-19 in younger patients because of its demographic characteristic as well as the prevalence of co-existing non-communicable diseases that have weakened their immune system. Malnutrition, anemia, malaria, HIV/AIDs, and tuberculosis are also likely to increase the severity of COVID-19. It is conceivable that the situation in Africa could be worse than in other countries where most affected people are likely to undergo uneventful recovery.¹⁴

Shortage of hospital equipment

Severe forms of COVID-19 (i.e. acute respiratory distress syndrome and septic shock) lead to respiratory failure that requires ventilation support. The ability to treat severe forms of COVID-19 depends on the availability of ventilators, electricity, and the supply of oxygen. A recent analysis of countries with the largest numbers of intensive care beds per capita does not include any country from Africa. In Liberia, for example, there are no intensive care units (ICU) with ventilators. Uganda has 0.1 ICU bed/100,000 population. In contrast, the United States has 34.7 beds/100,000 population.^{15,16}

Social gatherings

Social gatherings are of great importance for maintaining group adhesiveness in Africa. For instance, weekly attendance of a religious

service is an important part of life in Africa with an attendance rate as high as 82% in Uganda and Ethiopia. As a result, measures to impose social and physical distancing may prove to be challenging as reflected by the protests on March 20, 2020 in Senegal after a prohibition of public gatherings in response to a rise in the number of COVID-19 cases at mosques. Although lessons learned in Taiwan, Italy, and China are valuable, they cannot be extrapolated directly to Africa because of the above-mentioned differences in demographics and health care systems. The overloaded health care systems in Africa have very limited capacity to cope with the pandemic.¹⁷

Shortage of food and water

Frequent handwashing, social distancing, and partial or total lockdowns are among the most popular measures recommended by WHO and being implemented across the world in an attempt to contain the pandemic. However, existing inequalities in access to life-sustaining commodities (i.e., water, sanitation facility, and food storage) create vulnerabilities to COVID-19 and can render the preventive measures ineffective or simply counterproductive, especially in sub-Saharan Africa as well as in central and southern Asia. In sub-Saharan Africa, people in urban areas are twice as likely as those in rural areas to have clean and safe water. Another urban-rural difference is in sanitation. While rural areas often have a limited access to sanitation facilities, the situation is even worse in Sub-Saharan Africa. As a whole, only 24% of the rural population and 44% of the urban population have access to sanitation facilities.¹⁸

Other important issues also include nutrition and environment. Although Sub-Saharan African (SSA) comprises nearly 13% of the global population, a high proportion of the population living in rural communities are in poverty and undernourished.¹⁹ Children in poverty are more likely to

live in overcrowded areas with poor sanitation, less likely to be vaccinated, and more likely to catch infections that damage the respiratory system early in life. They have less access to greenery and space for exercise and are more likely to breathe polluted air, both indoors or outdoors.²⁰

Communication and health literacy

Another quagmire that Africa has stumbled into is its limited access to information about the prevention measures being promoted. Recent incidents of violence suggest a growing atmosphere of general mistrust and hostility similar to that during the previous Ebola epidemic. People who failed to receive messages from the Health Ministries were prone to take rumors as official statements.²¹ Take Nigeria for example, with the low level of education, people vulnerable to COVID-19 were expected to be misled by rumors. As the number of COVID-19 cases gradually rises among the Nigerian population, misinformation regarding COVID-19 has created a sense of fear and anxiety among the inhabitants of the region.²² Culture is essential to achieving effective communication to reduce health-related risks.²³ Therefore, healthcare professionals are in a position to highlight the important impact of culture on health and guide policy-makers' efforts to adopt a culture-based approach to health promotion.²⁴

Infrastructure of technology

Difficulties impeding the successful implementation and scale-up of technology in low- and middle-income countries are as follows: the complexity of the intervention and lack of technical consensus, limited human resource, poor leadership, insufficient financial support, staff resistance, lack of effective management, low organizational capability, misapplication of proven diffusion techniques, non-engagement of local users, and inadequate use of research findings on implementation.²⁵

Emergency preparedness and response

There is a heated discussion over "will Africa be able to combat COVID-19?" In our review, Africa has taken important steps to prepare itself in response to the threat of the pandemic.

Organization formation

The African public health system responded promptly to the COVID-19 pandemic well before the report of the first confirmed case of infection on the continent. This response was made possible by the organization of a consortium orchestrated by WHO that allowed strengthening of communication as well as establishing trust and 'unity of purpose' among African governments, Africa CDC, Nigeria CDC, local communities, and the Pan-African Network For Rapid Research, Response, Relief and Preparedness for Infectious Disease Epidemics (PANDORA). PANDORA-ID-NET, which is a €10 million grant funded by the European and Developing Countries Clinical Trials Partnership, enabled the collaboration among local African and European public health workers and scientists. The establishment of such a "One Health" network allowed those involved to work effectively and equitably together across all Africa regions in close liaison with the Africa CDC and other global public health agencies.²⁶⁻²⁸

Policies under WHO guidelines^{28,29}

Despite the implementation of policies including country lockdown, quarantine, and isolation of imported cases of COVID-19, the ongoing local viral spread has highlighted the inadequacy of current measures.¹³ The approach should focus on containment and aggressive preventive measures. Early and aggressive physical distancing and frequent handwashing will prevail as the most effective and affordable interventions for the continent, with parallel testing, contact tracing, and case

isolation.^{30,31}

Community involvement

Since Africa is characterized by the predominance of its young population as well as its unique cultural and religious tradition, a full public support for the successful implementation of aggressive preventive measures requires enthusiastic community engagement and a strong healthcare leadership³² with the involvement of the youth and religious leaders. At the systemic level of healthcare, an elaborate reconstruction of the medical system could be crucial to increasing the critical care capacity in response to the growing threat of the pandemic.³³⁻³⁵

Alcohol banning

South Africa began to limit alcohol sales in mid-March 2020, followed by a national lockdown that prohibited the sale of all liquors. These measures are considerably stricter than those of other countries such as the United Kingdom and New Zealand. The rationale for the implementation of such drastic measures in South Africa is based on the detrimental role of alcohol in undermining the policy of social distancing, compromising immune response, impairing consciousness, and increasing the possibility of injuries.³⁶

Conclusion

Enhancement of public access to health resources, enrichment of scientific expertise, consolidation of national cooperative experience, and a strong leadership commitment may be the keys to successful prevention of the second wave of COVID-19 in Africa. A whole new generation of young African public health workers, scientists, and healthcare providers need further training and funding support to keep up with their expected roles in the global battle against the COVID-19 pandemic. We reviewed the current data in an

attempt to provide the future direction for the improvement of public health in Africa, which may be achieved through the implementation of a well-organized long-term strategy and a strong public health leadership.

Acknowledgment

We would like to thank the chief librarian of the E-Da Medical Library, Madam Su-Ying Chiu, for her professional assistance in our literature search as well as Dr. Dania Aragon's input regarding the basic virology and clinical management of COVID-19. A tribute is also paid to Miss Abby I-Chen Chen who kindly helped in the preparation of the manuscript.

References

1. Čivljak R, Markotić A, Kuzman I: The third coronavirus epidemic in the third millennium: what's next? *Croat Med J* 2020;61:1-4. doi: 10.3325/cmj.2020.61.1.
2. Institute of Medicine (US) Forum on Microbial Threats: Ethical and legal considerations in mitigating pandemic disease: workshop summary. Washington (DC): National Academies Press (US), 2007.
3. Lin CF, Wu CH, Wu CF: Reimagining the administrative state in times of global health crisis: an anatomy of Taiwan's regulatory actions in response to the COVID-19 pandemic. *Eur J Risk Regul* 2020;1-17. doi:10.1017/err.2020.25.
4. Arshad Ali S, Baloch M, Ahmed N, et al: The outbreak of Coronavirus Disease 2019 (COVID-19)—An emerging global health threat. *J Infect Public Health* 2020; 13:644-6. doi: 10.1016/j.jiph.2020.02.033.
5. Kadanali A, Karagoz G: An overview of Ebola virus disease. *North Clin Istanbul* 2015;2:81-6. doi:10.14744/nci.2015.97269.
6. Bahadur AV, Tanner T, King D, et al: Resilience Scan October-December 2015: a review of literature, debates and social media activity on resilience, Overseas Development Institute, London, 2016.
7. Binti Hamzah FA, Lau C, Nazri H, et al: CoronaTracker: Worldwide COVID-19 outbreak data analysis and prediction. [Preprint]. *Bull World Health Organ*. E-pub: 19 March 2020. doi: http://dx.doi.org/10.2471/BLT.20.255695.
8. Afriyie DK, Asare GA, Amponsah SK, et al: COVID-19 pandemic in resource-poor countries:

- challenges, experiences and opportunities in Ghana. *J Infect Dev Ctries* 2020;14:838-43. doi: 10.3855/jidc.12909.
9. She J, Jiang J, Ye L, et al: 2019 novel coronavirus of pneumonia in Wuhan, China: emerging attack and management strategies. *Clin Transl Med* 2020;9:19. doi: 10.1186/s40169-020-00271-z.
10. World Health Organization: Coronavirus disease (COVID-19): weekly epidemiological update, 2020. <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/situation-reports> Accessed October 15, 2020.
11. World Population of Africa, 2020. <https://www.worldometers.info/world-population/africa-population/>. Accessed October 16, 2020.
12. European Commission: Median age over 43 years in the EU, 2018. <https://ec.europa.eu/eurostat/web/products-eurostat-news/-/DDN-20191105-1>. Accessed October 20, 2020.
13. Han E, Tan MMJ, Turk E, et al: Lessons learnt from easing COVID-19 restrictions: an analysis of countries and regions in Asia Pacific and Europe. *Lancet* 2020;396:1525-34. doi: 10.1016/S0140-6736(20)32007-9.
14. Amimo F, Lambert B, Magit A: What does the COVID-19 pandemic mean for HIV, tuberculosis, and malaria control? *Trop Med Health* 2020;48:32. doi: 10.1186/s41182-020-00219-6.
15. Martina A, Simone S, Federico N, et al: Clinical needs and technical requirements for ventilators for COVID-19 treatment critical patients: an evidence-based comparison for adult and pediatric age. *Health Technol (Berl)* 2020;1-9. doi: 10.1007/s12553-020-00467-w.
16. El-Sadr WM, Justman J: Africa in the Path of Covid-19. *N Engl J Med* 2020;383:e11. doi: 10.1056/NEJMp2008193.
17. Karbo T: Religion and social cohesion in Ethiopia. *Int J Peace and Dev Stud* 2013;4:43-52. doi: 10.5897/IJPDS2013.0164.
18. Ekumah B, Armah FA, Yawson DO, et al: Disparate on-site access to water, sanitation, and food storage heighten the risk of COVID-19 spread in Sub-Saharan Africa. *Environ Res* 2020;189:109936. doi:10.1016/j.envres.2020.109936.
19. Ayanlade A, Radeny M: COVID-19 and food security in Sub-Saharan Africa: implications of lockdown during agricultural planting seasons. *NPJ Sci Food* 2020;4:13. doi: 10.1038/s41538-020-00073-0.
20. Sinha IP, Lee AR, Bennett D, et al: Child poverty, food insecurity, and respiratory health during the COVID-19 pandemic. *Lancet Respir Med* 2020;8:762-3. doi: 10.1016/S2213-2600(20)30280-0.
21. Seytre B: Erroneous communication messages on COVID-19 in Africa. *Am J Trop Med Hyg* 2020;103:587-9. doi: 10.4269/ajtmh.20-0540.
22. Reuben RC, Danladi MM, Saleh DA, et al: Knowledge, attitudes and practices towards COVID-19: an epidemiological survey in North-Central Nigeria. *J Community Health* 2020:1-14. doi: 10.1007/s10900-020-00881-1.
23. Airhihenbuwa CO, Iwelunmor J, Munodawafa D, et al: Culture matters in communicating the global response to COVID-19. *Prev Chronic Dis* 2020;17:E60. doi: 10.5888/pcd17.200245.
24. Napier D, Depledge MH, Knipper M, et al: Culture matters: using a cultural contexts of health approach to enhance policy-making. Copenhagen, Denmark: World Health Organization Regional Office for Europe, 2017.
25. Khubone T, Tlou B, Mashamba-Thompson TP: Electronic health information systems to improve disease diagnosis and management at point-of-care in low and middle income countries: a narrative review. *Diagnostics (Basel)* 2020;10:327. doi: 10.3390/diagnostics10050327.
26. Africa CDC: Daily updates COVID-19 Africa, 2020. <https://africacdc.org/>. Accessed October 20, 2020.
27. Kapata N, Ihekweazu C, Ntoumi F, et al: Is Africa prepared for tackling the COVID-19 (SARS-CoV-2) epidemic. Lessons from past outbreaks, ongoing pan-African public health efforts, and implications for the future. *Int J Infect Dis* 2020;93:233-6. doi: 10.1016/j.ijid.2020.02.049.
28. Rosenthal PJ, Breman JG, Djimde AA, et al: COVID-19: shining the light on Africa. *Am J Trop Med Hyg* 2020;102:1145-8. doi: 10.4269/ajtmh.20-0380.
29. World Health Organization: Coronavirus disease (COVID-19) advice for the public, 2020. <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public>. Accessed October 23, 2020.
30. Momtazmanesh S, Ochs HD, Uddin LQ, et al: All together to fight COVID-19. *Am J Trop Med Hyg* 2020;102:1181-3. doi: 10.4269/ajtmh.20-0281.
31. Moodley K, Obasa A, London L: Isolation and quarantine in South Africa during COVID-19: Draconian measures or proportional response? *S Afr Med J* 2020;110:456-7. doi: 10.7196/SAMJ.2020v110i6.14842.
32. Anoko JN, Barry BR, Boiro H, et al: Community engagement for successful COVID-19 pandemic response: 10 lessons from Ebola outbreak responses in Africa. *BMJ Glob Health* 2020;4:e003121. doi: 10.1136/bmjgh-2020-003121.
33. Chiang C, El Sony A: Tackling the threat of COVID-19 in Africa: an urgent need for practical planning. *Int J Tuberc Lung Dis* 2020;24:541-2. doi: 10.5588/ijtld.20.0192.
34. Echoru I, Kasozi KI, Usman IM, et al: Religion influences community adherence to COVID-19 guidelines in Uganda. *Research Square* 2020. doi: 10.21203/rs.3.rs-59701/v1.
35. Ihekweazu C, Agogo E: Africa's response to COVID-19. *BMC Med* 2020;18:151. doi: 10.1186/s12916-020-01622-w.
36. Matzopoulos R, Walls H, Cook S, et al: South

Africa's COVID-19 alcohol sales ban: the potential for better policy-making. Int J Health Policy Manag

2020. doi: 10.34172/ijhpm.2020.93. Epub ahead of print.