



Descriptive Analysis of the COVID-19 Pandemic During the First and Second Waves in a North-Central State in Nigeria



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Abstract

Introduction: COVID-19 is a novel infection caused by severe acute respiratory syndrome coronavirus (SARS-CoV-2). This study was a descriptive analysis the epidemiology of COVID-19 during the first and second waves in Kwara State, North-Central Nigeria.

Methods: This study investigated COVID-19 cases and deaths in Kwara State between 2nd April 2020 when Kwara State recorded her index case till the 15th of September 2020 (first wave), and between 16th September 2020 till 15th March 2021 (second wave). Case definitions of COVID-19 as obtained from the Nigeria Centre for Disease Control (NCDC) was used. Data were extracted from the case notes of patients and the Surveillance Outbreak Response Management System, and on-site activities engaged in by the field investigation team were duly captured.

Results: Overall, 3015 confirmed cases of COVID-19 have been identified in Kwara State as of 15th March 2021. The median age was 38 years and ranged between 24 days to 97 years. Also, 1056 (35%) were aged 25 – 39 years, 1695 (56.2%) were males. The case fatality rate was less than 2%. A total of 1064 (35.3%) symptomatic COVID-19 cases had been identified as of the reference date, among whom 696 (65.4%) were mild, 308 (28.9%) were moderate, and 60 (5.6%) were severe/critical cases.

Conclusion: COVID-19 remains a public health problem. A scale-up of COVID-19 surveillance activities should be conducted by the Ministry of Health through active case search and regular refresher training for volunteers. In addition, active community engagement should be prioritized by stakeholders in the national COVID-19 outbreak response.

Keywords: COVID-19, Epidemiology, Pandemics, Nigeria

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Introduction

The emergence of illnesses locally and globally has required the intervention of public health experts.¹ Over the years, illnesses of the severe acute respiratory syndrome have ravaged the entire globe and have placed great demands on the overall health system.^{2,3} The outbreak of the novel coronavirus disease (COVID-19) commenced during the winter of December 2019 in Wuhan city of Northern China.² Since then, rapid transmission of the infection has been recorded across all regions. It was named a global pandemic by the World Health Organization (WHO) in accordance

with the epidemiological definition of pandemics on the 11th of March 2020.¹ Recent statistics from the WHO confirms the data of over 503 488 012 persons infected and 6,219,261 deaths due to the COVID-19 globally as of 15th April 2022.⁴

The index case of COVID-19 in Nigeria was an Italian traveler from Milan who arrived in Lagos, Nigeria on the 24th of February 2020.⁵ Laboratory confirmation of his COVID-19-positive status was done on the 27th of February 2020.^{5,6} At the beginning of the outbreak in Nigeria, the Nigeria Centre for Disease Control (NCDC) classified travelers and arrivals from COVID-19-infected areas as high-risk individuals.⁶

Within a month after the detection of the first case, a total of 139 cases and 2 deaths were recorded.⁷ The identification of community transmission of COVID-19 has necessitated community testing for the identification of infected persons.⁸ As of 15th April 2022, Nigeria had recorded 255 646 cases and 3143 deaths attributable to COVID-19.^{4,9}

COVID-19 is caused by severe acute respiratory syndrome coronavirus (SARS-CoV-2).³ With similarities to other members of the *Coronaviridae* family, COVID-19 is a respiratory tract infection characterized by inter-human transmission.³ Mediation of the COVID-19 infection is by respiratory droplets, which are composed of water and other inclusions and generated through coughing, sneezing, breathing, or talking actions.^{3,10} These respiratory droplets, circular in nature and with a circumference of ~5 microns are acted upon by the force of gravity and are transmitted within 1m during normal breathing exercise.^{3,10}

Respiratory swabs obtained from infected persons have identified other potential vehicles for the deadly infection. These have included direct contact with biological specimen such as saliva.³ Compared to other sources respiratory droplets remain the most potent driver of COVID-19 transmission. Varying degrees of infectivity have been noted, alongside the persistence of the virus on surfaces. A study found out the persistence of SARS-CoV-2 for up to 72 hours on some surfaces.¹¹ Different features have been accrued to the Coronavirus infection at different periods of the outbreak. It was previously named an air-borne infection, but recently named a droplet infection.^{3,12}

The COVID-19 infection is accompanied by a range of presentations, from mild symptoms, severe illness, deaths, and without symptoms among other persons.³ Data from existing epidemiologic and virologic studies have confirmed that highest shedding of the virus is highest in the upper respiratory tract at the onset of the illness, that is within the first 3 days of infection.^{13,14} Data from preliminary studies have reported highest infectiousness during this period. The incubation period, the time between infection and the onset of symptoms has been set on an average of 5-6 days with range between 2-14 days.¹⁵ A pooled analysis of COVID-19 cases in China estimated 5.1 days as the mean incubation period, and with 97.5% of cases presenting symptoms within 11.5 days of the onset of the infection.¹²

Reports from laboratory-confirmed cases have suggested the possible transmission of COVID-19 from asymptomatic persons.^{13,15} Presently, there seems to exist more asymptomatic persons than symptomatic cases. Increased viral loads have been noted following isolation of both symptomatic and asymptomatic persons.¹⁰ This therefore explains the possible transmission of the infectious illness from asymptomatic persons. The transition from the first to the second wave of COVID-19 in Nigeria necessitates a critical assessment of the epidemiology of the COVID-19 outbreak during these periods.¹⁶ A study in this regard would be required for adequate preparedness to forestall another surge in the COVID-19 cases and deaths in Nigeria. This study was a descriptive analysis of COVID-19 in Kwara State, North-Central Nigeria.

Methods

Outbreak Setting

Kwara State is in the North-Central geopolitical zone of Nigeria with her administrative headquarters located in Ilorin, the State capital. Kwara State is made up of 16 local government areas (LGAs), with a projected population of 3 586 485 as of December 2020.¹⁷ Kwara State is bounded by the Republic of Benin to the West, and by Niger State to the North, Kogi State to the East, and Ekiti, Osun, and Oyo States to the North.¹⁷ The index case of COVID-19 in Kwara State was reported on the 2nd of April 2020.¹⁸ We therefore investigated COVID-19 cases and deaths in Kwara State between 2nd April 2020 till the 15th of September 2020 (first wave), and between 16th September 2020 till 15th March 2021 (second wave). As of the 15th of March 2021, Kwara State ranked 11th on the NCDC COVID-19 case reports, with 3,015 confirmed COVID-19 cases and 51 COVID-19 deaths i.e., 1.87% of total COVID-19 cases and 2.5% of total COVID-19 deaths in Nigeria.¹⁹

Field Investigation

The field investigation team was made up of Rapid Response Team members in the 16 LGAs in Kwara State, Africa Centers for Disease Control and Prevention volunteers, and the NCDC officials. Planning and administration of the field investigation was done by the COVID-19 Emergency Operation Centre. To identify contacts of suspected cases of COVID-19 in each community, home visits were conducted to the homes of these individuals. Contact tracing and follow-up measures adapted from the guidelines of the NCDC were implemented by Africa Centers for Disease Control and Prevention community health workers and their supervisors who were involved in the contact tracing activities.

Contact and Case Definitions

The case definitions of COVID-19 were reviewed between the first and second waves of COVID-19. The case definitions were obtained from the NCDC during the two periods.²⁰ During the first wave, contacts were defined as individuals who have had some form of exposure to a confirmed case. Contacts could include family members, neighbors, or colleagues. Any individual who has had contact (within one meter) with a confirmed case during their period of high infectiousness was defined as a close contact. During the second wave of COVID-19 in Nigeria, however, a contact was defined as individuals who experienced one or more of the following exposures between 2 days before and 14 days sequel to the onset of symptoms in a probable or confirmed COVID-19 case. These exposures include face-to-face contact or direct contact with a probable or confirmed COVID-19 case within 1 meter and for a minimum of 15 minutes, direct care for a probable or confirmed COVID-19 case without the use of personal protective equipment.²⁰

In the first wave of the COVID-19 outbreak, a suspected case was defined as any person who presented with any of the following symptoms: fever, cough, or difficulty in breathing who within 14 days before the onset of illness had direct

or indirect exposure to SARS-CoV-2. Also, persons with a travel history to any COVID-19 high risk country (UK, USA, China, Korea, Iran, Italy) with ongoing community transmission of COVID-19, or with exposure to a facility where COVID-19 case(s) have been reported, or close contact with a confirmed case of COVID-19 were defined as suspected cases. However, in the second wave, the case definition for a suspected COVID-19 case was expanded to include patients with acute respiratory distress, characterized by cough, fever, and shortness of breath within the immediate past ten days. Individuals working or living in an area identified by the NCDC as a high prevalence region for COVID-19 were also classified as suspected cases in the absence of an alternative diagnosis.²⁰

During the first wave of COVID-19, probable COVID-19 cases were defined as suspected cases of COVID-19 for whom test results have been inconclusive. The case definition for probable COVID-19 cases was however revised during the second wave to include persons for whom positive test results were obtained on a pan-coronavirus assay, or suspected cases among whom samples were not collected before their demise.²¹

In the first wave of COVID-19, confirmed cases were defined as suspected cases for whom laboratory confirmation of the presence of SARS-CoV-2 had been achieved using the Rapid Test - Polymerase Chain Reaction. This definition was expanded during the second wave to include persons with laboratory confirmation of SARS-CoV-2, with or without the manifestation of signs and symptoms.²⁰

Contact Tracing

We obtained and followed up contacts of COVID-19 cases according to the case definition in the first and second waves of COVID-19 using the contact listing form. The contact listing form included sociodemographic characteristics such as age, sex, number of contacts, and household characteristics and clinical characteristics of contacts.

Surveillance Activities

We engaged in surveillance activities such as community-based case search, and active case search in health facilities. In the health care facilities, we extracted data of COVID-19 positive cases from health records. Records of healthcare workers who have had a history of illness or gone on unexplained absenteeism were examined. Active case search was conducted to identify symptomatic cases of COVID-19. The community-based active case search on the other hand was to provide an excellent opportunity through which high-risk contacts could get tested for COVID-19. Compared to the first wave, the surveillance activities were intensified upon during the second wave of the COVID-19 outbreak. The engagement of more Africa Centers for Disease Prevention and Control community health workers during the second wave increased the effectiveness of surveillance activities.

Rumor Management

Four lines were made available to the public for call in if there was anyone with symptoms and signs of COVID-19

in the community. The call center had volunteers who take calls and messages. Calls are received by volunteers at the call center from the public, responses were made based on the COVID-19 management algorithm and action were taken as appropriate. The calls were screened for symptoms of COVID-19 and travel history to high-risk countries or states. People with symptoms and signs of COVID-19 and those with travel history were scaled up to the surveillance and laboratory pillars.

Points of Entry

The port health officers were supported by scientific officers from the Ministry of Health to conduct screening of travelers at the airport and land borders using infrared thermometers as well as provision of hand washing points and sanitizers at the airport and land borders. These passengers include returnees that travelled in from countries that share border with Nigeria e.g., Republic of Benin. Other travelers from different parts of Nigeria were also screened as they travelled through Kwara State. The port health officers were charged with the responsibility of screening travelers on arrival at the airport or international land borders using the infrared thermometers. Individuals with fever were immediately advised to go on isolation.

The team also established a Port Sanitary Group (a network of various stakeholders) comprising Nigeria Immigration, Nigeria Customs Service, Nigeria Quarantine Service, and the Department of State Service to curb the influx of returnees through the international land borders. Vehicles with many passengers onboard from Northern Nigeria also gained significant attention. These passengers could be immigrants from neighboring countries such as Niger and Chad that share the Northern border with Nigeria, a high index of suspicion at international land borders was of dire necessity.

Isolation and Treatment Centers

During the first and second waves of COVID-19 in Kwara State, COVID-19 positive persons were managed at the Infectious Disease Hospital (Sobi Specialist Hospital), Alagbado area, Ilorin. The facility provided 24-hour care with clinical staff including Doctors, Nurses and ancillary staffs trained on COVID-19 case Management. The facility operated with laboratory support from Lagos State University Teaching Hospital, the Virology laboratory of Redeemer's University, Ede, Osun State, and the Virology laboratory of the University College Hospital, Ibadan, Oyo State during the first and second waves of COVID-19.

Data Analysis

Data were extracted from the case notes of patients and the Surveillance Outbreak Response Management System.²⁰ Data analysis was conducted using SPSS version 25.0. A line-list of COVID-19 cases was created, and this consisted of data on the date of sample collection, age, sex, type of exposure, and symptoms. The outcome of the cases was used to generate an epidemic curve for Kwara State.

Results

The sociodemographic characteristics of the 3,015 confirmed COVID-19 cases in Kwara State are as shown in Table 1. The median age was 38 years and ranged between 24 days to 97 years. Among them, 1056 (35%) were aged 25 – 39 years, 1,695 (56.2%) were males, and 1175 (34%) were from Ilorin South LGA (Figure 1). Also, 2668 (88.5%) recoveries had been recorded in Kwara State as of the 15th of March 2021. The COVID-19 case fatality rate (CFR) of Kwara State was less than 2% as of the reference date.

Epidemiology of Index Case

The index case was a 45-year-old British-Nigerian who returned from England on 18th March 2020. Kwara State Government confirmed the first case of COVID-19 in Offa LGA, Kwara State on 2nd April 2020. He was successfully treated at the Infectious Diseases Hospital, Alagbado, Ilorin and discharged by the State team 12 days. The Emergency Operation Centre (EOC) was immediately escalated to response mode (Level 3) after a second risk assessment that put the state at extreme (very high) risk. The Kwara State EOC was activated for COVID-19 on the 6th of March at alert mode after a preliminary risk assessment that put the State at high risk. COVID-19 surveillance, risk communication and testing were intensified.

Outcome of Identification of Cases and Contact Tracing

Table 1. Proportion of Confirmed Cases of COVID-19 in Kwara State, North Central Nigeria as of 15th March 2021

Socio-demographic Characteristics	Frequency	%
Age group (y)		
< 25	552	18.3
25-39	1056	35.0
40-54	692	23.0
55-69	476	15.8
70+	239	7.9
Gender		
Male	1695	56.2
Female	1320	43.8
Death distribution of COVID-19 patients by health facilities (n = 51)		
University of Ilorin Teaching Hospital	12	23.5
COVID-19 treatment centre	19	37.3
General hospital	10	19.6
Home	1	2.0
Other health facilities	9	17.7
Classification of COVID-19 cases		
Cases with no epidemiological linkage	2463	81.7
Cases from contacts	357	11.8
Cases with travel history	195	6.5
COVID-19 infection outcome		
Active Cases	296	9.8
Recoveries	2668	88.5
Deaths	51	1.7

In Kwara State, 3,015 cases have been confirmed positive from the laboratory as at the time of this report, 1967 (65.2%) were asymptomatic while 1048 (34.8%) were symptomatic. 689 (65.7%) of the symptomatic had mild symptoms, 299 (28.5%) had moderate symptoms, 57 (5.4%) had severe symptoms while 3 (0.3%) cases were critical. Also, 2668 (88.5%) of the confirmed cases had been treated and discharged, 292 (9.7%) cases are active and 55 (1.8%) deaths had been recorded as at the time of this report. Furthermore, 3505 contacts were identified with the confirmed cases and followed up. Likewise, 3178 (90.7%) contacts completed 14 days follow up, 357 (10.2%) contacts tested positive, 10 (0.3%) contacts were lost to follow up and 141 (4.0%) contacts were still being followed up as the time of this report.

Rumor Management

A total of 73 944 signals were investigated; 67 289 (91%) were resolved and 6654 (9%) were escalated to the surveillance team for follow up. During the second wave of COVID-19 in Kwara State, a total of 1552 calls were received; 86% were resolved, and 14% were escalated to the surveillance team for follow up.

Clinical Management of Cases

A total of 1064 symptomatic COVID-19 cases were identified as of 15th March 2021. Among them, 696 (65.4%) were mild, 308 (28.9%) were moderate, and 60 (5.6%) were severe/critical cases.

Epi-curve and Transmission Chain

The epidemic curve (Figure 2) shows a propagation in the COVID-19 cases in Kwara State, Nigeria (Figure 2). The median incubation period of COVID-19 was 12 days and serial interval for the first and second SARS-CoV-2 infection was 4 days.

Discussion

This study was a descriptive epidemiological study of COVID-19 characterized by time, place, and persons between 2nd April 2020 and 15th March, 2021 in Kwara State, Nigeria. Findings from this study revealed a higher prevalence of COVID-19 cases among males compared to females. Evidence from literature has examined the associated between sex-based immunological differences and variations in susceptibility to infectious diseases.^{21,22} Also, findings have been obtained from similar studies in Nigeria and West Africa where SARS-CoV-2 was found to have infected more men than women.^{22,23} In addition, more males were found to be infected by Middle East Respiratory Syndrome (MERS) and other SARS illnesses than females.^{24,25} Although protection could be offered by sex chromosomes to a reasonable extent, Canadian research on influenza viruses explain that women are at an increased risk for developing autoimmune diseases, but less susceptible to infectious diseases than men. Therefore, COVID-19 awareness campaigns should be promoted via media platforms such as radio and television jingles which are more frequently among men.

obtained from COVID-19 studies conducted in China which found a mixture of propagated and common source outbreak in local settings. Our findings are however like reports on epidemiological pattern of COVID-19 in Lagos, the epicenter for COVID-19 in Nigeria, where a propagated pattern of the COVID-19 outbreak was confirmed.^{29,30} Our findings therefore validate the person-to-person transmission of COVID-19. To break the chain of COVID-19 transmission, herd immunity was proposed during the first wave of the COVID-19 outbreak.³¹ The second wave of COVID-19 ushered the development and introduction of COVID-19 vaccines.³²⁻³⁴ The commencement of the administration of the AstraZeneca vaccine in Kwara state and other parts of Nigeria restored the hope of complete conquest of the COVID-19 outbreak in Nigeria.³²

Other activities engaged during the management of the COVID-19 outbreak in Kwara State, Nigeria included infection prevention and control measures at the COVID-19 treatment center. In addition, the decontamination of the offices and homes of COVID-19 positive cases, and the public health laboratory were conducted on a regular basis. Likewise, laboratory tests have been scaled up during the second wave of COVID-19 in Kwara State compared to the first wave. For instance, more than 400 samples were collected weekly, and a reduction in the result-turnaround time was recorded. More samples were collected during the second wave, thus overwhelming of the GeneXpert laboratory and delayed the release of results in many instances. To address this gap, there is a need for the establishment of a molecular laboratory was established in Kwara State.

Study Limitations

This study described the epidemiology of COVID-19 in only Kwara State, Nigeria, and so the results may not be generalizable for the entire country. This study included only the first and second waves of the COVID-19 pandemic, thus, data for other periods of the COVID-19 pandemic in the state have not been included.

Conclusion

To the best of our knowledge, this study is the first to report the epidemiological characteristics of the COVID-19 pandemic during the first and second waves in Kwara State, and in Nigeria as a whole. The use of public data available on the SORMAS could have masked some reports which could have been included in this study. Regardless, this study provides generalizability for the epidemiological characteristics of COVID-19 in Nigeria. Onward, it is required that regular refresher trainings are organized for all members of the COVID-19 outbreak response team, and continuous follow-up and monitoring of all line-listed contacts are organized. In addition, community sensitization and community engagement should be promoted for the prompt detection of COVID-19 cases, and to improve the uptake of the COVID-19 vaccine.

Research Highlights

What Is Already Known?

- At the beginning of the outbreak in Nigeria, the Nigeria Centre for Disease Control (NCDC) classified travelers and arrivals from COVID-19-infected areas as high-risk individuals
- Data from existing epidemiologic and virologic studies have confirmed that highest shedding of the SARS-CoV-2 virus is highest in the upper respiratory tract at the onset of the illness, that is within the first 3 days of infection

What Does This Study Add?

- The COVID-19 CFR in Kwara State was found to be less than 2% of the COVID-19 cases in Nigeria
- The epidemic curve showed a propagated pattern in the COVID-19 outbreak in Kwara State, similar to the pattern recorded in Nigeria
- Laboratory tests have been scaled up during the second wave of COVID-19 in Kwara State compared to the first wave. Because more samples are being collected during the second wave, overwhelming of the Gene Xpert laboratory and laboratory staff delays the release of results in many instances.

Authors' Contributions

OSI and AAA conceptualized the study. OEF, ODA, OSI, FO, MTO, IAA, IGB, ANM, JY, DMA, HAL, KSA, and SAO participated in data collection. OSI and AAA conducted data analysis and wrote the first draft of the manuscript. OEF, ODA, OSI, and AAA revised the manuscript for critical intellectual content. All authors approved the final version of the manuscript.

Conflict of Interest Disclosures

The authors have no conflicts of interest to declare.

Ethical Approval

Prior to the collection of patients' data on SORMAS, informed consent was obtained from adult patients, while both assent and consent were obtained from minors (those with ages below 18 years) as appropriate and their parent/guardian respectively. Ethical approval for this study was obtained from the Kwara State Research Ethics Committee with reference number: MOH/KS/3241/1/107.

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