Review Article

Health System Responses and Capacities for COVID-19 in Nigeria: A Scoping Review

Nkolika Pamela Uguru[1,2], Nnamdi Ude[2], Udochukwu Ugochukwu Ogu[2], Nwadiuto Ojielo[2], Solumkenechukwu Onah[2], Chinyere Cecilia Okeke[2,3], Benjamin S. Chudi Uzochukwu[2,3], Obinna Onwujekwe[2,4]

[1]Department of Preventive Dentistry, Faculty of Dentistry, College of Medicine University of Nigeria, Enugu Campus, [2]Department of Pharmaco-Therapeutics, Health Policy Research Group, College of Medicine, University of Nigeria, Enugu Campus, Departments of [3]Community Medicine and [4]Health Administration and Management, College of Medicine, University of Nigeria, Enugu, Nigeria

Abstract

Background: Nigeria is in short supply of health workforce and equipment needed to manage the infected COVID-19 individuals. The rate of occurrence of new cases of infection has the capacity to further deplete the human resources in the sector, putting a dent in the fight against the spread of the virus. This study aims to determine the capacity of Nigerian health systems to respond to COVID-19. **Materials and Methods:** This was a scoping review of media documents, official documents and journals, published from 1st December 2019 to 31st December 2021. Online media reports were sourced from major newspapers on FACTIVA (Vanguard, Punch, Guardian, The Nation, Business Day, and Premium Times) that reported national and state level health system responses to COVID-19. We also reviewed other online news sources that have consistently reported health systems response to COVID-19 in Nigeria. Some of these are Nigeria Health Watch, APO Africa Newsroom, Federal Ministry of Health newsletter, and national media. **Results:** By December 31st, 2020, Nigeria had 70 free laboratories controlled by the government. These comprised 31 federal laboratories, 30 state, 3 military, 2 Non-Governmental Organization (NGO), 2 UN and 2 private labs. In 2019, Nigeria's IHR score at point of entry 1 & 2 was 3 and 1. Routine capacities established at points of entry was improved, however, effective public health response at point of entry, remained the same. Which supports the low response capacity of the country. Nigeria's average score across the JEE 2019 had increased to 7% (from 39% in 2017 to 46% in 2019) - four new indicators and 20 indicators with improved scores from 2017. **Conclusion:** Nigeria's health system response and capacity to handle COVID-19 is quite poor and grossly inadequate. There is a need to increase the number of health workforce in the country and institute adequate accountability mechanisms to ensure prudent and focused management of health funds.

Keywords: Coronavirus, COVID-19, health system capacity, health system response, Nigeria

Introduction

Nigeria has been classified as one of the high-risk countries with respect to the spread of COVID-19[1] and considering the country's weak healthcare system, it is also among the vulnerable African nations.[1] The country recorded 243,450 COVID-19 cases and 3,039 deaths by January 2, 2021.[2] On the 31st of January 2020, a preparedness group was created[1,3,4] This preparedness group was embodied by the Nigeria Centre for Disease Control (NCDC).[3] They aided 22 states in their creation of emergency operation centres (EOC),[3,4] including the training of rapid response teams.[3]

Nigeria, at the beginning of the outbreak, had personal protective equipment (PPEs) to last for about a few months.[5] However, statements from a news report showed,[6] that a total of 300 doctors and other many other health workers had been diagnosed with coronavirus (COVID-19) within a few months of the pandemic. The report showed that these health professionals got infected while caring for patients who had contracted the virus, and according to the National Medical Association chairman and the Federal Ministry of Health, the cause of the infection was a lack of the necessary PPE, in addition to the insufficient training of frontline health workers.[6] According to the report, Nigeria has an inadequate

Access this article online

Quick Response Code:

Website: www.njmonline.org

DOI: 10.4103/NJM.NJM_123_22

Address for correspondence: Mr. Udochukwu Ugochukwu Ogu, Department of Pharmaco-Therapeutics, Health Policy Research Group, College of Medicine, University of Nigeria, Enugu Campus, Enugu, Nigeria. E-mail: udo2ogu@gmail.com

How to cite this article: Uguru NP, Ude N, Ogu UU, Ojielo N, Onah S, Okeke CC, *et al*. Health system responses and capacities for COVID-19 in Nigeria: A scoping review. Niger J Med 2023;32:1-7.

Submitted: 01-Dec-2022 **Revised:** 03-Jan-2023
Accepted: 06-Jan-2023 **Published:** 25-Apr-2023

health workforce and the rate of infection has the capacity to further deplete the human resources, already lacking in the health sector, thus putting a dent in the fight against the spread of the virus. Although PPEs were in short supply globally, most of the other countries were looking inwards to improve availability.[6]

Prior to the entrance of COVID-19 into Nigeria, there was no official preparedness plan.[7] Thus Nigeria had not prepared financially or otherwise for the pandemic[7] and there was inadequate public awareness prior to the index case.[7] This study aims to determine the capacity of the Nigerian health system to respond to COVID-19 in the short and long-term, as well as future pandemic preparedness plans.

Methods

Study design

This was a scoping review of news and media documents, official documents, and journals, published or collected from December 1, 2019, to December 31, 2021. In addition, this review serves as a prelude to a larger study that is currently underway.

Search strategy

Published government documents (5 were final review) were retrieved from relevant organisational websites such as the NCDC, Presidential Task Force, Federal Airports Authority of Nigeria etc. The documents were guidelines, protocols, reports, and plans written in English [Figure 1].

Online media reports (21 were final review) were sourced from major newspapers on FACTIVA (Vanguard, Punch, Guardian, The Nation, Business Day, and Premium Times) that reported national and state-level health system responses to COVID-19. We also reviewed other online news sources that have consistently reported health systems responses to COVID-19 in Nigeria. Some of these are Nigeria Health Watch, African Press Organisation (APO) Africa Newsroom, Federal Ministry of Health reports, media reports and blogs; TalkNaija, Devex, PWC Nigeria etc., [Figure 1].

Research articles (15 were seen. Seven were included) were sourced from online journals written in English and published from December 2019 to December 2021. The geographical scope was national and sub-national. Search terms and queries were generated using combinations of primary keywords or secondary keywords selected from each category. The search was conducted in English and performed on PubMed, Google Scholar, and Scopus [Figure 1].

A series of indicators were used to further narrow down the search parameters. The indicators are as follows:

- Number of tests performed/million population
- Number of testing centres/months
- Number of people/ventilator
- Number of people/intensive care unit (ICU) bed
- Number of nurses (and midwives)/million population
- Number of hospital beds/million population
- Score International Health Regulations (IHR) capacity at point of entry (PoE)
- Score IHR capacity for surveillance
- Government COVID-19 stringency index.

Data extraction and analysis

The review was performed by four reviewers. Reviewers sourced for documents independently and merged them following the removal of all duplicated documents. Reviewers read the documents and extracted pertinent data using a standard data extraction template. The template was divided into themes based on health system building blocks, with subthemes capturing state and nonstate stakeholders. A repository of all documents, journals, and media reports was generated.

The thematic transcript from the document review was summarised through narrative synthesis and trend analysis by the reviewers and the summary reports were merged.

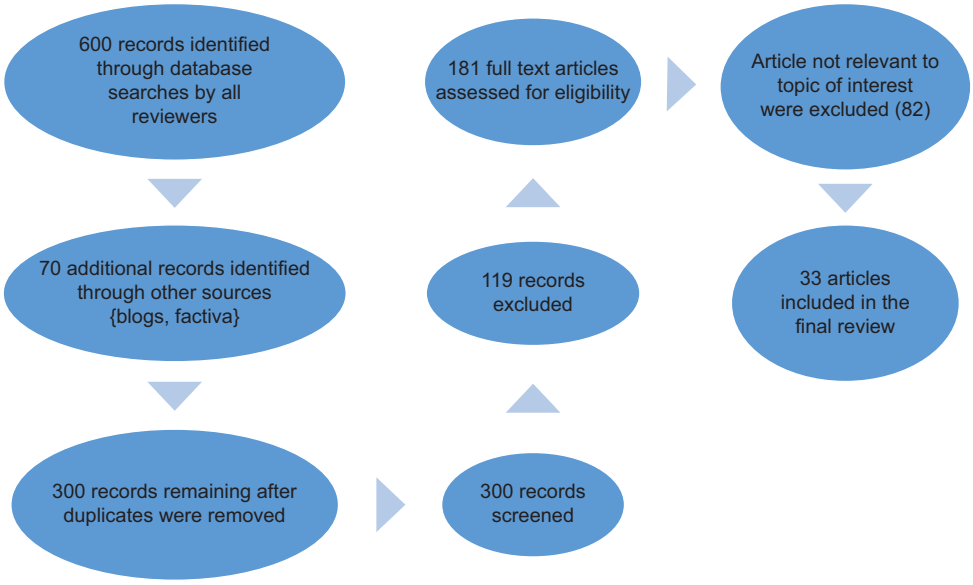

Figure 1: Flowchart of scoping review process

Findings and Discussion

Trend of COVID-19 cases and deaths in Nigeria

Total coronavirus cases in Nigeria

The health effects of COVID-19 are not immune to Nigeria. The country recorded the first case of COVID-19 on February 27, 2020, and then suffered from three different waves of infection, peaking in June 2020, January 2021 and August 2021 [Panel A and Figure 2].[8]

Health and safety measures such as interstate and international travel bans, group rally restrictions, and school closures are swaying and declining with the number of incidents as the federal government seeks to stop the spread of the virus.[8] On February 15, 2021, the number of positive coronavirus (COVID19) cases in Nigeria increased by 108 to a total of 254,124. At the same time, about 3,140 casualties and 230,000 people have recovered in the country. Nigeria has the eighth highest number of registered cases in Africa. The largest daily increase in cases in Nigeria since the start of the pandemic occurred on December 22, 2021 [Figure 3].[9]

Furthermore, the case incidence was mostly stable from week 44 (October 26 to November 1, 2020) to week 48 (November 23–29, 2020). The incidence of COVID-19 cases then increased from week 49 (November 30 to December 6, 2020) until peaking again in week 3 of the following year (January 18–24, 2021)-the highest number of cases (11,179) throughout the pandemic.[10] However, after week 3, the number of reported cases began to decline as of the time of writing the report for week 12: March 22–28, 2021 [Figure 4].[10]

Laboratory capacity

As at December 31, 2020, Nigeria had 70 free laboratories that are controlled by the government. These comprise 31 federal laboratories, 30 State, 3 military, 2 nongovernmental organisation (NGO), 2 United Nations (UN) and 2 private labs. Also, by the same timeline, the available testing platforms were Gexpert, open Polymerase Chain Reaction (PCR), Corbas, and Abott. There were also 32 fee-based labs that are operational and 7 corporate laboratories.[11] By December 31, 2020, Nigeria had the capacity to test only 2500 samples a day,[12] which is really poor and due largely to the shortage of human resources, only half of this number is administered each day.[12] However, as of January 2021, NCDC has established more than 70 public health laboratories and helped revitalise 36 private laboratories.[13] Currently, every state in Nigeria has at least one public health laboratory for the diagnosis of COVID-19 and also, 36 private-paid private laboratories and seven corporate employee laboratories provide services to individuals and corporate organisations to meet their personal needs. However, the COVID-19 test remains free at all public health laboratories.[13]

Nigeria's score at point of entry

In 2017, Nigeria's IHR score at PoE 1 and 2 was 1.[14] Nigeria scored poorly in World Health Organisation (WHO's) 2017 Joint External Evaluation (JEE). They scored poorly on both prevention and response.[15] Nigeria's average score across the 15 JEE indicators in the prevention category was 1.9.[15] This suggests that, in general, Nigeria has limited capacity to prevent chemical, biological, or radiation health risks.[15] The detect category received a score of 2.6 across the 13 parameters, indicating that Nigeria has acquired some capacity for detecting emerging health concerns through real-time surveillance and laboratory capabilities to test for diseases.[15] As at January 2021 report,[13] Nigeria's average score across the JEE 2019 had increased to 7% (from 39% in 2017 to 46% in 2019)-four new indicators and 20 indicators with improved scores from 2017.

However, the sustainability of these capabilities was reported to be doubtful.[15] Furthermore, in considering the COVID-19 era, there are questions that are noteworthy. The IHR underlines the significance of building a public health EOC, which will allow health leaders to gather information from diverse sources, coordinate decision-making, communicate across levels and sectors, and mobilise regional rapid transit system and resources.[16] In 2019, Nigeria's IHR score at PoE 1 and 2 was 3 and 1.[17] Routine capacities created at entry points were enhanced. However, effective public health response at points of entry remained constant,[17,18] supporting the country's limited response capacity. On the other hand, 2019 saw Nigeria

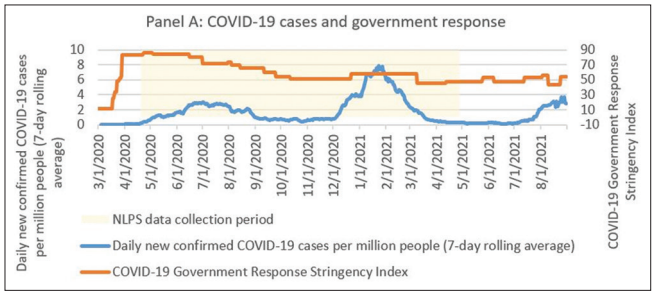

Figure 2: The changing nature of the COVID-19 crisis in Nigeria. (Source: COVID 19 cases and government response[8])

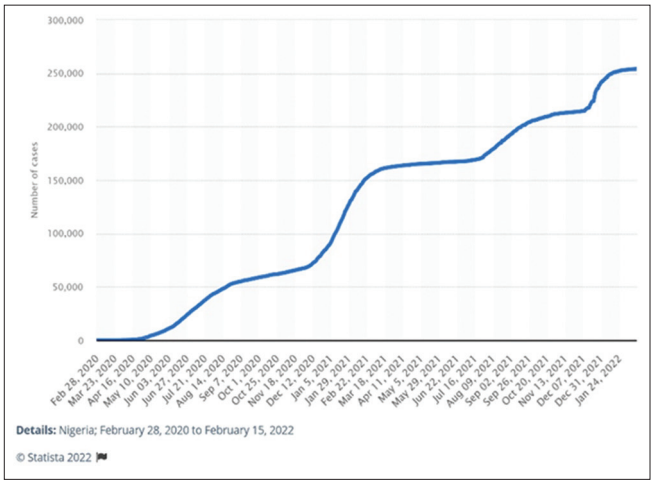

Figure 3: Nigeria February 28, 2020 to January 24, 2022. (Source: Nigeria; cumulative coronavirus cases 2020–2022)

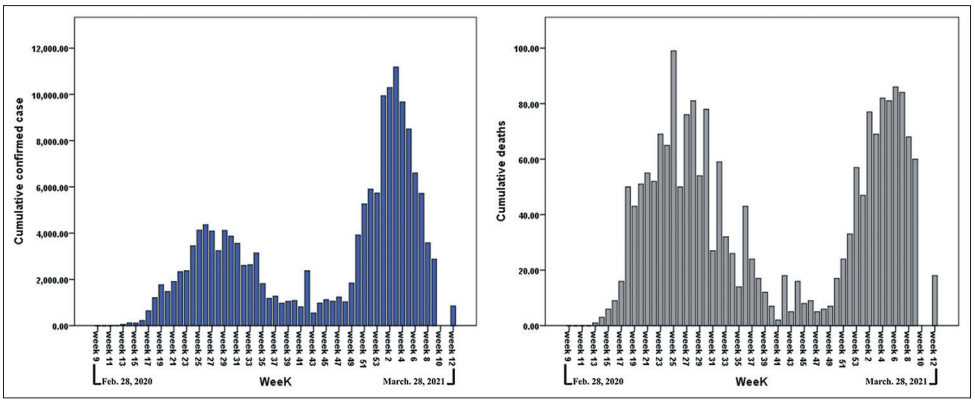

Figure 4: Trend of confirmed cases. (Source: Trend of weekly report of confirmed case[10])

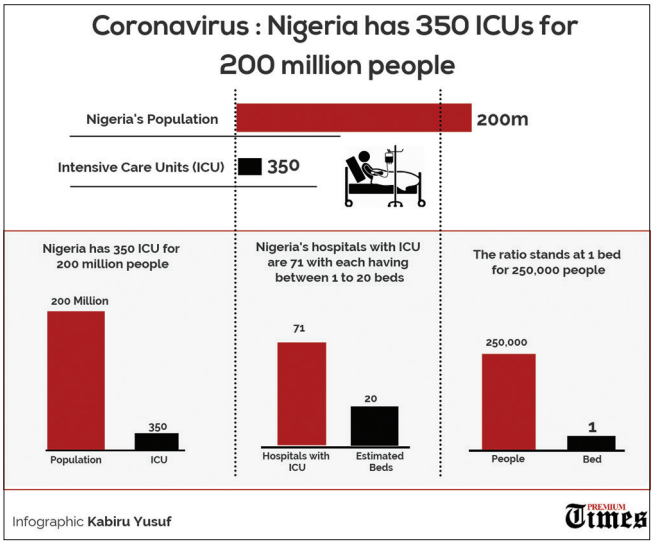

Figure 5: Chart showing ICU distribution across the country. (Source: Premium Times)

having an average score of 2.5 for the 15 response indicators,[17] which is still poor.

Adequacy of equipment, infrastructure, tools and supplies

Equipment, infrastructure, tools, and supplies are grossly inadequate and incapable of strongly managing the increasing spread of COVID-19. A news article, published by Guardian News[19] reported that prior to COVID-19, many innovations were already in existence, only that they were in use in other areas. The coming of COVID-19 meant that these innovations had to be redirected for COVID-19 response. Most of the innovations were reported to be homegrown. For instance, all 14 booths are located in Abuja, Kano, Kaduna, Lagos, Ogun, Oyo, Rivers and Zamfara states. However, Healthwise[20] reported that Nigeria, at the beginning of the pandemic, did not have up to 500 ventilators. Prior to the pandemic/outbreak, For its total population, Nigeria had only 350 ventilators and 350 ICU beds.[12,20,21] In addition, Ogunbameru *et al*.[21] found that there were also only 0.2 hospital beds per 1000 population, 450 ventilated beds, and 350 ICU beds that had no ventilators, which is an equivalent of 0.07 ICU beds per 100,000 population. Nigeria entered the pandemic, unprepared to respond to it.[12] According to the most recent WHO data,[22] Nigeria has five hospital beds for every 10,000 people.

By April 2021, 100 more ventilators had been purchased, although these, too, were not enough, considering the growing caseload.[12] These inadequacies in the availability of ventilators for patients, contributed to the difficulties faced by health personnel in the handling of the COVID-19 pandemic. Furthermore, while some hospitals in Lagos, did not have any ventilators at all, those that had, did not have enough.[20] As at the time of this study, Lagos State University Teaching Hospital had 15 functional ventilators, Imo State University Teaching Hospital had two ventilators with only 1 functional. The University of Benin Teaching Hospital was reported to have four ventilators with questionable.[16] A medical centre in Lagos, by the time of this study, had acquired five of what they called "state of the art" ventilators.[20] These numbers however, are only a fraction of what is needed to serve the Nigerian population. Also, the dilapidated state of our health centres, contributed to the poor health system response to the pandemic.

Healthwise on the 25th of November[23] reported that Ondo state inter-ministerial committee on COVID-19 had established a 20-bed unit and laboratory isolation centre and that the staff that would be responsible for the laboratory had been trained in both precautionary measures and the needed skills for working efficiently and effectively at the centre. In their study, Ajisegiri *et al*.[3] reported that testing capacity was very low and is limited to symptomatic cases. In addition, considering the change in testing strategy, the increase in the number of laboratories from five to thirteen nationally across the six geopolitical zones,[6] decentralised testing and active case search in states such as Lagos and the Federal Capital Territory, the number of cases has surged in the last few days from the time of their study. Despite these, overall testing capacity is low at 103 per 1 million of the population. The testing rates were low– as at about June 2021, and Nigeria only had the capacity to test 2,500 samples a day and half of these were only administered each day because of the shortages in laboratories, testing kits, human resources, and case definition for testing that prioritises symptomatic cases and their contacts.[12]

Another source[5] reported that officials that were interviewed pointed out that Nigeria, at the beginning of the outbreak, had personal protective equipment (PPE) to last for 30 days. [See Figure 5 for distribution].

It was further reported that there have been many complaints regarding the shortage of PPE and ventilators needed to combat the COVID-19 virus, thus supporting the reports on the COVID-19 infection among health care workers, which is due to occupational exposures. Despite private organisations and individuals donating 20,000 test kits and a COVID-19 mobile laboratory, health worker infection accounted for approximately 6% of confirmed COVID-19 cases as of May 1st, 2020.

Procurement and local production of equipment, tools and supplies

Procurement and local production of some of these equipment, supplies, and tools were poor and highly dependent on external aid. Although media reports from the sub national level, showed that some states were more proactive in improving their response to fighting the virus than others, for example, the governor of Bayelsa state inaugurated a molecular laboratory in October 2020, bringing the total number of laboratories in Nigeria to 66 in 34 states,[24] and Delta State procured 19 ventilators.[25] However, this is still inadequate to meet the needs of the huge Nigerian population. The country was mostly dependent on contributions from high income countries and development partners to procure majority of COVID-19 supplies including vaccines.

Furthermore, all the health personnel with direct involvement in managing the pandemic in the state were said to have all been enrolled in a life insurance package. The WHO and the UN were also reported to have handed over tons of COVID-19 supplies to the Nigerian government. They were also reported to have procured lab supplies such as extraction kits, and PCR test kits, which would help accelerate the COVID-19 response. These supplies were distributed by the APO Group on behalf of WHO Nigeria.[26] In a press release, Reliefweb[27] (citing OCHA, UNDP, UNIC etc., as their sources) on the 16th of April 2020, reported that the UN had received a delivery of vital health supplies to support Nigeria's fight against the pandemic. The supplies comprised 10,000 test kits, 15 oxygen concentrators, various Interagency Emergency Health Kit/ Post-exposure prophylaxis (IEHK/PEP) kits, PPE, and other vital health supplies;[27] all these were meant to be used towards Nigeria's COVID-19 response plan. In terms of funding for the supplies, they were co-financed by the European Union.[27] In an earlier press release dated 14th April 2020, among the supplies were 50 A30 ventilators and PPEs procured with funds from the recently launched COVID-19 Basket Fund, 2 million United States Dollars (USD) that were mobilized within the UN system in Nigeria and a $200,000 USD contribution from APM terminal.[25] These supplies were designed to be distributed to healthcare facilities in most need due to the outbreak, it is, however, uncertain if the distribution was done as planned.[25]

However, on the 12th of July, 2020, the Nigerian Tribune[28] reported that government found it challenging to get medical equipment and vaccines to those who need them. The report stated that "out of desperation, governments had contracted with suppliers with no track record of delivering the needed equipment to supply them."[29] Thus, it was suggested that the only way for emergency procurements of medical supplies to be efficient and fast is by publishing a list of all contracts and tenders, as well as names of credible suppliers.

Access to needed resources and availability of human resources for health

According to a researcher at Human Rights Watch,[30] the lockdown, which was instituted as a result of the pandemic, saw millions of Nigerians lacking access to needed resources such as food and quality health care in addition to lowered household income. They reported that to lessen the impact of the afore mentioned, the Humanitarian Affairs Ministry gave 20,000 Naira (which is equivalent to about US$ 52) to the families that are registered in the National Social Register of Poor and Vulnerable Households (a body established in 2016 to combat poverty). The families on the register were supposed to receive the cash for four months. It is, however, uncertain if they received it.

However, not all the poor are registered, which means that only about a fraction of Nigerians needing economic assistance received this payment. Furthermore, the government did not give details of the cash transfer. The Social and Economic Rights Accountability Project, a NGO, told Human Rights Watch that they were concerned that the declared palliatives, donations, reported cash payments, cash transfers, and other benefits had not reached millions of the country's poorest and most vulnerable citizens. The Central Bank of Nigeria issued a targeted credit facility worth 50 billion naira (US$ 128.5 million) to assist households and micro, small, and medium companies affected by the COVID-19 pandemic. However, there is no evidence that such was distributed or made available.[30] The same goes for the US$3.4 billion approved by the International Monetary Fund in emergency funding to Nigeria,[31] an amount that at the time was the highest disbursed for any country. No records existed for the usage of the said funds at the time. There were inadequate human resources for health,[29] laboratories, PPEs,[6] etc.

Excerpts from literature showed that human resources for health at the onset of the outbreak was below par, as Nigeria had about 20 nurses, midwives, and 1 doctor for every 10,000 people, which is, less than the minimum number that has been recommended by the WHO in order to provide adequate care.[29] The available health workers were inequitably distributed by region and location because many health workers preferred to work in urban areas than in rural, leaving the rural areas deficient of health workers.[29] In an interview with Healthwise,[32] the President of the National Association of Nigerian Nurses and Midwives, said that the shortage of manpower in Nigeria's health workforce has created a big

vacuum in the health sector. He opined that a country like Nigeria, with a population of about 210 million, should have at least 800,000 nurses. However, what is obtainable is a number that is <200,000.[32] That is about 75,000 doctors, 180,709 nurses and 25,000 midwives.[33] Nigeria lacks the human resource capacity to thoroughly deal with the pandemic, now and in the future if things stay the way they are.

The Nigerian government continues to step up efforts to improve health system response to COVID-19 and other future pandemics, however extreme reliance on external aid is also a draw back. As internal investment and indigenous development of adequate and timely public health emergency response plans and protocols are necessary for any country to continue to plan against impending pandemics. Albeit many development partners like WHO continue to donate equipment, supplies and provide implementation support for the delivery of COVID-19 response interventions, they also support the country in COVID-19 infection surveillance among health workers and the periodic updating of protocols for points of entry and public health measures used to mitigate the changing COVID-19 infection surveillance among health workers as well as scaling up COVID-19 vaccine deployment, which has a 70% coverage target set for the year 2022 (WHO,2021). However, with only 21.3% of Nigerians having received at least 1 dose of vaccine, 15.1% fully vaccinated, and 1.6% received booster doses (36) and with the security issues in the country, it is unlikely this target will be met as health worker and vaccine access in those areas is likely to be very poor.

Conclusion

Nigeria's health system's response and capacity to deal with COVID-19 are grossly insufficient. Equipment, tools, and supplies are insufficient, and the health infrastructure is inadequate. If these do not improve, the country is unlikely to be able to handle another wave of the pandemic or future public health emergencies. Conversely, the introduction of the COVID-19 vaccines has created a leeway for managing the virus, though vaccine awareness and hesitancy are a major problem. Nigeria is also plagued with insecurity issues, so getting health workers to create awareness and deliver vaccines to these areas of conflict is a herculean task which might further derail any little success gained in the country. Thus, most success stories about COVID-19 vaccine will be in areas without severe conflict and insecurity issues as there are no nationwide provisions to cater for these areas.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Amzat J, Aminu K, Kolo VI, Akinyele AA, Ogundairo JA, Danjibo MC. Coronavirus outbreak in Nigeria: Burden and socio-medical response during the first 100 days. Int J Infect Dis 2020;98:218-24.
2. Federal Ministry of Health. Nigeria Centre for Disease Control; 2022. Available from: https://ncdc.gov.ng/diseases/sitreps/?cat=14&name=An update of COVID-19 outbreak in Nigeria. [Last accessed on 2022 Aug 10].
3. Ajisegiri WS, Odusanya OO, Joshi R. COVID-19 outbreak situation in Nigeria and the need for effective engagement of community health workers for epidemic response. Glob Biosecur 2020;1. Available from: https://jglobalbiosecurity.com/article/100.31646/gbio.69/. [Last accessed on 2020 Nov 25].
4. The Conversation. Steps Nigeria is Taking to Prepare for Cases of Coronavirus; 2020. Available from: https://theconversation.com/steps-nigeria-is-taking-to-prepare-for-cases-of-coronavirus-130704. [Last accessed on 2021 Feb 25].
5. Ogundipe S. Coronavirus: Nigeria has 350 ICU Beds for 200 Million People. Available from: https://www.premiumtimesng.com/news/headlines/384840-coronavirus-nigeria-has-350-icu-beds-for-200-million-people.html. [Last accessed on 2021 Jan 27].
6. Editorial. Health workers and COVID-19. This Day Newspaper [Internet]. 2020. Available from: https://www.thisdaylive.com/index.php/2020/05/27/health-workers-and-covid-19-2/. [Last accessed on 2021 Jan 27].
7. Anyanwu MU, Festus IJ, Nwobi OC, Jaja CJ, Oguttu JW. A perspective on Nigeria's preparedness, response and challenges to mitigating the spread of COVID-19. Challenges 2020;11:22.
8. Jonathana L, Tara V. The COVID-19 Crisis in Nigeria: What's Happening to Welfare? New Data Call for Expanded Social Protection in Africa's Most Populous Country; 2021. Available from: https://blogs.worldbank.org/africacan/covid-19-crisis-nigeria-whats-happening-welfare-new-data-call-expanded-social-protection. [Last accessed on 2022 Mar 10].
9. Sasu D. Nigeria: Cumulative Coronavirus Cases 2020-2022. Statista; 2022. Available from: https://www.statista.com/statistics/1110879/coronavirus-cumulative-cases-in-nigeria/. [Last accessed on 2022 Mar 10].
10. Okoroiwu HU, Ogar CO, Nja GM, Abunimye DA, Ejemot-Nwadiaro RI. COVID-19 in Nigeria: Account of epidemiological events, response, management, preventions and lessons learned. Germs 2021;11:391-402.
11. Nigeria Center for Diisease Control. NCDC Coronavirus COVID-19 Microsite; 2020. Available from: https://covid19.ncdc.gov.ng/laboratory/. [Last accessed on 2021 Jan 20].
12. Dixit S, Ogundeji YK, Onwujekwe O. How Well has Nigeria Responded to COVID-19? Future Development; 2020. Available from: https://www.brookings.edu/blog/future-development/2020/07/02/how-well-has-nigeria-responded-to-covid-19/. [Last accessed on 2021 Jan 21].
13. Nigeria Centre for Disease Control. One Year After: Nigeria's COVID-19 Public Health Response February 2020 – January 2021; 2021. Available from: https://covid19.ncdc.gov.ng/media/files/COVIDResponseMarch1.pdf. [Last accessed on 2022 May 08].
14. World Health Organization. Joint External Evaluation of IHR Core Capacities of Federal Republic of Nigeria: Executive Summary. Geneva: World Health Organization; 2017. Available from: https://apps.who.int/iris/handle/10665/258724. [Last accessed on 2021 Mar 07].
15. The Center for Policy Impact in Global Health. How well has Nigeria Responded to COVID-19? The Center for Policy Impact in Global Health; 2020. Available from: https://centerforpolicyimpact.org/2020/07/28/how-well-has-nigeria-responded-to-covid-19/. [Last accessed on 2021 Jan 30].
16. Oyebanji O, Ibrahim Abba F, Akande OW, Aniaku EC, Abubakar A, Oladejo J, *et al.* Building local capacity for emergency coordination: Establishment of subnational public health emergency operations Centres in Nigeria. BMJ Glob Health 2021;6:7203.
17. Nigeria Center for Disease Control. Country-led midterm Joint external evaluation of IHR core capacities. Nigeria; 2020. Available from: https://ncdc.gov.ng/themes/common/docs/protocols/119_1581414518.pdf. [Last assessed on 2021 Mar 07].
18. Ogoina D, Mahmood D, Oyeyemi AS, Okoye OC, Kwaghe V, Habib Z, *et al.* A national survey of hospital readiness during the COVID-19 pandemic in Nigeria. PLoS One 2021;16:e0257567.
19. APO Group. Coronavirus – Nigeria: "Flying Doctors" Boost Nigeria's

COVID-19 Testing. Guardian Newspaper; 2020. Available from: https://guardian.ng/apo-press-releases/coronavirus-nigeria-flying-doctors-boost-nigerias-covid-19-testing/. [Last accessed on 2020 Nov 21].
20. Healthwise. COVID-19: Nigeria Can't Boast of 500 Ventilators Across 36 States and FCT – Sources – Healthwise; 2020. Available from: https://healthwise.punchng.com/covid-19-nigeria-cant-boast-of-500-ventilators-across-36-states-and-fct-sources/. [Last accessed on 2021 Jan 21].
21. Ogunbameru A, Barrett K, Joda A, Khan YA, Pechlivanoglou P, Mac S, *et al.* Estimating healthcare resource needs for COVID-19 patients in Nigeria. Pan Afr Med J 2020;37:293.
22. Prevention USC for DC and. When a Failure to Diversify Meets COVID-19: Implications for Nigeria – IGC. Available from: https://www.theigc.org/blog/when-a-failure-to-diversify-meets-covid-19-implications-for-nigeria/. [Last accessed on 2021 Jan 26].
23. Healthwise. Ondo Establishes 20-Bed COVID-19 Isolation Centre. Healthwise – Punch Nigeria; 2020. Available from: https://healthwise.punchng.com/ondo-establishes-20-bed-covid-19-isolation-centre/. [Last accessed on 2020 Nov 25].
24. Oyadongha S. COVID-19: NCDC Certifies Bayelsa Molecular Lab. Vanguard News; 2020. Available from; https://www.vanguardngr.com/2020/08/covid-19ncdc-certifies-bayelsa-molecular-lab/. [Last accessed on 2020 Nov 25].
25. Reliefweb. UN Procures Ventilators and other Medical Supplies to Boost the Government of Nigeria's Response to COVID-19 – Nigeria. ReliefWeb; 2020. Available from: https://reliefweb.int/report/nigeria/un-procures-ventilators-and-other-medical-supplies-boost-government-nigeria-s. [Last accessed on 2021 Jan 21].
26. APO Group. Coronavirus – Nigeria: Handover of COVID-19 Supplies to Nigeria by WHO Nigeria and UN Nigeria. APO Group Africa Newsroom; 2020. Available from: https://www.africa-newsroom.com/press/coronavirus-nigeria-handover-of-covid19-supplies-to-nigeria-by-who-nigeria-and-un-nigeria?lang=en. [Last accessed on 2022 May 08].
27. Reliefweb. UN Provides Vital Supplies for Nigerian Government's COVID-19 Response. ReliefWeb; 2020. Available from: https://reliefweb.int/report/nigeria/un-provides-vital-supplies-nigeria-government-s-covid-19-response. [Last accessed on 2021 Mar 07].
28. Okonjo-Iweala N. (OPINION): To Beat COVID-19, Governments Need to Open Up, by Ngozi Okonjo-Iweala. Tribune Online; 2020. Available from: https://tribuneonlineng.com/opinion-to-beat-covid-19-governments-need-to-open-up-by-ngozi-okonjo-iweala/. [Last accessed on 2022 May 08].
29. Nigeria | Intra Health. Available from: https://www.intrahealth.org/countries/nigeria. [Last accessed on 2021 Jan 26].
30. Human Rights Watch. Nigeria: Protect Most Vulnerable in COVID-19 Response; 2020. Available from: https://www.hrw.org/news/2020/04/14/nigeria-protect-most-vulnerable-covid-19-response. [Last accessed on 2020 Nov 19].
31. ONE. ONE Africa COVID-19 Tracker: Country Deep Dives – ONE. ONE Africa; 2020. Available from: https://www.one.org/africa/about/policy-analysis/covid-19-tracker/country-deep-dives/. [Last accessed on 2021 Jan 26].
32. Nigeria Needs 800,000 Nurses for Its Growing Population –NANNM–Healthwise. Available from: https://healthwise.punchng.com/nigeria-needs-800000-nurses-for-its-growing-population-nannm/. [Last accessed on 2021 Jan 26].
33. Trapped by Coronavirus, Nigeria's Elite Faces Squalid Hospitals – Bloomberg. Available from: https://www.bloomberg.com/news/articles/2020-04-02/trapped-by-coronavirus-nigeria-s-elite-faces-squalid-hospitals. [Last accessed on 2021 Jan 26].