Review of Awareness and Mitigation of various Waves and Variants of COVID-19 Disease Pandemic in Nigeria

[*1]Williams Terhemen Yongu and [2]Justina Ooja Okpe

[1,2]Department of Human Kinetics and Health Education , Faculty of Education , Benue State University, Makurdi, Nigeria.

*Corresponding Author: *Williams Terhemen Yongu. Email: manwilly2002@yahoo.com. Telephone: 08023564595

Abstract

Coronavirus disease (COVID-19) is an emerging disease from the group of viruses causing severe acute respiratory diseases. It has become a major public health concern, having affected most countries in the world with wide-spread illness and death, disruption of socio-economic activities and psychological distress for bereaved families. Since it was first discovered in late December 2019 in Wuhan, China, it has spread to other countries in waves due to the mutation of the virus, despite unprecedented efforts to curb it using public health control measures. The inclusion of an emergency listing of vaccines by the World Health Organization is expected to reduce the severity of the infection and help achieve herd immunity in the communities. However, some of these measures like regular hand washing and use of hand sanitizers, physical distancing, coughing in bent elbows, use of face mask in public places, quarantining of exposed individuals and vaccination are resisted by some members of the public on account of conspiracy theories and socio-cultural factors. An empirical study in Rivers state shows Knowledge was assessed as great for 80 per cent of the time, decent for 50–79 per cent of the time, and poor for 50 per cent of the time. Radio jingles (86.7 %) and television commercials (74%) were the most prevalent sources of information regarding COVID-19. At the moment, the Nigerian government is adopting non-pharmacological and pharmacological mitigation strategies. These include coercive measures to ensure compliance with vaccination in order to protect the public from exposure to the virus, with varying degrees of success. The author recommended that public health education and preventive measures should be sustained by the government and other stakeholders until a positive behaviour change is achieved and the pandemic controlled.

Keywords: COVID-19, Awareness, Mitigation strategies, Wave, Variant, Pandemic

Introduction

Coronavirus disease 2019 (COVID-19) is a new coronavirus known as Severe Acute Respiratory Syndrome Coronavirus 2. (SARS-CoV-2; formerly called 2019-nCoV). It is a respiratory illness that was first found in Wuhan, Hubei Province, China, in December 2019. (Wu, 2020). The virus

is part of a wider family of RNA viruses that cause infections ranging from the common cold to more serious illnesses such as Middle East Respiratory Syndrome (MERS-CoV) and Severe Acute Respiratory Syndrome (SARS-CoV) (Zhou, 2020). Fever, dry cough, tiredness, myalgia, shortness of breath, and dyspnea are the most common COVID-19 symptoms (Chan, 2020; Riou, 2020). The disease spreads quickly and can be contracted by intimate contact with an affected individual (Parry, 2020; Phan, 2020; Shereen, 2020). COVID-19 has spread internationally and quickly, from Wuhan to other regions of the world putting many people's lives in jeopardy (Wang, 2020).

The World Health Organization (WHO) declared COVID-19 a public health emergency of worldwide significance and magnitude by the end of January 2020, and urged all governments to work together to avoid its fast spread. COVID-19 was thus proclaimed a "global pandemic" by the WHO on March 11, 2020(Tang, 2020). Following the WHO announcement, countries all over the globe, including Nigeria, have been focusing on developing suitable reaction strategies to combat the pandemic and control the virus. Nigeria has been actively monitoring the situation since the confirmation of its first case of COVID-19 on 27th February, 2020, and establishing country-specific procedures that are in line with WHO standards in dealing with the epidemic (Federal Ministry of Health, 2020). These included, but were not limited to, the suspension of all inbound and outgoing flights to the nation; the closure of all stores and shops in the country, with the exception of pharmacies and grocery stores; and the closure of all schools, including colleges. In Abuja and Lagos, religious venues were shut down, while other States permitted just 50 attendees in their churches and mosques, with physical separation imposed. The first phase of the COVID-19 lock down was declared by Nigeria's president on 27th April, 2020, and was enforced in Abuja and Lagos from 4th May through 17th May, 2020. Between 8 pm. and 6 am., the government implemented a national curfew to restrict people's movements. In addition, inter State travel was limited. However, all 36 States and the Federal Capital Territory (FCT) had recorded at least one case of the disease within 5 months (by 7th July, 2020), with a total of 29,789 cases and 669 fatalities (Nigerian Centre for Disease Control, 2020).

Despite the fact that extraordinary national steps were taken to combat the COVID-19 epidemic, the success or failure of these initiatives is mostly determined by public behaviour change. To limit the spread of the illness, public commitment to preventive measures provided by the government through the Nigerian Centre for Disease Control (NCDC) is critical. The public

understand of and views of COVID-19 are likely to impact compliance. Public awareness is critical in the fight against pandemics, according to empirical research (Chirwa, 2019; Chirwa, 2020).

Statistics on Level of awareness and practice of COVID- 19 prevention strategies in Nigeria

Coronavirus disease 2019 (COVID-19) has provoked panic, anxiety, and misinformation, as it does with numerous epidemics. The Public Health Emergency Intervention Centre's risk communication pillar is reacting to the pandemic by facilitating and assuring accurate and consistent information to facilitate the adoption of disease-prevention and control behaviours. During the early phases of the COVID-19 pandemic response, a research was conducted to investigate peoples' understanding, perceptions, and practices of COVID-19 prevention in Rivers State, Nigeria (Owhonda, 2020).

A descriptive cross-sectional survey of 1,294 adult citizens from all of the State's Districts was conducted. It used a questionnaire presented by an interviewer. Knowledge was assessed as great for 80 per cent of the time, decent for 50–79 per cent of the time, and poor for 50 per cent of the time. Correct hand washing practice was defined as respondents who cleaned all vital portions of their hands. With a p=0.05, regression modeling was utilized to find determinants of COVID-19 prevention knowledge and practice (Owhonda, 2020). Radio jingles (86.7 %) and television commercials (74%) were the most prevalent sources of information regarding COVID-19, according to the findings. About 34.9 per cent of those polled thought they were unlikely to catch the virus. Only 39.0 per cent of respondents successfully cleansed all of their hands' vital areas. The respondents' knowledge of COVID-19 was substantially predicted by their occupation (p=0.01), degree of education (p=0.001), and location (p=0.001). Age (p=0.003), employment (p=0.001), locality (p=0.001), and knowledge of the prevention (p=0.001) were all significant predictors of COVID-19 practice (Owhonda, 2020). In order to manage existing and future epidemics in Nigeria, the study determined that broadcast media plays a critical role in risk communication and behavioural change (Owhonda, 2020).

Another study on level of awareness, knowledge and perception on COVID-19 among pregnant women attending antenatal clinics in Central Hospital Benin City, Edo state revealed that 274 (66.2%) indicated television as their source of information about the virus. One hundred (24.2%) indicated radio while 92 (22.2%), indicated friends (Omozuwa, 2021). The study recommended the need to scale up health education efforts using the internet and other social

media platforms so as to reach the younger age groups. This could be done in the form of question and answer formats and online seminars. Pregnant women were to maintain physical distancing in the antenatal clinics and also be allowed to ask questions to clear all their misinformation (Omozuwa, 2021)

Characteristics of Various Waves of COVID-19 in Nigeria

COVID-19's second wave ran from 25thOctober, 2020 through 3rd April, 2021. During the second wave, a comparison research indicated a 21.3 per cent rise in the number of tests performed and a 14.3 per cent increase in the test positive rate (TPR) (Akande, 2021). This data shows that the virus was spreading at a faster rate. This might be owing to the second wave's expanded sample collecting and testing capabilities, greater monitoring efforts, and the reopening of the economy and social gatherings (Nigeria Centre for Disease Control [NCDC], 2021). Nigeria's testing capacity was steadily expanded throughout the first wave's many months, and considerable testing infrastructure was already in place at the start of the second wave (Akande, 2021).

The findings might also hint to the impact of viral variations that have been linked to greater transmissibility, highlighting the need for improved genomic surveillance (NCDC, 2021). In the second wave, there was also an increase in cumulative incidence (CI), which might be explained by the country's overall improvement in testing capability. During both waves, there was a broad variation of CI across the States. For example, during the first and second waves, Kogi State recorded as low as 0.1 per 100,000 and 0 per 100,000, respectively, while Lagos State reported 167.6 per 100,000 and 215.2 per 100,000, respectively (NCDC, 2021). Kogi State, on the other hand, tested the fewest samples in the country during the first and second waves. This might point to an underestimating of the CI rate and, as a result, the COVID-19 case fatality rate (CFR) in the State (Akande, 2021). The Northern zone of the nation (particularly the north-eastern zone) has a lower CI than the southern zone across all geopolitical zones. These disparities might be linked to variances in testing rates caused by differing diagnostic capabilities as well as cultural, socio-political, and security settings between states and zones (Akande, 2021).

Furthermore, in the second wave, fewer positive patients (about 74 %) indicated a local or international travel history within 14 days of sample collection, suggesting that this wave was predominantly driven by community transmission rather than by case importation (Akande, 2021). It was also noticed that there was a modest demographic shift towards a younger

population during the second wave (Akande , 2021; Saito, 2021). This change might be related to particular activities that drew a large number of people from this age group during the second wave.

The Nigerian government ordered the closure of schools as part of its pandemic management efforts in March 2020, three weeks after the country's first case of the disease was discovered (Adedigba, 2020). Most schools, however, had reopened by the start of the second wave, after the Federal Government's acceptance of a staggered reopening of schools, subject to compliance with non-pharmaceutical interventions (NPIs) and the completion of regular risk assessment activities (Centre for the Study of the Economies of Africa,2020: Punch Newspapers, 2020).

Following the reopening, however, there have been reports of COVID-19 outbreaks in several schools. National Youth Service Corps orientation camps restarted in tandem with the reopening of schools. COVID-19 tests were required of all Corps members (NCDC, 2020). Around the same time, the #ENDSARS anti-police brutality protest, which lasted over three weeks in practically every State in Nigeria, took place (Ohia, 2020). Although anecdotal, the large gathering of demonstrators, mostly young people, may have aided the second wave.

The Delta variant of COVID-19 and the third wave of the pandemic in Nigeria

After being discovered in India in late 2020, the Delta variant quickly spread across the country and into the United Kingdom before reaching the United States, where it exploded (Kathy, 2021). On 8th July , 2021, the Nigeria Centre for Disease Control (NCDC) discovered a verified case of SARS-CoV-2 Delta, commonly known as lineage B.1.617.2. Following a normal travel test required of all overseas passengers and genomic sequencing at the NCDC National Reference Laboratory in Abuja, the variant was discovered in a traveler to Nigeria (Reliefweb, 2021). Because of its heightened transmissibility, the World Health Organization (WHO) designated the Delta mutant as a variant of concern. It has been found in more than 90 countries and was anticipated to spread further. It was also connected to an increase in cases in other nations where the strain was the most prevalent.

According to the Nigerian government, the country is already experiencing the third wave of the COVID-19 epidemic, with instances of the Delta variant on the rise in various States. On August 3rd, 2021, Nigeria had 174,315 Covid-19 cases from 2,542,261 samples examined, with 7,151 active cases and 2,149 fatalities (Nkechi, 2021).The Nigerian government, through the Presidential Steering Committee (PSC), had taken numerous steps to decrease the chance of

COVID-19 spreading. This includes imposing travel restrictions from nations where there has been a spike in cases linked to the wide spread occurrence of variants of concern. To decrease the chance of the virus spreading, the national travel policy was implemented, which included mandatory seven-day self-isolation and a repeat test on the seventh day after arrival. It was critical that this was followed to the later in order to avoid a COVID-19 outbreak in Nigeria.

Omicron variant of COVID-19 in Nigeria

Nigeria's daily COVID-19 infection rate had more than fivefold increase in the preceding week before the omicron variant was discovered in the country on 1st December, 2021. The average number of Nigerians who tested positive for the pathogen had risen to 451 a day for the week ending 12th December , 2021, compared with 76 in the preceding week, according to data from the National Centre for Disease Control (Osae-Brown,2021). Lagos remained the epicenter of the illness in the nation, accounting for more than half of the daily recorded infections. The Lagos State's governor Mr.Babajide Sanwo-Olu had warned of the beginning of the fourth wave of Covid-19 cases after the positivity rate increased from 0.1% to 6% in the middle of November, 2021 (Osae-Brown, 2021).

Corona virus Vaccines in Nigeria

The WHO has approved a number of COVID-19 vaccines for usage (given Emergency Use Listing). The first mass vaccination campaign began in early December 2020, and the COVID-19 dashboard displays the number of immunization doses provided on a daily basis (WHO, 2021). Based on all available facts on safety and efficacy, as well as its applicability in low and middle-income countries, the WHO Emergency Use Listing procedure assesses whether a product may be recommended for use. Clinical trial data, as well as manufacturing and quality control techniques, are used to analyze vaccines to ensure they satisfy acceptable quality, safety, and effectiveness requirements.

The threat posed by the emergency is weighed against the advantage that would come from using the product, as well as any possible concerns (WHO, 2021). The following vaccinations have received an emergency use listing as of November 26, 2021:

Dates of Emergence of Use of COVID-19 Vaccines

Pfizer/BioNTech	31stDecember, 2020.

Vaccines SII/COVISHIELD and AstraZeneca/AZD1222	16th February, 2021.
Johnson&Johnson developedJanssen/Ad26.COV 2.	12th March, 2021.
Moderna COVID-19 vaccine (mRNA 1273)	12thMarch ,2021.
Sinopharm COVID-19 vaccine	7th May, 2021
Sinovac-CoronaVac,	1st June , 2021
Bharat Biotech BBV152 COVAXIN vaccine	3rdNovembe, 2021.

In Nigeria, the AstraZeneca/AZD122 double dose vaccine first arrived in the country on March 2, 2021, for use by frontline health workers and other high-risk groups. This was subsequently followed by a single dose of moderna vaccine. However, the vaccination rate has not been impressive because of vaccine resistance arising from various conspiracy theories on the social media as well as socio-cultural and religious beliefs. This is in line with the health belief model of therapeutic choice selection and health-seeking behaviour (Siddiqui, 2001).

Corona virus mitigation strategies in Nigeria

Physical or social separation, quarantining, ventilation of interior areas, covering coughs and sneezes, hand washing, and keeping unwashed hands away from the face are all preventive methods against COVID-19. In public places, the use of face masks or covers has been advocated to reduce the risk of transmission. Other mitigating techniques used in Nigeria include enforcing social/physical distance, partial or total lockdown, and limiting non-COVID-19 patients' access to health care facilities. Vaccination has also been enforced at airports and at several federal government institutions in Abuja. This has also been done at National Youth Service Corps camps around the country.

Innovative Covid-19 Mitigation Strategies in Nigeria

Most African nations have a preponderance of elements that might lead to the fast spread of the COVID-19 pandemic, including a high level of poverty, high population density, and very frail health systems. Despite these obstacles, the continent has demonstrated its ability to respond to the pandemic. This might be due to the continent's previous experience with infectious illness epidemics such as Ebola, Lassa fever, and cholera. Several local improvements have been created and used since the start of the COVID-19 epidemic (Ochu, 2021).

On February 27, 2020, the National Coronavirus Preparedness Group (NCPG) became a national multisectoral Emergency Operations Centre (EOC) at the NCDC, after the confirmation of the

first COVID-19 case in Nigeria(Akande,2020). The EOC was activated at level three, the highest degree of response possible in the country for public health emergencies that need national coordination and the deployment of all available resources. Coordination, surveillance and epidemiology, case management, laboratory, ports of entry (PoE), infection prevention and control (IPC), risk communication, logistics, and research are all pillars of the EOC. The Federal Ministry of Health's Departments of Port Health Services and Hospital Services, respectively, lead the POE and case management pillars (Dan-Nwafor, 2020; Ochu, 2021). Both Lagos and Ogun states created sub-national EOCs to coordinate the reaction in the first two impacted states. To boost coordination and response efforts at the state and local government area (LGA) levels, national multidisciplinary rapid response teams (RRTs) were strategically deployed to the first two states (Lagos and Ogun), plus the Federal Capital Territory (FCT), and eventually to other states. The national RRTs, which are made up of NCDC employees and Nigeria Field Epidemiology and Laboratory Training Program graduates/residents (NFELTP) offered state and sub-state level technical and logistical support(Dan-Nwafor,2020).

On March 9, 2020, Nigeria's President formed the Presidential Task Force (PTF) on COVID-19, with the overall purpose of coordinating and overseeing the country's multisectoral and inter-governmental efforts to limit the spread and minimize the impact of the COVID-19 pandemic in Nigeria. The National COVID-19 Multi-Sectoral Pandemic Response Plan was created in response to the virus. The PTF approved it in March, and it now serves as a framework for a government-wide reaction (Bassey, 2022; Dan-Nwafor, 2020)

The PTF directed the national reaction with high-level strategic leadership based on scientific facts. PTF media briefings were held on a daily basis to inform Nigerians about new evidence, current challenges, and the government's response. The President of Nigeria's policy decisions for the various phases of the outbreak were guided by technical evidence-based recommendations from the PTF (Bassey, 2022; Ochu, 2021). Overall, Nigeria's response measures intended to stop COVID-19 from spreading by testing all suspect cases, isolating all confirmed cases, and tracking all confirmed cases' contacts, as well as implementing country-wide or regional non-pharmaceutical treatments as needed(Bassey, 2022). Nigeria's reaction was marked by close coordination with its allies. Technical and material assistance from various local and international partners, including the WHO, Africa CDC, and charitable organizations, aided the development and execution of response initiatives. The Nigeria COVID-19 Research

Consortium (NCRC) was formed in response to the requirement to provide relevant research evidence. Its mission is to establish and implement a COVID-19 research agenda based on specified national objectives, in accordance with WHO's global research roadmap. In Nigeria, the NCRC also functions as the coordinating organization for COVID-19 research (Dan-Nwafor, 2020).

The NCDC EOC convened a mid-action review meeting on May 9, 2020, to strategically review the existing response approach, share lessons learned, and identify key opportunities for improvement and further collaboration, given the virus's novelty, the evolving nature of transmission in Nigeria from imported cases to clusters of cases to community transmission, and the level of response implemented(Ochu, 2021). The meeting's result and main suggestions have been utilized to enhance response tactics, promote disease control and preventative efforts, as well as targeted activities to strengthen the health system, based on growing data and worldwide best practices (Akande, 2020). Poor use of state-level public health EOCs for coordinated responses, sub-optimal data use to guide decision making, delayed laboratory results, non-standardization of case management across treatment centers, and poor adherence to IPC practices in health care facilities are among the gaps identified (Bassey, 2022; Dan-Nwafor, 2020).

Several intervention measures were implemented, including training and mentoring of State EOC teams on the incident management system as a tool for outbreak response coordination, the development and operationalization of data management, analysis, and use plans, the deployment of the electronic surveillance system to laboratories to speed the release of results, the formation of a community of practice for COVID-19 case managers, and the deployment of online IPC training.(Akande, 2020; Bassey, 2022)

Conclusion

COVID-19 is an emerging disease that started in Wuhan, China but has spread to all parts of the world, causing disease of varying severity and death in some cases. The pandemic has been spreading in waves because of the mutation of the virus. Prevention is still dependent on strict observance of public health protocols for respiratory hygiene, regular hand washing or use of hand sanitizers, wearing of face masks in crowded places, and physical distancing. Vaccines have been added to the mitigation strategies. It is known that when people are vaccinated, they have milder diseases and acquire some immunity in the process. When this becomes widespread,

herd immunity will be achieved and the pandemic brought under control. Based on the issues discussed, there is a need for sustained health education of the populace to observe the COVID-19 guidelines by the NCDC. There is a need to encourage citizens in Nigeria to embrace COVID -19 vaccination in order to achieve herd immunity and control the pandemic.

There is need to counter conspiracy theories fuelling vaccine resistance for prevention of COVID-19 infection through radio and television jingles. Religious leaders and traditional rulers will need to be involved in campaigns to increase public confidence on COVID-19 prevention measures including COVID-19 vaccination. Pregnant women should maintain physical distance while attending ante natal care where there are large crowds. The younger people should be engaged in public health education on the internet and through social media platforms in the language and form they will understand.

Innovative mitigation strategies developed to contain the current pandemic should be sustained to control future epidemics or pandemics..

References

Adedigba, A. (2020). Coronavirus: Nigerian government orders closure of schools nationwide [Internet]. 2020. Available: https://www. premiumtimesng. com/ news/ top- news/ 382806- coronavirus- nigerian-govt- orders- closure- of- schools- nationwide. html [Accessed 02 Oct 2021].

Akande, O.W., & Akande, T. M. (2020).COVID-19 pandemic: a global health burden. *Nigerian Postgraduate Medical Journal [Internet]*,27, 144–55.

Akande. O.W., Elimian, K.O., & Igumbor, E.(2021) .Epidemiological comparison of the first and second waves of the COVID- 19 pandemic in Nigeria, February 2020–April 2021. British Medical Journal Global Health ,6,e007076. doi:10.1136/ bmjgh-2021-007076

CDCP. (2019). SARS- CoV- 2 Variant Classifications and Definitions [Internet]. Centers for Disease Control and Prevention, 2020. Available: https://www. cdc. gov/ coronavirus/ 2019- ncov/ variants/ variant- info. html [Accessed 15 Jul 2021].

Centre for the Study of the Economies of Africa. (2020). Reopening Schools for Learning amid Covid- 19 [Internet], 2020. Available: http:// cseaafrica. org/ post- covid- 19- reopening-schools- for- learning/ [Accessed 02 Oct 2021].

Chan, J.F., Yuan, S., Kok, K.H., To ,K.K., Chu, H., & Yang, J.(2020). A familial cluster of pneumonia associated with the 2019 novel coronavirus indicating person-to-person transmission: a study of a family cluster. *Lancet,* 395,514–23.doi: 10.1016/S0140-6736(20)30154-9

Chirwa, G.C. (2019).Socio-economic Inequality in Comprehensive Knowledge about HIV in Malawi. *Malawi Medical Journal*,31,104–11. doi: 10.4314/mmj.v31i2.1

Chirwa, G.C. (2020). "Who knows more, and why?" Explaining socioeconomic-related inequality in knowledge about HIV in Malawi. *Science African,* 7,e00213. doi: 10.1016/j.sciaf.2019.e00213

Dan-Nwafor, C., Ochu, C.L,.& Elimian, K. (2020). Nigeria's public health response to the COVID-19 pandemic: January to May 2020. *Journal of Global Health*, 10, 02039

FMoH. (2020). Health minister: first case of covid-19 confirmed in Nigeria. https://www.health.gov.ng/index.php?option=com_k2&view=item&id=613:health-minister-first-case-of-covid-19-confirmed-in-nigeriafromhttp://medrxiv.org/lookup/doi/10.1101/2020.10.11.20210864

Iorfa, S. K., Ottu, I. F., Oguntayo, R., Ayandele, O., Kolawole, S.O., & Gandi, J. C. (2020). COVID-19 Knowledge, Risk Perception, and Precautionary Behavior Among Nigerians: A Moderated Mediation Approach. Frontiers of Psychology, 11.566773. doi: 10.3389/fpsyg.2020.566773

Janz, N. K., & Marshall, H. B. (1984). "The Health Belief Model: A Decade Later". *Health Education & Behavior*,11 (1), 1–47.

Kathy, K. (2021). Five Things To Know About the Delta Variant.https://www.yalemedicine.org/news/5-things-to-know-delta-variant-covid

Li, Q., Guan, X., Wu, P., Wang, X., Zhou, L., & Tong, Y.(2020). Early transmission dynamics in Wuhan, China, of novel coronavirus–infected pneumonia. *New England Journal of Med*icine, 382,1199–207. doi: 10.1056/NEJMoa2001316

NCDC. (2020).COVID-19 Situation Report 130 [Internet].Nigeria Centre for Disease Control, 2020. Available: https://ncdc.gov.ng/diseases/sitreps/?cat=14&name=An% 20update%20of%20COVID-19%20outbreak%20in%20Nigeria

NCDC. (2020). Guidelines on 2020 National Youth Service Corps (NYSC) Orientation Camp Activities [Internet], 2020. Available: https:// covid19. ncdc. gov.ng/ media/ files/ Guidelines_ on_ 2020_ National_ Youth_ Service_ Corps_ NYSC_ Orientation_ Camp_ activities. pdf [Accessed 10 Feb 2021].

NCDC. (2021). One Year After: Nigeria's COVID- 19 Public Health Response, February 2020 – January 2021 [Internet]., 2021. Available: https:// covid19. ncdc. gov.ng/ media/ files/ COVIDResponseMarch1. pdf [Accessed 05 Jul 2021].

Nkechi, O.U. (September,2021).COVID-19: Nigeria enters third wave as cases of Delta variant spikehttps://guardian.ng/news/nigeria/covid-19-nigeria-third-wave-delta-variant-spike/.

Ochu, C.L., Akande ,O.W., & Oyebanji .O. (2021). Fighting a Global War Using a Local Strategy: contextualism in COVID-19 response in Africa. *British Medical Journal on Innovations*,7, 347-355.

Ohia, C., & Salawu, M.M. (2020).COVID- 19 pandemic and civil unrests in Africa: implication of recent #EndSARS protests for increased community transmission in Nigeria. *Pan African Medical Journal*, 37,47.

Omozuwa, S.E., & Uwaibi, N.E. (2021). Level of awareness, knowledge and perception on COVID-19 among pregnant women attending antenatal clinics in Central Hospital Benin City, Edo state. *Annals of Clinical and Biomedical Research ,2, 116*

Osae-Brown, A. (December,2021). Covid Cases Surge in Nigeria after discovery of Omicron Variant.https://www.bloomberg.com/news/articles/2021-12-13/covid-cases-surge-in-nigeria-after-discovery-of-omicron-variant

Owhonda, G., Maduka, O., Nwadiuto, I., TobinWest, C., Azi ,E., Ojimah, C., Alasia, D., Olofinu ka, A.M, Agala, V., & Paul, J.N. (2020). Awareness, perception and practice of COVID 19 prevention among residents of a state in the south-south region of Nigeria: implications for public health control efforts. *medRxiv*.

Parry, J. (2020). China coronavirus: cases surge as official admits human to human transmission. *British Medical Journal*, 368,m236. doi: 10.1136/bmj.m236

Phan, L.T., Nguyen. T.V., Luong, Q.C., Nguyen, H.T., & Le, H.Q. (2020).Importation and human-to-human transmission of a novel coronavirus in Vietnam. *New England Journal of Medicine*, 382,872–4. doi: 10.1056/NEJMc2001272

Podder, D., Paul, B., Dasgupta, A., Bandyopadhyay ,L., Pal, A., & Roy, S.(2019). Community perception and risk reduction practices toward malaria and dengue: a mixed-method study in slums of Chetla, Kolkata. *Indian Journal of Public Health.*63,178. doi: 10.4103/ijph.IJPH_321_19

Punch Newspapers. (2020). PTF okays phased reopening of schools, orders risk assessment [Internet]. Punch Newspapers, 2020. Available: https:// punchng. com/ ptf- okays- phased- reopening- of- schools- orders- risk- assessment/ [Accessed 02 Oct 2021].

Reliefweb. (2021). Confirmed Case of Delta Variant Detected in Nigeria.https://reliefweb.int/report/nigeria/confirmed-case-delta-variant-detected-nigeria#:~:text=The%20Nigeria%20Centre%20for%20Disease,2.

Riou, J., & Althaus, C. L. (2020). Pattern of early human-to-human transmission of Wuhan 2019 novel coronavirus (2019-nCoV), December 2019 to January 2020. *Eurosurveillance*. 25,2000058. doi: 10.2807/1560-7917.ES.2020.25.4.2000058

Saito, S., Asai, Y., & Matsunaga, N. (2021). First and second COVID- 19 waves in Japan: a comparison of disease severity and characteristics. Journal of Infection, 82,84–123.

Shereen, M. A., Khan. S., Kazmi, A., Bashir, N., & Siddique, R. (2020). COVID-19 infection: origin, transmission, and characteristics of human coronaviruses. *Journal of Advanced Res*earch, 24,91–98. doi: 10.1016/j.jare.2020.03.005

Tang, D., Tou, J., Wang, J., Chen, Q., Wang, W., & Huang. J.(2020). Prevention and control strategies for emergency, limited-term, and elective operations in pediatric surgery during the epidemic period of COVID-19. *World Journal of Pediatric Surgery*, 3,e000122. doi: 10.1136/wjps-2020-000122

Wang, D., Hu, B., Hu, C., Zhu, F., Liu, X., & Zhang, J.(2020). Clinical characteristics of 138 hospitalized patients with 2019 novel coronavirus–infected pneumonia in Wuhan, China. *Journal of American Medical association* ,323,1061–9. doi: 10.1001/jama.2020.1585

WHO. (2020). *Coronaviruses (COVID-19) 2020*. Available online at: https://www.who.int/news-room/q-a-detail/q-a-coronaviruses (accessed 1 April, 2020)

WHO. (2021).Corona virus disease(COVID-19):Vaccines. https://www.who.int/emergencies/diseases/novel-coronavirus-2019/question-and-answers-hub/q-a-detail/coronavirus-disease-(covid-19)vaccines?adgroupsurvey={adgroupsurvey}&gclid=Cj0KCQiAweaNBhDEARIsAJ5hwbfrymIP5cuSACMQzdQhEoBwsZzDZeyQHDXPmFUpuDunUSy-XVbOR-YaAlBOEALw_wcB

Wu, F., Zhao. S., Yu, B., Chen, Y.M., Wang, W., & Song, Z.G. (2020).A new coronavirus associated with human respiratory disease in China. *Nature*, 579,265–9.doi: 10.1038/s41586-020-2008-3

Zhou, P., Yang, X.L., Wang, X.G., Hu, B., Zhang, L., & Zhang, W.(2020). A pneumonia outbreak associated with a new coronavirus of probable bat origin. *Nature*, 579,270–3. doi: 10.1038/s41586-020-2012-7