Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Ethics, Medicine and Public Health (2020) **15**, 100580

Available online at
ScienceDirect
www.sciencedirect.com

Elsevier Masson France
EM|consulte
www.em-consulte.com

COMMENTARY

COVID-19 response in Nigeria: Health system preparedness and lessons for future epidemics in Africa

La réponse à la COVID-19 au Nigéria : préparation des systèmes de santé et leçons pour de futures épidémies en Afrique

C.C. Etteh[a,b], **M.P. Adoga**[c,d,*], **C.C. Ogbaga**[e,f]

[a] *Department of medical biochemistry, Imo State university, Owerri, Imo State, Nigeria*
[b] *Department of science, university of Highlands and Islands, Moray Scotland, United Kingdom*
[c] *Department of microbiology, faculty of natural and applied sciences, Nasarawa State university, Keffi, Nigeria*
[d] *African centre for infection and biomolecular sciences (ACIBS), Nasarawa State university, Keffi, Nigeria*
[e] *Department of biological sciences, Nile university of Nigeria, Airport road, Abuja, Nigeria*
[f] *Department of microbiology and biotechnology, Nile university of Nigeria, Abuja, Nigeria*

Received 31 July 2020; accepted 13 August 2020
Available online 20 August 2020

KEYWORDS
Africa;
Coronavirus disease 2019 (COVID-19);
Health system preparedness;
Nigeria;
SARS-CoV-2

Summary The coronavirus disease 2019 (COVID-19) will continue to have a significant impact on the way we live for at least the next few years until the scale-up of production and administration of an effective vaccine. Unfortunately, this will not be the last pandemic of infectious diseases the world will experience, and the next one may have more devastating consequences in Africa than COVID-19, unless critical lessons for the future are learnt now for more rapid and robust containment measures. Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), the viral cause of COVID-19, is thought to have been introduced into the continent by returning travellers from hotspots in Asia, Europe and America. In a pandemic with Africa having relatively lower morbidity and mortality, it is alarming that in about five months since confirmation of the continent's first case of COVID-19 in Egypt on February 14th, 2020, the infection rate remains at an exponential phase with forty-seven African countries reporting a total of 766,803 cases, 13,191 deaths and 486,925 recoveries as at 31st July, 2020; out of which Nigeria reported

* Corresponding author. Department of microbiology, faculty of natural and applied sciences and African centre for infection and biomolecular sciences (ACIBS), Nasarawa State university, Keffi, Nigeria.
E-mail address: moses.adoga@nsuk.edu.ng (M.P. Adoga).

https://doi.org/10.1016/j.jemep.2020.100580

42,689 cases, 878 deaths and 19,290 recoveries, with Lagos State accounting for close to half of all cases in Nigeria. Importantly, lessons learnt during the Ebola epidemic have had a significant impact on Nigeria's COVID-19 response. In this article, we discuss Nigeria's response, health system preparedness and the lessons that are critical for containment of future outbreaks, epidemics or pandemics of any infectious disease in Africa.

MOTS CLÉS
Afrique ;
Coronavirus 2019 (COVID-19) ;
Préparation des systèmes de santé ;
Nigeria ;
SRAS-CoV-2

Résumé La maladie du coronavirus 2019 (COVID-19) va continuer à avoir un impact sérieux sur la façon dont nous vivons pour encore quelques années jusqu'à ce que nous mettions au point et administrions un vaccin. Malheureusement, cela ne va pas être la dernière épidémie à laquelle le monde va être confronté, et la prochaine pourrait avoir des conséquences encore plus désastreuses en Afrique que la COVID-19 à moins que des leçons soient tirées pour un confinement plus rapide et plus sévère. Le syndrome respiratoire aigu coronavirus 2 (Sars-CoV-2), la cause virale de la COVID-19, a été introduit, pense-t-on, sur le continent africain par des travailleurs qui revenaient de pays fortement touchés en Asie, Europe et Amérique. Dans une pandémie où la morbidité et la mortalité sont relativement faibles en Afrique, il est alarmant de constater qu'environ cinq mois après la confirmation du premier cas de COVID-19 en Égypte le 14 février 2020, le taux d'infection reste à une phase exponentielle, 47 pays africains ayant déclaré un total de 766 803 cas, 13 191 décès et 486 925 récupérations au 31 juillet 2020 ; le Nigeria a fait état de 42 689 cas, 878 décès et 19 290 guérisons, l'État de Lagos représentant près de la moitié de tous les cas au Nigeria. Il est important de noter que les leçons tirées de l'épidémie d'Ebola ont eu un impact significatif sur la réponse du Nigeria à la COVID-19. Dans cet article, nous examinons la réponse du Nigeria, la préparation du système de santé et les leçons qui sont essentielles pour contenir les futures épidémies ou pandémies de toute maladie infectieuse en Afrique.

Introduction

The current coronavirus disease 2019 (COVID-19) pandemic will not be the last global spread of an infectious disease the world will experience, and the next one may stamp its feet firmer in Nigeria and the rest of Africa with much more catastrophic consequences than it does in the current situation unless critical lessons for the future are learnt now for more rapid and robust containment measures. As alarmist as this might seem, a simple analysis of the trends of outbreaks, epidemics or pandemics in the past is a testament to this [1—3]. Moreover, experiences with influenza, cholera and Middle East respiratory syndrome coronavirus (MERS-CoV) demonstrate that pandemics come with fear and uncertainties that are characterized by losses of lives, livelihood and economic meltdown that results from low industrial and economic activities [1—6]. Therefore, public health challenges of such magnitude will usually lead to critical questions, especially in countries with dysfunctional or weak health systems; and Nigeria is not excluded in this class. For instance, does the response provided by the Nigerian stakeholders in its current state, no matter how good it might seem, effectively match the ferocity of the pandemic?

More importantly, are lessons being learnt to inform future responses to disease outbreaks, epidemics or pandemics? These and many more questions should occupy the minds of public health officials and policy-makers in Nigeria and other African countries. Moreover, since its first report, the high morbidity and mortality associated with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), the aetiological agent of COVID-19, pose the greatest global economic and public health challenges in decades. Only a few months after the initial outbreak of this highly pathogenic and transmissible viral pathogen was reported in Wuhan, the capital city of Hubei Province in China, precisely in December 2019, the disease has regrettably become a pandemic [7]. In addition, it's alarming that the infection is spreading so fast that as at 21st June, 2020, just within approximately six months of the first outbreak, 8,708,008 cases of COVID-19 have been confirmed, including 461,715 deaths [8].

In Nigeria, since confirmation of the index case on 27th February, 2020, and its subsequent genomic sequencing, the transmission rate remains at exponential phase with no clear clues on when it will plateau, with attendant economic and public health consequences in the country [9,10]. A number of factors might be responsible for this. For instance, when the World Health Organization (WHO) started providing information on the threat posed by the COVID-19 in China, there were very few or no cases identified in Africa and elsewhere. As the virus started spreading to other parts of the world, at the time an African country such as Ghana and the USA issued travel bans on returning travellers from

high-risk countries including China and countries in Europe, Nigeria, like many other African countries, was initially hesitant to toe the line. Consequently, there were unconfirmed reports that some Europe-based returning travellers to the USA who got caught up in the web of travel ban, took flights to the Murtala Muhammed Airport in Lagos, Nigeria, before connecting to their U.S. destinations in disguise. Could this explain why Lagos State accounts for close to half of all cases in Nigeria? Or could it be because Lagos State has conducted more tests than any other state in Nigeria or both?

Health system preparedness

The COVID-19 pandemic caught most health systems around the world off guard and initially overstretched and threw an enormous challenge to health systems everywhere including developed countries. It is no surprise, therefore, that in Nigeria and the rest of Africa, the initial reaction was that of panic and confusion thanks to the weak or dysfunctional health systems characteristic of most African countries. Consequently, it was crystal clear that, like most developing countries, Nigeria's health system was ill-prepared for the monumental challenge posed by the ferocious new coronavirus. However, Nigeria has been through similar health emergencies in the past, which necessitated the establishment of a public health institute that is equipped to provide scientific and technical leadership in times of health crises. That institute is the Nigeria Centre for Disease Control (NCDC), which was copycatted from the U.S. Centers for Disease Control and Prevention (CDC). The NCDC has, to a large extent, lived up to a responsibility of serving as a rescue public health institute in times of health emergencies. Importantly, lessons learnt during the Ebola epidemic were to a significant extent leveraged upon for the COVID-19 response.

However, although the contact tracing coordinated by the NCDC and Presidential Task Force (PTF) so far seems good at identifying individuals exposed to risk through close contacts with infected persons, we suggest that recruiting and training official contact tracers will make such efforts more effective. The contact tracers should employ several approaches including running a national virtual call centre for easy dissemination of any useful information or clues that make tracing more prompt and comprehensive. This is critical if the country must flatten the infection rate curve, as prompt test-and-trace or contact tracing has been shown to be effective in several settings [11,12].

Lessons from Ebola epidemic inform COVID-19 response

Nigeria demonstrated strong leadership and well-coordinated response during the Ebola epidemic after the index case arrived Lagos on 20th July, 2014, and was confirmed to have been infected with the virus on 23rd July of the same year. Patrick Sawyer, the index case, was a citizen of Liberia who lost a sister to Ebola before taking a flight to Lagos, Nigeria. On arrival in Lagos, he immediately sought medical attention in a hospital because he already had symptoms onboard flight. Sawyer did not survive. Nine doctors and nurses that had contacts with him got infected and four lost their lives [7]. A contact of the index case travelled to Port Harcourt on 1st August of the same year with high-risk and very high-risk exposure of hundreds of people in the city as attested by the WHO and Nigeria's public health officials [7]. The anticipated explosion of new cases as a result of this did not happen thanks to an effective response by the public health officials.

However, before Mr Sawyer embarked on a journey from his country to Nigeria, Nigeria's Minister of Information had exaggerated Nigeria's preparedness for potential outbreaks in the country by a false claim in the media that the country had a vaccine stockpile for the virus and was well-prepared to contain its spread should there be outbreaks. Unknown to the politician, no vaccine had been developed against the virus anywhere in the world at the time. It is, therefore, obvious that Mr Sawyer's decision to travel to Nigeria could be a deliberate one in a desperate attempt in search of a life-saving solution against a disease that was somewhat a death sentence at the time, which he knew he had contracted. On confirming Ebola disease in Mr Sawyer as Nigeria's index case, public health officials were put on high alert and contact tracing begun immediately. Moreover, a WHO-supported emergency operations centre was established, a first-rate virology laboratory affiliated with the University of Lagos Teaching Hospital was equipped and staffed for case detection of Ebola, funds were allocated by the government and expeditiously dispatched, isolation facilities were built in the two cities (i.e. Lagos and Port Harcourt) and certain facilities were designated for Ebola treatment.

In addition, information dissemination in English and local dialects was carried out in local radio stations, technologies available for polio eradication were deployed to provide support for the Ebola response, Global Positioning Systems (GPS) were used for real-time contact tracing and mapping of transmission chains on a daily basis with 100% and 99.8% contact tracings in Lagos and Port Harcourt respectively. With a total number of 19 cases and 7 deaths, the success story was attested by the WHO as being 'spectacular' leading to a declaration on 20th October, 2014, by the WHO that Nigeria was free of Ebola transmission [7]. The success story of Ebola response in Nigeria was possible because public health officials leveraged on the lessons learnt in poliomyelitis response. In the same vein, but for initial delays in the suspension of air travels to Nigeria, the lessons learnt during the Ebola outbreak have had a significant impact on the ongoing COVID-19 response.

COVID-19 ignites a multi-sectoral response with NCDC providing technical leadership

It is obvious that a pandemic that has shaken the foundations of the best of health systems around the world must require a robust multi-sectoral response for effective containment and Nigeria realizes this. Consequently, the Nigeria Centre for Disease Control (NCDC) and the Presidential Task Force (PTF) on COVID-19 are at the forefront coordinating the multi-sectoral response. The legislation that established NCDC was given presidential assent in late 2018. Ever since,

the country's national public health institute has been at the forefront of the response to public health emergencies. In that vein, after the confirmation of the index case on 27th February, 2020, from an Italian citizen who had visited Nigeria, NCDC started a daily situation report on 29th February which provided the number of cases, deaths and recoveries both on a state-by-state basis and cumulatively. The daily COVID-19 Situation Report document also contained links to five resources the institute had initially developed namely; infection prevention and control recommendations for health workers, recommendations on the use of personal protective equipment for health workers, public health advisory to Nigerians, case-definition to guide diagnosis in Nigeria and answers to frequently asked questions on COVID-19 [13].

However, by 7th July, 2020, the response resources provided by the NCDC had grown to include guidelines on the re-opening of places of worship (as a result of the national lockdown), guidelines on conducting elections during COVID-19 outbreak, operational guidelines for law enforcement agencies, guidelines on safe transportation of remains of individuals who have died of COVID-19, guidelines for integration of private laboratories into the response architecture, guidelines for businesses and employers, community case-definition and case management guide, periodic public health advisories on COVID-19, advisory on the use of face masks, information on the use of cloth face masks and how to make cloth face masks, advisory for vulnerable groups, guidelines for the management of pregnant women and nursing mothers during the pandemic, advisory on the management of dead bodies for burials and guidelines for the rational use of personal protective equipment in the care of COVID-19 cases for health workers. Additionally, NCDC published a national strategic document on scale-up of access to COVID-19 testing and established public health reference laboratories across the country in designated cities to ensure this is achieved [14].

The PTF on its part complements NCDC's efforts by providing daily press briefings on COVID-19 and lockdown measures, publication of the Federal Government's policy documents on COVID-19 including fiscal measures by the Federal Government in response to the COVID-19 pandemic, making available presidential addresses and information on economic support during the pandemic. Related documents are often made available by the Task Force on the website of the Presidency or State House. Moreover, after initial reluctance, faith-based organisations as well complied with directives or appeals by authorities through donations in cash or in-kind, suspension of congregational church and mosque services and prayers. In addition, financial business institutions and other business enterprises donated in cash and kind. There are periodic radio and television advertorials by celebrities, business enterprises or authorities on staying safe during the pandemic.

Moreover, The Tertiary Education Trust Fund (TETFund), NCDC and other stakeholders constituted the National COVID-19 Research Consortium, with members drawn from the academia and research institutes. The consortium is mandated to undertake research on all aspects of COVID-19 to ensure effective prevention and control. In addition, the Central Bank of Nigeria (CBN), Nigeria's apex regulatory bank, announced a 1.15 trillion naira (approximately 3 billion dollars) COVID-19 Pandemic Intervention Fund intended to provide interest-free credit facilities to businesses, health institutions and households affected by the pandemic. The CBN's intervention package includes a Healthcare Sector Research and Development Intervention Scheme (HSRDIS) aimed at strengthening the public healthcare system with strategic funding of research and development of improved or new drugs, diagnostics and vaccines for infectious diseases in Nigeria, especially COVID-19 [15]. In conclusion, the COVID-19 pandemic presents an opportunity for critical lessons to be learnt for a more prompt, coordinated and effective response to future outbreaks, epidemic or pandemic.

Funding

The authors did not receive specific funding for this research.

CRediT authorship contribution statement

Chinedu Casmir Etteh: conceptualization, writing, review and editing. Moses P. Adoga: conceptualization, writing, review and editing. Chukwuma C. Ogbaga: conceptualization, writing, review and editing.

Disclosure of interest

The authors declare that they have no competing interest.

References

[1] Dudas G, Carvalho LM, Rambaut A, Bedford T. MERS-CoV spillover at the camel-human interface. Elife 2018;7:e31257.
[2] Holmes EC, Dudas G, Rambaut A, Andersen KG. The evolution of Ebola virus: insights from the 2013—2016 epidemic. Nature 2016;538:193—200, http://dx.doi.org/10.1038/nature19790.
[3] Purohit V, Kudale A, Sundaram N, Joseph S, Schaetti C, Weiss MG. Public health policy and experience of the 2009 H1N1 influenza pandemic in Pune, India. Int J Health Policy Manag 2018;7:154—66, http://dx.doi.org/10.15171/ijhpm.2017.54.
[4] Chia T, Oyeniran OI. Human health versus human rights: an emerging ethical dilemma arising from coronavirus disease pandemic. Ethics Med Public Health 2020;14:100511, http://dx.doi.org/10.1016/j.jemep.2020.100511 [Published online ahead of print, 11th April 2020].
[5] Iorliam A, Ho AT, Tirunagari S, Windridge D. Data forensic determination of the accuracy of international COVID-19 reporting: using Zipf's law for pandemic investigation. Preprints 2020:2020040531, http://dx.doi.org/10.20944/preprints202004.0531.v1.
[6] Hu D, Liu B, Feng L, Ding P, Guo X, Wang M, et al. Origins of the current seventh cholera pandemic. Proceedings Nat Acad Sci 2016;113:E7730—9.
[7] WHO. Successful Ebola responses in Nigeria, Senegal and Mali. Geneva: WHO; 2015.
[8] WHO. World Health Organization, 2015. [Accessed on 29th June 2020. Available from: https://www.who.int/].
[9] Ihekweazu C, Happi C, Omilabu S, Salako BL, Abayomi A, Oluniyi PE. First African SARS-CoV-2 genome sequence from Nigerian COVID-19 case — novel 2019

coronavirus/genome reports — virological, 2020. [Accessed on 29th June 2020. Available from: https://virological.org/t/first-african-sars-cov-2-genome-sequence-from-nigerian-covid-19-case/421].

[10] Adepoju P. Nigeria responds to COVID-19; first case detected in sub-Saharan Africa. Nat Med 2020;26:444—8.

[11] Cheng H-Y, Jian S-W, Liu D-P, Ng T-C, Huang W-T, Lin H-H. Contact tracing assessment of COVID-19 transmission dynamics in Taiwan and risk at different exposure periods before and after symptom onset. JAMA Intern Med 2020;180:1156—63, http://dx.doi.org/10.1001/jamainternmed.2020.2020 [Article in press].

[12] Kavanagh MM, Erondu NA, Tomori O, Dzau VJ, Okiro EA, Maleche A, et al. Access to lifesaving medical resources for African countries: COVID-19 testing and response, ethics, and politics. Lancet 2020;395:1735—8.

[13] Nigeria Centre for Disease Control (NCDC). COVID-19 outbreak in Nigeria: situation report S/N: 001; 2020 [Available from: https://ncdc.gov.ng/diseases/sitreps/].

[14] Nigeria Centre for Disease Control (NCDC). COVID-19 situation report: situation report 130; 2020 [Available from: https://ncdc.gov.ng/diseases/sitreps/].

[15] Central Bank of Nigeria (CBN). Healthcare research and development grant guidelines, 2020. [Available from: https://www.cbn.gov.ng/].