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Health and Public Health Implications of COVID-19 in Nigeria

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Abstract
Coronavirus Disease 2019 (COVID-19) has become a major public health issue in humans, producing severe acute respiratory sickness. Since its first detection in Wuhan, China, in December 2019, it has spread fast over the world. Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is the causal virus, and the new epidemic disease has been dubbed Coronavirus Disease by the World Health Organization (WHO) (COVID-19). With over three million verified cases and over 244,000 deaths worldwide, COVID-19 continues to spread. COVID-19 does not yet have a specific treatment or vaccination. In the absence of pharmacological interventions, care and hygienic measures will be required to keep the virus under control and reduce human transmission. The pathogenesis, transmission, public health implications, and symptoms are all highlighted in this paper.
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Introduction

Globally, public health activities are still been affected by emergent diseases. Socio-economic, environmental, and ecological factors are thought to be drivers of this emergence which has also put a lot of pressure on the health systems and global economy. The term Covid-19 was given to the virus by the WHO on the 11th of February, 2020. It is an acronym that stands for Coronavirus Disease of 2019. Coronaviruses are part of the Nidovirales order's Coronaviridae family. The coronavirus was named for the crown-like spikes on the virus's outer surface. Coronaviruses are small (65-125 nm in diameter) and have a single-stranded RNA nucleic material with a length of 26 to 32 kilobases (kb). alpha (α), beta (β), gamma (γ), and delta (δ) are the four subgroups of the coronavirus family HYPERLINK \l "She203" 1

The first reported instance of the virus occurred in December 2019 in Wuhan, China's capital. In the province, it started as a type of pneumonic case. Cases were reported to the country office of the World Health Organization (WHO). It turned out to be a novel strain of the 2002 SARS-CoV virus. Coronavirus Disease 2019 (COVID-19) was caused by the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) in 2020, resulting in a pandemic that is still underway in most nations. With varying levels of execution of nonpharmaceutical intervention strategies, Africa's response to the pandemic was mostly decisive 2. 88 percent (43/49) of African countries implemented stringent nonpharmaceutical interventions at the start of the first wave of the pandemic in April 2020, including some level of public transportation system closure, stay-at-home measures, and travel restrictions, but most countries have since relaxed these measures HYPERLINK \l "Tho20" 3 .

The public health and social interventions put in place have helped to slow the spread of COVID-19 throughout Africa, with the number of new cases falling dramatically by the end of August 2020. However, from September 2020, a second wave has been observed in most African countries. As of April 27, 2021, the continent had reported a total of 4.52 million illnesses and 120,420 fatalities, accounting for 3.1 percent of global cases and 3.9 percent of deaths 4. However, severe restrictions on social contact and transportation, as well as the fear of attending healthcare facilities, have had an impact on non-COVID healthcare services. In addition to reallocating resources such as healthcare professionals and diagnostic equipment to properly tackle the pandemic, a shortage of medical supplies caused by supply chain disruptions has exacerbated COVID-19's indirect influence on other health problems in Africa. COVID-19's epidemiological pattern predicts a five to fourteen-day incubation period HYPERLINK \l "Wor206" 5 , with a recent case report suggesting as many as twenty-four days 6. SARS-CoV-2 is spread through respiratory droplets, although it has also been identified in blood and feces. Males are more likely than females to have severe symptoms, especially in the elderly HYPERLINK \l "Wor206" 5 .

COVID-19 prevention methods, on the other hand, will be more effective and less taxing on the healthcare system. In Nigeria, strong preventive measures are being done to extend the virus's infectivity. COVID-19 has decimated several countries throughout the world since it was proclaimed a global pandemic, and many

healthcare systems have been overburdened as a result. The epidemic has also resulted in the loss of livelihoods as a result of extended shutdowns, which has had a knock-on effect on the worldwide economy. Despite significant advances in clinical research that have led to a better understanding of SARS-CoV-2 and the management of COVID-19, limiting the virus's and its variants' continued spread has become a growing concern as SARS-CoV-2 continues to wreak havoc around the world, with many countries experiencing a second or third wave of outbreaks attributed primarily to the emergence of mutant variants of the virus. The disease's symptoms were similar to the symptoms of a regular cold. Fever, cough, shortness of breath, and loss of smell are among them. However, the repercussions are more serious than the symptoms, since it can lead to pneumonia, viral sepsis, ARDS, kidney failure, and other issues. According to the individual's health situation, the complications are considered to worsen over time 7.

The virus is not transmitted by the air, but it can be distributed in a variety of ways. It is mostly dispersed Among people who are nearby. People could become infected by contacting an existing contaminated surface if droplets from sick people fall on it. Various studies have revealed that the virus's half-life outside the human body is temperature and humidity-dependent, implying that various places may see varied rates of dissemination HYPERLINK \l "Cor20" 8 . On February 11, 2020, the International Committee on Virus Taxonomy (ICTV) published a statement providing an official designation for the novel virus: severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) 9. Individuals in close contact with infected people, travelers arriving from locations where local spread has been reported, people in areas where local transmission is still ongoing, and healthcare workers caring for COVID-19 patients are all classified as high risk by the Centers for Disease Control HYPERLINK \l "CDC201" 10 . COVID-19 can manifest itself in a variety of ways, ranging from severe disease and death to moderate symptoms and even asymptomatic infection. After being exposed to the virus for 2 to 14 days, symptoms may appear 11. The average incubation period for COVID-19 outside of Wuhan, China, was 5.1 days, and 97.5 percent of those who exhibited symptoms did so within 11.5 days after infection HYPERLINK \l "Lau201" 12 . According to Wu and McGoogan, 81 percent of COVID-19 cases reported to the Chinese Center for Disease Control and Prevention (CCDC) were mild (absent or mild pneumonia), 14 percent were severe (hypoxia, dyspnea, 50 percent lung involvement within 24-48 hours), 5% were critical (shock, respiratory failure, multiorgan dysfunction), and 2.3 percent were fatal 13.

The best way to prevent infection is to remain a safe distance from infected people, frequent washing of the hands, and cleaning of any potentially contaminated surfaces. Because the symptoms are inconsistent, it is impossible to tell if someone is infected without testing. The spread has been aided by the presence of these silent carriers. The silent carriers are divided into three groups HYPERLINK \l "Lau20" 14 :
Asymptomatic: these individuals are those who have the active virus in their bodies but have not yet developed symptoms.

Presymptomatic: People who have been infected and are incubating the virus but do not show any symptoms.
Very mildly symptomatic: People who are just slightly sick after a Covid-19 infection but continue to interact with others.

SARS-CoV-2 transmission rates are unknown, however, human-to-human transmission has been observed. As with other respiratory infections such as influenza and rhinovirus, transmission is thought to occur by respiratory droplets (which cannot move more than 6 feet) via coughing and sneezing. Individuals can become infected by coming into contact with viruses released in respiratory secretions or infected mucous membranes. The virus can also survive on surfaces for different amounts of time and infectivity. Because the infection potential of these carriers has yet to be recognized, social distance has been advocated. The pandemic and its repercussions are seen in every country, forcing localized strategies to manage the situation while waiting for a vaccine. The coronavirus disease pandemic of 2019 (COVID-19) has had a significant influence on our lives. Not only did this devastating infection claim a large number of lives, but it also caused economic downturns in many countries as a result of lifestyle changes made to slow the spread of the infection and the implementation of policies that limited economic activity, such as lockdowns and travel restrictions. Yet, as far as we know, there hasn't been a complete examination of how the epidemic is influencing our health and health-care systems, including its secondary impacts. The goal of this research is to assess the probable spread of COVID-19 by analyzing the evolution of the virus and Nigeria's response to it.

Statement of Problem

Humans are exerting too much pressure on the natural environment, which has catastrophic effects, including the evolution of the Coronavirus. The immediate goal was to protect individuals from the Corona Virus and stop it from spreading; however, the long-term focus must be on habitat and biodiversity degradation 15]. Never before

has there been such a wide range of opportunities for infections to spread from wild to domestic animals to humans; never before has our continuing extinction of wild species brought us dangerously near to animals and plants that carry diseases that can spread to humans. How these new diseases, particularly the Coronavirus, impacted man's immediate environment remain unsolved questions. What are the benefits and drawbacks of this influence, and what are the steps that may be taken to mitigate these effects for the benefit of humans and the ecosystem as a whole? Nigeria is at the center of this conversation thanks to this effort.

Pathogenesis of Covid-19

COVID-19 is still a new illness whose whole pathophysiology is yet unknown, and numerous knowledge gaps will need to be filled over time. Virus replication, immunopathogenesis, and cytokine storm are the three pathophysiological processes that have now been established as hallmarks of COVID-19 pathogenesis, according to the current literature HYPERLINK \l "Cha17" 16 . The virus recognizes and binds with the host transmembrane cellular receptor protein, which has been identified as an angiotensin-converting enzyme 2 (ACE2) receptor located in the mucous membrane of the human lower respiratory tract, in the first step of SARS-CoV-2 viral replication 17. This promotes virus-membrane fusion, allowing the viral genome RNA (gRNA) to be released into the cytoplasm and replicated or replicated several times via the stages below: Translation of viral gRNA to produce two polyproteins that encode NSPs and a replication-transcription complex (RTC) in a double-membrane vesicle; proteolysis of the translated polyproteins with viral 3C–like proteinase; replication of viral RTC to produce subgenomic RNA that encodes NSPs Assembly of viral components into viral particle buds, including the newly generated subgenomic RNA and the four required structural proteins; release of the replicated virus out of the cells via binding and extrusion of virion-containing vesicles with the plasma membrane.

Immune response to the invading SARS-CoV-2 virus is typically a double-edged sword: a precise response in some patients' immunity indicates virus regulation and resolution; whereas an out of control immune response in some subset of patients results in immunopathogenesis, which indicates an over-reacting, dysfunctional, and out of control immune response, which leads to cytokine storm syndrome. To regulate and remove SARS-CoV-2, a careful balance of optimal immune response and optimal generation of inflammatory cytokines is necessary. Over-activation of the immune system, which leads to hyper inflammation, produces clinical characteristics linked to bad results, such as severe COVID-19 symptoms and mortality HYPERLINK \l "Che20" 18 . The innate immune response, which is made up of epithelial cells, alveolar macrophages, and dendritic cells, is the initial line of defense against SARS-CoV-2 infection in the airways19. This immunity fights the virus until adaptive immunity takes over. ACE2 expressed respiratory invaded epithelial cells of the host innate immunity is initiated by virus-cell interactions where the viral RNA is recognized in an optimal and ideal state immune system. TIR-domain-containing adaptor protein (TIRAP), TIR-domain-containing adapter-inducing interferon (TRIF), mitochondrial antiviral-signaling protein (MAVS), and stimulator of interferon genes protein (SIGP) are among the viral adaptor proteins that are recruited when they are recognized (STING). These adaptor proteins then trigger a series of cellular cascades that result in the transcription of pro-inflammatory genes like nuclear factor kappa-light-chain enhancer of nuclear factor kappa-light-chain enhancer of nuclear factor kappa-light-chain enhancer of nuclear factor kappa-light-chain enhancer of nuclear factor kappa-light-chain enhance Nuclear factor-kappa B (NFB) and interferon regulatory factor 3 (IRF3) are two proteins produced by activated B cells that work together to produce immune mediators that help control and resolve invading viruses. The exact mechanism by which SARS-COV-2 subverts and overcomes innate immune responses is unknown, but it has been shown in SARS-CoV that the nucleocapsid (N) protein aids the virus in escaping such immune responses, further activating adaptive immune responses of both cellular and humoral immunity to respond to the virus. SARS-CoV-2 is protected by a combination of innate and adaptive immune responses, which emerged after antigen presentation HYPERLINK \l "Tay20" 20 . However, if these processes, which are triggered by virus-cell interactions and an appropriate innate immune response, go awry and the coordinated immune response is compromised, immunopathogenesis occurs, resulting in a dysfunctional immune response that causes physiological changes in pulmonary function, such as the release of the replicated virus from the ACE2 expressed epithelial cell linings of the alveoli, which causes mechanical irritations of the nervous. SPO2 (Saturated Phosphate Oxide). Local inflammation triggers a pro-inflammatory feedback loop, which, in combination with a drop-in surfactant due to damaged type II pneumocytes and lung tissue fibrosis, continuously creates and amplifies pathophysiological processes that damage lung structure and reflect COVID-19 respiratory complications.

Cytokine storm (CS) is a disease feature of COVID-19 that correlates with infection severity and thus marks the critical stage in the clinical progression of COVID-19 to severe pneumonia, acute respiratory distress syndrome (ARDS), respiratory failure, and death, as well as COVID-19 manifestations of multiple-organ dysfunction 21.

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Cytokines are low-molecular-weight proteins produced by immune and stromal cells in response to a production stimulus to regulate a variety of physiological and pathological processes, including innate and acquired immunological responses to pathogens, as well as a variety of inflammation. The six categories of cytokines are as follows: interleukin (IL) is a type of protein that is produced by the immune Interferon (IFN), tumor necrosis factor (TNF), colony-stimulating factor (CSF), chemokines, and growth factors are all examples of proteins (GF). Pro-inflammatory interleukins, interferon-gamma (IFN-), tumor necrosis factor-alpha (TNF-), macrophage colony-stimulating factor (MCSF), monocyte chemoattractant protein 1 (MCP-1), and hepatocyte growth factor are among the cytokines that are abnormally elevated in COVID-19 patients (HGF).

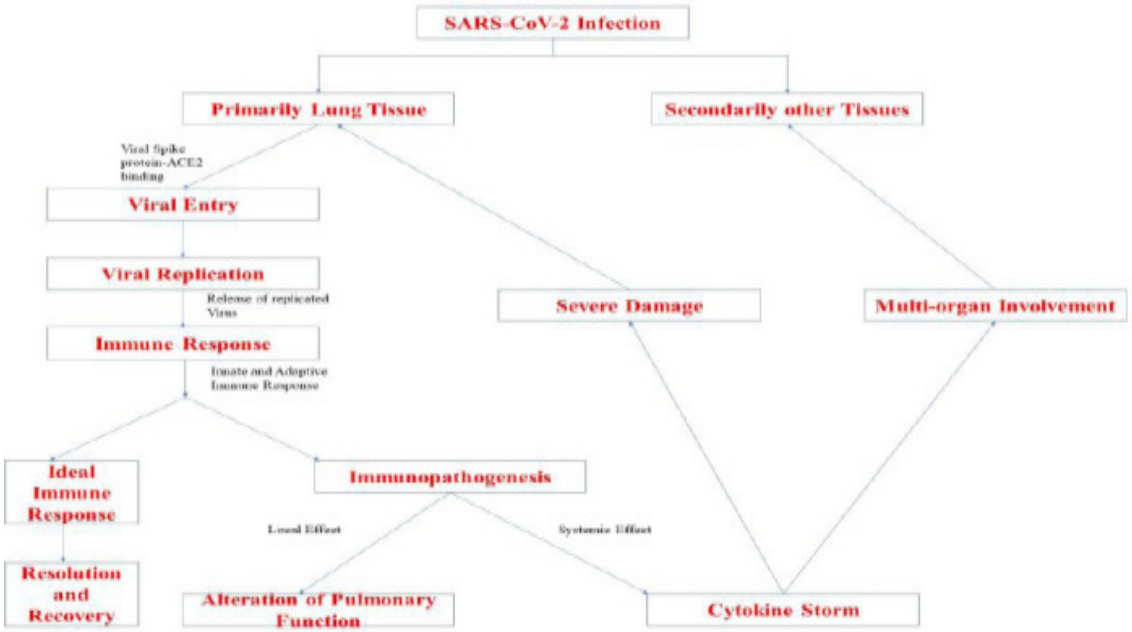

Figure 1 Schematic representation illustrating pathogenesis of COVID-19

COVID-19 has been linked to neurological, gastrointestinal, nephrological, hepatobiliary, and cardiovascular disorders, in addition to the development of respiratory illness. Although the rationale for this multi-organ involvement is still under investigation, cytokine storm has been suggested as the most likely pathophysiological mechanism. For example, a cytokine storm can cause sepsis as a result of systemic dysregulation of the host's response to infection, and sepsis is linked to a hypercoagulable and hyper thrombotic body state. The pathogenesis of neurological manifestations of ischemic stroke caused to COVID-19 has recently been identified as hypercoagulability and hyper thrombotic condition, which produces microthrombi occlusion of cerebral microvasculature. With the growing body of evidence indicating that COVID-19 causes neurological symptoms, the neurological expression of COVID-19 have become more visible. such as a loss of smell and taste, which could occur before the much-discussed respiratory symptoms3. The neurological manifestation can be attributed to both a direct factor of neuroinvasion into the CNS to infect resident cells that expressed the ACE2 receptor and an indirect factor involving a cytokine storm-induced hypercoagulable and hyper thrombotic state, according to emerging evidence on the mechanism of multi-organ involvement.

The cardiovascular and nephrological signs of COVID-19 are thought to be caused by the same mechanism involving direct cytopathic effects through ACE2 receptor-expressing tissues and indirect effects through cytokine storm-produced damage. COVID-19 as a respiratory sickness may arise from the vascular side of the alveolus rather than the epithelial side, according to new research. With widespread abnormal findings in endothelial cells of pulmonary and renal blood vessels among COVID-19 patients. This growing body of evidence suggested COVID-19 is a viscerotropic disease that infects blood vessels and causes endothelial damage rather than a purely respiratory illness, raising the possibility of a shift in scientific thinking about how COVID-19 causes fatal outcomes and, as a result, a new approach to therapy development. Patients presenting with low oxygen saturation and shortness of breath are becoming more common, according to anecdotal data from frontline medical workers. Yet, despite being out of breath and having no abnormal lung findings on a CT scan, they test positive for COVID-19. This discovery of well-preserved lung mechanics despite hypoxemia in COVID-19 patients has also been observed and reported 25. Raising issues about whether SARS-CoV-2-

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associated ARDS is nonconforming with the well-established mechanism of conventional ARDS.

The 2019-nCoV's origin remains a mystery. The Huanan South China Seafood Market HYPERLINK \l "Gra20" [26] has been linked to expanding illness. Scientists are trying to figure out what animal this unusual coronavirus infects to stop it from spreading, but no one knows for sure. The 2019-nCoV could be found in bats, pangolins, or shellfish, according to most publications [27]. The goal is to identify the intermediate host that transmits the coronavirus to humans. To aid in finding zoonotic transmission patterns, it is critical to pinpoint the virus's source HYPERLINK \l "Jin20" [27]. The virulence and transmissibility of SARS-CoV-2 are both high [28]. It may be spread from person to person through droplets and contact. The most common source of COVID-19 transmission is symptomatic patients. Coughing or sneezing from an infected person distributes the virus mostly through respiratory droplets HYPERLINK \l "Rot20" [29]. There's also a chance that asymptomatic people could pass the infection on to others. In addition, research is needed to better understand the virus's transmission methods, incubation period, and infectivity duration.

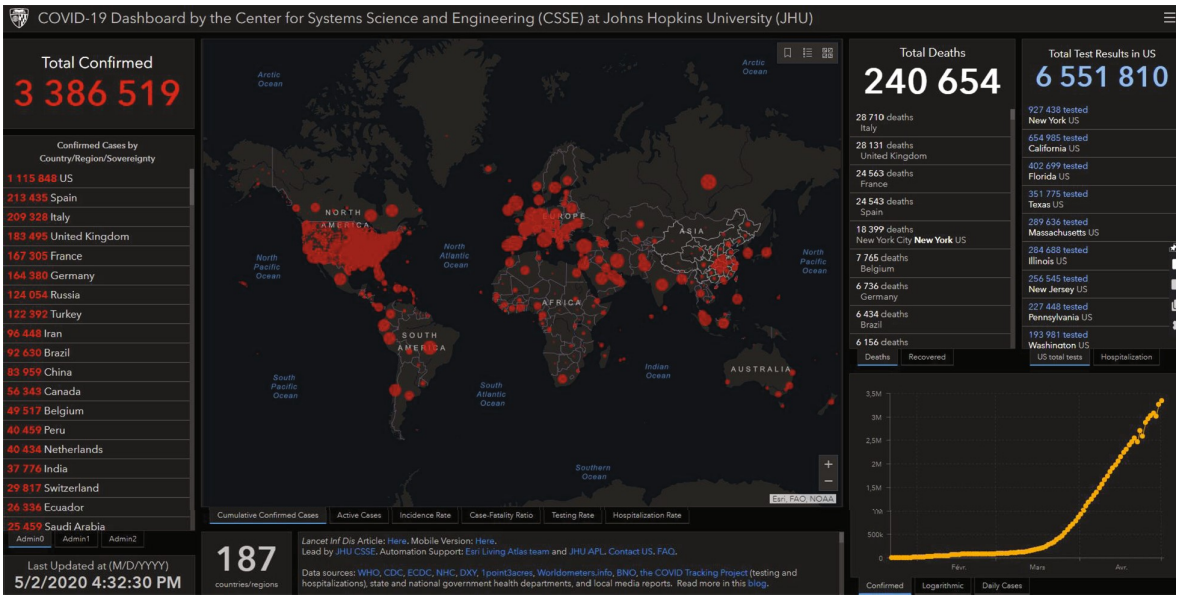

Fig 2 World map represents the geographical distribution of COVID-19 outbreaks. Data are accurate as of 21 March 2020 [30]

Transmission

The disease is spread primarily through respiratory droplets in close-contact situations and by touching contaminated surfaces before touching one's eyes, nose, or mouth. While these transmission patterns are comparable to those of SARS, MERS, and influenza, SARS-CoV-2 has been found to have higher transmissibility (as measured by the basic reproductive number) than those respiratory infectious illnesses Another distinguishing aspect of COVID-19 transmission is the high incidence of transmission from people who don't have any symptoms (i.e., infection from those who aren't sick yet, which accounts for almost half of all infections) HYPERLINK \l "Cev20" [31]. SARS or other diseases like it are not frequent. SARS or influenza are rarely spread before symptoms appear. While many infectious diseases, such as influenza, need people to wear masks only when they are sick, COVID-19 outbreaks require everyone to wear masks regardless of their symptoms since the virus spreads from presymptomatic (yet contagious) patients. Because COVID-19 spreads from presymptomatic people, tracing and isolating infected people is particularly difficult. The rate of COVID-19 reinfection is unknown, but a recent prospective study indicated that reinfection can occur even if the SARS-CoV-2 antibody is positive[32].

Diagnosis

COVID-19 usually presents as an acute viral respiratory tract infection, and many differential diagnoses related to common viral pneumonia, such as influenza, parainfluenza, adenovirus infection, respiratory syncytial virus infection, metapneumovirus infection, and atypical pathogens, such as Mycoplasma pneumoniae and

Clamydophila pneumonia infections, should be considered HYPERLINK \l "Hua20" [33]. When approaching a suspected patient returning from an epidemic location, it is critical to track their travel and exposure history. Commercial respiratory syndromic diagnostic kits (such as the Filmarray Respiratory Panel) that identify numerous etiological agents may also aid in the early differential diagnosis**.**

COVID-19 laboratory diagnosis should be carried out in a well-equipped facility with biosafety level 3 facilities for virus culture. A real-time RT-PCR assay targeting a consensus E region of pan beta-CoV or other more specific regions is commonly used for confirmatory laboratory diagnosis to identify viral RNA (such as RdRp or N region). A chest x-ray and computer tomography (CT) scan indicated bilateral pneumonia with numerous mottling and ground-glass opacity in 75–98% of cases. Lymphopenia, delayed prothrombin time, raised D-dimer, liver enzymes (alanine aminotransferase), total bilirubin, and lactate dehydrogenase, with worsening results in ICU cases, are typical laboratory findings in the early stages of the COVID-19 epidemic [33]. Having a subsequent bacterial infection could get one leukocytosis. To avoid the possibility of unintentional exposure, clinicians should carefully consider the need for regular blood collection and aspiration.

Treatment

COVID-19 does not yet have a proven treatment. Symptomatic and supportive therapy, such as preserving vital signs, maintaining oxygen saturation and blood pressure, and treating consequences such as secondary infections or organ failure, are the key techniques. Many experimental treatments are being tested because of COVID-19's potential for death which includes:

1. Gilead Sciences, Inc. is developing Remdesivir, a novel nucleotide analog prodrug. It is an experimental antiviral medication for Ebola and SARS. In a case report on the first instance of 2019-nCoV in the United States, giving remdesivir for compassionate use on day 11 following sickness resulted in lower viral loads in nasopharyngeal and oropharyngeal samples, as well as an improvement in the patient's clinical condition. However, randomized controlled trials are needed to determine the drug's safety and efficacy in treating people infected with 2019-nCoV.
2. Antiviral medicines such as lopinavir/ritonavir and ribavirin have been used to treat SARS with good results. At doses of 4 and 50 g/mL, respectively, lopinavir and ribavirin showed in vitro antiviral efficacy against SARS-associated coronavirus after 48 hours. Unique insertions in the 2019-nCoV spike protein are strikingly similar to HIV-1 gp120 and Gag.21, according to a recent study. Will the 2019-nCoV treatment outcome be affected by anti-HIV drugs? More COVID-19 patients must undergo randomized controlled trials.
3. This method was utilized to assist passive immunization using convalescent therapy (plasma from recovered COVID-19 patients). Convalescent plasma, interferon-beta/ribavirin combination therapy, and lopinavir are among the medicinal medicines with potential advantages, according to MERS studies. However, there is currently no COVID-19 experience and no randomized controlled clinical studies for this therapy.
4. There is presently no vaccination available to prevent infection with 2019-nCoV. The spike protein could be used as a vaccine candidate, but the impact on humans needs to be studied further.

Prevention

The Nigerian Federal Government has established a Presidential Task Force on COVID-19 to provide a high-level strategic national response to the disease. To coordinate the national public health response, the Federal Ministry of Health has activated a COVID-19 Emergency Operations Centre (EOC) led by the NCDC. Public Health EOCs in each state is in charge of coordinating preparedness and response activities at the state level.

A campaign called #Take Responsibility has also been launched by the NCDC. This is a call to all Nigerians and residents to band together and be proactive in preventing and controlling the spread of COVID-19 in the country. Because there are no known treatments for COVID-19, it is critical to avoid infection and transmission. Travel to COVID-19 epidemic areas (mostly in China, including Wuhan, Hong Kong, and Macaw), interaction with wild animals, and eating wild animals are discouraged by the general public. Body temperature monitoring and self-surveillance for 14 days should be undertaken for persons who have traveled from an epidemic location in the previous 14 days.

To avoid unprotected exposure, it is recommended that if compatible symptoms emerge, designated transportation be used. While caring for a possible or confirmed patient, healthcare staff should put on and take off personal protective equipment properly. For high-risk procedures, stringent safeguarding mechanisms should be implemented (such as endoscopy, Ambu bagging, and endotracheal tube intubation). When unprotected healthcare workers come into contact with a patient's blood or body fluids, they should immediately flush the

area with water or soap. After that, it is important to keep track of the body temperature for at least 14 days. It is best to isolate the confirmed case (prefer a negative pressure isolation room or a single room with good ventilation). Isolation may be lifted if symptoms have been resolved for 24 hours and two negative tests have been obtained consecutively. It is necessary to bury the bodies. Steam and heat are two treatments that work well against coronavirus. Many active ingredients (AI) are susceptible to the virus, including sodium hypochlorite (0.1 percent–0.5 percent), 70% ethyl alcohol, povidone-iodine (1% iodine), chloroxylenol (0.24 %), 50% isopropanol, 0.05 % benzalkonium chloride, 1% cresol soap, or hydrogen peroxide (0.5 percent–7.0 percent), among others. Blood or body fluid spills might be cleaned up with a 1:10 dilution of 5.25 percent household bleach for 10 minutes, just like the WHO recommends for Ebola virus (RG4) disinfection HYPERLINK \l "Wor205" [34]

COVID-19 Clinical Features

The incubation period for COVID-19 is 5.2 days on average (95 percent confidence interval: 4.1–7.0). [35]Without being a carrier, the infection is severe. Fever, dry cough, and weariness are typical nonspecific symptoms. Respiratory (cough, shortness of breath, sore throat, rhinorrhea, hemoptysis, and chest discomfort), gastrointestinal (diarrhea, nausea, and vomiting), musculoskeletal (muscle ache), and neurologic (nervous system) systems may all be affected (headache or confusion). Fever (83–98%), cough (76–82%), and shortness of breath (31%–55%) are the most prevalent signs and symptoms. Fever, cough, and shortness of breath affected 15% of the population.

In the early series, no cases of conjunctival injection were reported, and occurrences under the age of 18 were uncommon. The symptoms are minor at first, and it takes a median of 7.0 days (4.0–8.0) for the patient to be admitted to the hospital. However, about 39% of patients develop shortness of breath (after 8 days), acute respiratory distress syndrome (ARDS) (after 9 days), and mechanical ventilation (after 10.5 days). 1 Patient with a deadly illness developed ARDS, which quickly progressed and eventually resulted in multiple organ failures. The death rate for hospitalized patients was 11–15 percent in the early series, but 2–3 percent in the later figures. The 2019-nCoV virus can enter the body through the lungs or mucosal surfaces (such as conjunctiva). It has not been proven that oral-fecal transfer occurs. The virus prefers human airway epithelial cells and uses the same cellular receptor as SARS, ACE2 HYPERLINK \l "Mun20" [36]. However, the disease's clinical alterations and pathophysiology in humans are not well understood. The lungs are the key organ involved in the theory. It is unclear whether the virus will reproduce in other parts of the body.

COVID-19 Pandemic and Public Health in Nigeria

Spread of COVID-19 in Nigeria

The Federal Ministry of Health certified the first COVID-19 case in Ogun State, Nigeria, on February 27, 2020, making Nigeria the third African country to recognize an imported COVID-19 case after Egypt and Algeria. The index case included an Italian citizen who flew from Milan, Italy to Lagos, Nigeria on February 24, 2020, and then took a private vehicle to his company's location in Ogun State the same day. He presented to the corporate clinic with symptoms compatible with COVID-19 on February 26, 2020, and was directed to the Infectious Disease Hospital (IDH) in Lagos on February 27, 2020, where a COVID-19 diagnosis was confirmed by real-time reverse transcription-polymerase chain reaction (RT-PCR). A total of 216 contacts were selected for 14-day follow-up in Lagos and Ogun states, including passengers on the February 24 air aircraft, with 40 of these connections being considered high-risk. COVID-19 was confirmed in an asymptomatic contact of the index case in Ogun State eleven days later.

COVID-19's epidemiology in Nigeria has changed since then, with cases reported in 35 of the country's 36 states, as well as the Federal Capital Territory (FCT) (Figure 1). Although Lagos State was the epicenter of the outbreak at first, Kano State and the Federal Capital Territory have now joined Lagos State as high-burden states, accounting for 64.5% of Nigeria's total cases at the end of May 2020. In Nigeria, 63 882 people were tested for COVID-19 between February 27 and May 31, 2020, with 10 162 (15.9%) of them being confirmed as SARS-CoV-2 infected using RT-PCR. Males appear to be disproportionately affected, with 67.7% (6,882) of confirmed cases being males. There have been 287 confirmed COVID-19 cases, with a total of 287 deaths reported.

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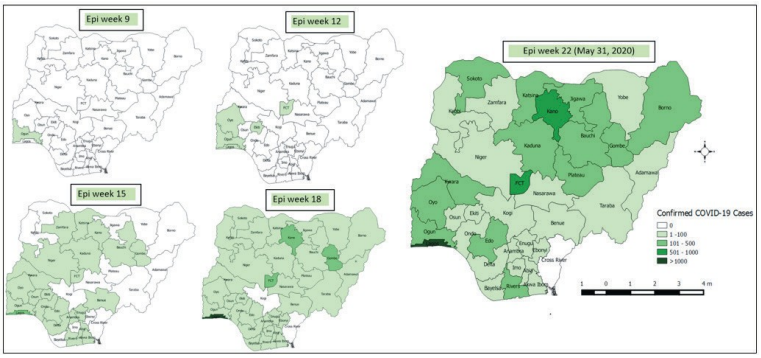

Fig 2 Trends of states reporting covid-19 cases in Nigeria from Epidemiological Weeks 9, 12, 15, 18 to 22 (May 31, 2020)

Challenges for Public Communities

As the COVID-19 occurrence lingers to put a strain on hospitals across the country, fears are increasing that many, particularly rural ones, could run out of cash. Most rural hospitals have limited financial resources and rely on high-profit services like elective surgery to stay afloat. To deal with the COVID-19 pandemic, many rural hospitals may have to stop these profitable services, which could lead to financial disaster.

Access to health care in rural communities can be harmed by the closure of rural health care facilities or the discontinuance of services. COVID-19 patients in remote locations have fewer hospitals to turn to for treatment. Rural hospitals are smaller, have a higher proportion of primary care physicians on their medical staff and a lower proportion of board-certified physicians, have fewer intensive care beds, and are less likely to have contracts with health maintenance organizations and preferred provider organizations than urban hospitals. COVID-19 is more likely to affect those who live in rural areas since they are less likely to be employed and have lower earnings than persons who live in other locations. They also confront substantial impediments to care, including provider shortages, recent hospital closures in rural areas, and long distances between providers. Local rural health-care systems are fragile; when one institution closes or a clinician leaves, it can have an impact on treatment and access in the community. Furthermore, because many specialists cluster around hospitals, when a hospital closes, access to nonhospital treatment may suffer. Rural hospitals face significant financial challenges and are more likely to close than urban hospitals. For example, in the United States, 15 of 21 hospitals have closed in 2016, and almost 90 rural hospitals have closed in the United States since 2010. Rural hospitals are also facing a financial struggle as their population declines, resulting in fewer patients to fill beds. Although the population of metropolitan counties has grown since 2000, the population of rural counties has declined by half, resulting in a decrease in revenue for rural hospitals. The majority of recent hospital closures have occurred in states that chose not to expand Medicaid under the Affordable Care Act, meaning that a large number of their healthcare costs remain unpaid, putting a financial strain on these states [37].

The challenges that rural communities face, which are aggravated by a deteriorating rural health care infrastructure, a shortage of health care providers, and the closure of rural hospitals, monitoring and control plans must be developed to ensure that the magnitude of illness and death in those communities is determined. Solutions that consider the rural nature of these communities, as well as the social determinants of health that influence health care outcomes, must be devised.

Distinct Concerns for Rural Communities

For rural areas in the southeastern United States, health care affordability is a serious concern. However, under the Affordable Care Act, several of the country's most rural areas chose not to expand Medicaid; these states account for 59 percent of the country's uninsured HYPERLINK \l "Fou17" [38]. Lack of insurance affects access to care because people without health insurance are more likely to delay seeking treatment even if they are experiencing symptoms for fear of paying costs, they cannot afford [38].

Many people in the southeast and rural states face a distance barrier in addition to a lack of good health insurance HYPERLINK \l "Rur19" [39]. Geographic isolation and related challenges, such as a lack of

transportation and extreme weather, make it more difficult for people in rural communities to travel for care than people in urban communities, and services are typically located further away. Some patients, for example, travel as far as 45 miles to receive care at Sunflower Medical Center in Ruleville, Mississippi [40]. The absence of infrastructure is not restricted to roads and highways; in rural areas, health care facilities, resources, and clinical practitioners may be lacking. Only 9% of physicians and 16% of registered nurses in the United States work in rural settings. There is also a scarcity of dentists and pharmacists in these places HYPERLINK \l "Har19" [41].

Implications for Public Health

Public health clinics play a vital role in rural and isolated locations, and they are one of the most comprehensive systems of treatment for rural residents. Community health centers now serve one in every six rural residents[42] making them an important part of the COVID-19 response plan in rural areas. Health facilities are in a unique position to respond to COVID-19 because they are present in practically every community in the United States. They can assist in making COVID-19 testing more accessible and available to the public.

Despite increasing testing and virtual visits, health centers are reporting a significant drop in inpatient visits, and many staff members are unable to work due to COVID-19-related concerns. These challenges include having to juggle work and parenting duties as a result of school closures, as well as not being able to locate suitable child care as a result of daycare closures. Another issue is that as a result of the epidemic, health centers are temporarily closed. Even though the federal government provided health care institutions with $1.98 billion in fast response grants, more funding may be required to keep services running HYPERLINK \l "Cor201" [43]). Personal safety equipment (PPE) and testing supplies are also in short supply in health care facilities. Personnel to assist with locating contacts for COVID-19–positive individuals are also required.

The CCVI is a helpful tool that may be utilized as a part of a coordinated response to identify populations that are most at risk for COVID-19, allowing resources to be strategically directed in those regions. In combination with targeted testing and contact tracing, this technique has the potential to flatten the COVID-19 curve and ensure that the most vulnerable communities have access to health care resources. It is also critical to compile a comprehensive list of people who could be infected with SARS-CoV-2. To focus and tailor control activities, a full risk assessment for the southeastern region, including geographic hotspots, must be produced. Investors that work with underserved groups should be involved in emergency response planning and enlisted to assist in reaching out to disadvantaged and marginalized communities. The CCVI data can be used to establish a coordinated, comprehensive approach to combating the epidemic that is unique to rural populations in the South. Hospitals, health care facilities, insurance providers, policymakers, community-based organizations, and faith-based organizations should all be included as stakeholders. This collaboration would be useful for disaster response planning, identifying regions of highest need, producing culturally relevant messaging, and spreading information throughout the community.

Optimistic Scenario

While Nigeria waits for the development and distribution of an effective vaccine, the best containment approach will only be able to slow the spread of the disease, not stop it. Increased testing (for early detection) and isolation centers across the country would be examples of this. This means that to reduce the number of instances, the Nigerian people must have a more active role in the process.

Policy Impartation

The COVID-19 outbreak has brought to light the necessity for the government to invest more in data collecting and preservation. It has brought to light the lack of statistics on Nigeria's socioeconomic distribution. Palliative care and relief resources for vulnerable people and households have become ineffective as a result of this. The government must carry out periodic data collection projects in collaboration with associated authorities and the business sector.

Improving data gathering and storage would aid socioeconomic growth significantly. Because the data collected is handled by multiple government agencies, aggregation of data is frequently advocated. Data centralization would help to eliminate data fragmentation and make data more easily accessible when needed. In 2001, African countries agreed to devote at least 15% of their budgets to health care; this agreement is known as the "Abuja Declaration" of 2001. According to the prior year's budget allocations, Nigeria has never been able to reach 8% health budget spending since the restoration to democratic administration in 1999. In recent years, the allocation to the industry has ranged from 4.23 percent of the total budget in 2016 to 4.16 and 3.9 percent in 2017 and 2018, respectively. The allocation to the health sector climbed to 4.1 percent of the total budget, with health

receiving 4.14 percent of the anticipated 2020 budget. More than 80% of the budget for health care is spent on the recurring expenses sector, leaving little money for capital health projects that would benefit the industry. Nigeria will need to significantly raise its health-care investment, particularly in capital goods like vaccines, hospital and primary-care center renovations, and procurement. COVID-19 is on the rise in Nigeria. A variety of medical devices, as well as disease prevention strategies, are available. The allocation of State government resources to the health sector must be monitored, and different States must be responsible for primary health care. This pandemic exposed the need for stronger incentives in the health sector, as well as the necessity to reform the welfare package for health personnel. The hazard allowance offered to them, in particular, would help to reduce the brain drain that occurs in the industry. Given that a big percentage of health personnel migrate to nations where they are paid more. Furthermore, Nigeria must prioritize the implementation of its National Health Act (NHA), which established a 1% Consolidated Revenue Fund (CRF) to provide basic health care to all Nigerians.

Conclusion

Finally, COVID-19 has emerged as a serious threat to both the general public and healthcare personnel around the world. Scientific research, on the other hand, is increasing to produce a coronavirus vaccine and treatments to combat the deadly COVID-19 virus. To regulate and minimize the rate of coronavirus infection, health education on illness prevention and control is also essential. SARS-CoV-2 replication, transmission, and pathogenesis in humans should be studied further using animal models. COVID-19 control mechanisms must be improved, and the prescribed COVID-19 protocols must be strictly followed. If the forecasted target is met, a contingency plan is required to care for the active patients.

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