EPIDEMIOLOGIC FEATURES OF COVID-19 PANDEMIC IN A TERTIARY HOSPITAL IN NORTH-WEST NIGERIA

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ABSTRACT

The COVID-19 pandemic remains a serious public health threat. Characterizing disease outbreaks is vital for immediate response and future planning. Hence, the study aims to described epidemiological features of the COVID-19 (SARS-CoV-2) in a tertiary hospital in North-West Nigeria. Secondary data analysis was carried out on Ahmadu Bello University Teaching Hospital (ABUTH) surveillance data of May 2020 to March 2021 for COVID-19 infection which was extracted from ABUTH COVID-19 surveillance register into Microsoft Excel® 2013, then analyzed using IBM SPSS version 23. Categorical variables were summarized using frequencies and percentages, and quantitative variables using means and standard deviation. A total of 2,249 samples were collected for SARS-CoV-2 RT-PCR test in the study period. Only 1,987 (88.4%) test results were returned, with a positivity rate of 20.8% (414). The mean age was 34.7 ± 17.1 years. Male to Female ratio was 1:0.9. Ages 20-39 years accounted for almost half 205 (49.5%) of the positive cases. One-fifth 186 (21.7%) of healthcare workers tested were positive for SARS-CoV-2. Over half 1,093 (55.0%) of all clients tested were from Sabon Gari LGA. Persons aged 20-39 years and healthcare workers, especially doctors and nurses, were most infected by COVID-19. Strict measures of infection prevention and control as well as risk communication should be enhanced and especially among the most at-risk population.

Keywords: COVID-19, Epidemiologic, Healthcare workers, North-west, Tertiary.
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INTRODUCTION

The world continues to be confronted by different infectious disease threats of varying severity [1]. The most recent is the Coronavirus Disease 2019 (COVID-19) pandemic [2], a severe acute respiratory disease caused by SARS-CoV-2. Due to its obvious threat to international health, it was declared a Public Health Emergency of International Concern (PHEIC) on 30th of January 2020 and a pandemic on 11th March 2020 following its spread to all World Health Organization (WHO) regions [3]. As a result of the pandemic in Nigeria, most of the States and institutions put in place various mechanisms to respond to the threat, each mounting varying responses [4].

In Nigeria, there was a rapid transition to community transmission following introduction of the disease in the country [4]. Testing for SARS-CoV-2 has been very low in the country and Africa as a whole. As at 27th April 2022, Nigeria had conducted 5,075,820 (out of which 3,743,237 were Polymerase Chain reaction (PCR) tests for a projected population of about 206 million [5, 6]. This is way too low and may not be adequate to unravel the true prevalence of COVID-19 infection in Nigeria.

As with other large outbreaks of infectious diseases, the COVID-19 pandemic can stop and even reverse significant social and economic progress [1, 2]. In Nigeria, the lockdowns had serious negative effects on the livelihood of individuals and families [4]. Several interventions were adopted to address the pandemic, this ranged from non-pharmaceutical to pharmaceutical and of note are the lockdowns, travel restrictions, development of vaccines and test kits [7, 8]. Despite the measures put in place so far and the strides in development of vaccines and therapeutics, COVID-19 remains a serious public health threat with the continued evolution of the virus into more transmissible and sometimes more virulent variants which are responsible for large surges of cases often referred to as waves [9]. So far, there have been four waves in the pandemic with a particular new virus variant being responsible for each wave [10].

A health system that will become resilient to future health threats learns from its own experiences and improves on them [11]. The need to learn, apply knowledge gained and to plan future response is critical, as the world has seen an increase in the occurrence of large-scale public health threats [1, 2]. In the past, the application of certain principles of public health such as hand washing, had helped in addressing the issues of puerperal sepsis in the 18th century, a time when it had not yet been established that microorganisms were the cause of infectious diseases. This followed observation

of certain patterns in a hospital by Ignaz Semmelweis [12]. In a similar way, learning to apply basic principles will suffice when we have emerging threats like COVID-19 which require prompt public health response to prevent the health economic and social consequences.

Characterizing disease outbreaks is vital for immediate response, documentation and for planning future responses [13]. The characterization of the diseases in terms of who, where, and when will help determine at-risk groups, identify gaps to surveillance activities, facilitate the understanding of transmission dynamics, guide the implementation of preventive measures and design of health education interventions [14]. In addition, it will help to properly channel limited health resources while maximizing efficiency in the health system.

Hence, the study described the epidemiological features of COVID-19 in Ahmadu Bello University Teaching Hospital (ABUTH), Shika-Zaria.

METHODS AND MATERIALS

Study area

This study was conducted in ABUTH, at the COVID-19 isolation and treatment center which also served as the testing center for the hospital. ABUTH is a tertiary hospital that serves as a referral center for clients from all over the federation to its various specialty clinics [15]. It has staff strength of more than 3000, a bed capacity of about 500 and a total patient admission turnover of more than 10,000 annually. The hospital has 18 clinical and eight non-clinical departments. It also has an isolation center for COVID-19 response activities.

The COVID-19 isolation and treatment center in ABUTH is managed by the epidemic response team (ERT) which coordinates the response to COVID-19. The center is a standalone building in the peripheral area of the hospital which has a separate area for testing suspected COVID-19 cases. Following the onset of the pandemic, the ERT which was already addressing the outbreak of Lassa fever, in April 2020 was adapted to meet the peculiar needs of the COVID-19 pandemic with several pillars and additional volunteers from various relevant departments of the hospital joining the team. The ERT had three response pillars; Case management, Surveillance, and Infection Prevention and Control. The surveillance pillar was responsible for coordinating surveillance activities for COVID-19 within and outside the immediate surroundings of the facility covering most parts of Sabon Gari, Zaria, and Giwa Local Government Areas (LGAs). Both active surveillance via case identification and contact tracing and passive surveillance via self-reporting were adopted in getting clients tested for SARS-CoV-2 infection.

Study design, period and population

Secondary data analysis was carried out on ABUTH surveillance data for COVID-19 infection covering a period of May 2020 to March 2021. Clients were categorized into the following suspected case, contact, follow-up and requested. These test categories were assigned at the instance the client was tested. A suspected case was defined as any person with acute respiratory illness (fever and either cough, difficulty breathing or shortness of breath) OR new respiratory symptoms without fever with no other explanation AND a history of travel to or residence in a country reporting COVID-19 within 14 days prior to symptom onset. Also, a patient with acute respiratory illness with no other explanation was regarded as a suspected case.

Over time, the definition of a suspected case of COVID-19 evolved to include individuals with loss of sense of smell and/or taste and requirement for travel later became unnecessary as the country transitioned to a phase of community transmission. A contact was defined as a person who experienced any one of the following exposures: direct physical contact with a confirmed case; direct care for a patient confirmed of COVID-19 disease without using adequate personal protective equipment; OR Other situations as indicated by local risk assessments 2 days before and the 14 days after the onset of symptoms for symptomatic cases or 2 days before and the 14 days after the date on which the sample was taken. Follow up category included those for whom a follow-up test was required before discharge at the initial stage of the COVID-19 pandemic response, while requested refers to those who were tested on self-request and as a requirement for travel.

Each individual who got tested had demographic and epidemiologic characteristics documented. Sample collection, packaging and transportation was conducted as follows: at least one nasal (or nasopharyngeal) swab, and one oropharyngeal swab using synthetic fiber swabs with plastic shafts were collected aseptically. Collected specimens were triple-packaged and transported via viral transport media, under suitable temperature conditions (2–4 °C) to a NCDC-approved laboratory. All the samples for the study period were tested by Reverse Transcriptase-Polymerase chain reaction (RT-PCR) method for the laboratory diagnosis of COVID-19. All sample collection and processes were performed by trained health workers.

Study instrument and data collection methods

Data was extracted from ABUTH COVID-19 surveillance register into a Microsoft Excel® 2013 sheet. Information extracted included age, sex, occupation, test result, test category, and LGA of residence.

Statistical analysis

Data was analyzed with IBM ® SPSS version 23. The findings were presented in frequencies and percentages for categorical variables, and means and standard deviations (or median and interquartile range for skewed data) for quantitative variables; some using tables and charts. In the epidemiologic curve, the first epidemiological week was defined as the week ending on the first Saturday of January 2020; subsequent weeks began on Sunday and ended on Saturday. The current study covered weeks 19 to 52 of 2020, and weeks 1 to 11 of 2021. Within the study period we had two waves according to the NCDC with the first wave in weeks 9 - 43 of 2020 and second wave in week 44 of 2020 - week 13 of 2021 [16]. Positivity rate was given as a proportion of those who tested positive out of all those tested within a defined period. An epidemiological wave was defined as "the time from the start of a spike (first week with increasing numbers of cases) to the end of a spike (week with dip reflecting a reduction of cases before the next rise)" this definition was adapted from another study [16].

Ethical considerations

Ethical approval to carry out the study was obtained from the Health Research Ethics Committee (HREC) of Ahmadu Bello University Teaching Hospital Shika-Zaria (ABUTHZ/HREC/W35/2021). Data was stored in a database secured in a password-protected computer and virtually accessible only to the researchers.

RESULTS

During the period under review, 2,249 samples were collected for SARS-CoV-2 RT-PCR testing, out of which 1,987 (88.4%) test results returned. Of the test results returned, 414 (20.8%) were positive. The epidemic curve showed a bimodal distribution of cases with the second wave peaking faster and larger than the first (Figure 1).

All age groups were affected by COVID -19. The mean age of clients that presented for testing was 34.7 ± 17.1 years. Male to Female Ratio (M:F) was approximately 1:0.9. Ages 20-39 years accounted for 205 (49.5%) of all positive cases with the mean age of positive cases being 37.5±16.8. A large number 858 (43.2) of clients tested were HCWs. Also, close to half 186 (44.9%) of all clients who tested positive for SARS-CoV-2 were health care workers. Over half 1,093 (55.0%) of all clients tested were from Sabon Gari LGA (Table 1). Majority, 1,085 (54.6%) of persons that presented for testing were contacts of positive persons. However, the proportion of positive cases among contacts (17.2%) was lower when compared to that among suspects (27.8%) (Table 2). Almost all cadres of healthcare workers (HCWs) were affected except for community health workers and the dental professionals. Doctors and nurses accounted for 667 (77.7%) of HCWs tested and accounted for 149 (80.1%) of infections among the HCWs (Table 3). Up to 39 (23.6%) of the hospital patients tested during the study period were positive. However, only 3 (11.1%) of the caregivers were positive (Table 4).

DISCUSSION

During the period under review, Nigeria was already in the stage of community transmission of COVID-19 [4]. The positivity rate among clients tested for COVID-19 in ABUTH was 20.8%, this was about 3 times positivity rate of 9.2% for the entire period from 1st May 2020 to 29th March 2021 for Nigeria [17]. Findings from testing centers in Lagos, Nigeria showed a lower positivity rate of 14.6% at an earlier time during the pandemic (February 2020 - April 2020) [18]. The high positivity rate in this study may be due to the ongoing community transmission during the period and the fact that the facility was the main center testing for COVID-19 within the region at that time.

The cases showed a bimodal distribution with the two peaks being in June and July 2020 (52 cases) and December 2020 (122 cases), giving two waves. Also, the second wave showed a rapid increase in the number of cases that were symptomatic compared with the first wave. These findings correlate with the first and second wave of the COVID-19 pandemic at the State and national levels and in many parts of Africa [19]. The first wave followed the pattern of a propagated epidemic as seen in several infectious diseases with person to person transmission. However, reasons for the second wave could be a decreased adherence to non-pharmacological measures mainly due to pandemic fatigue and economic necessity [20]. Also new variants of COVID-19 which were more transmissible had emerged [21].

All ages were affected by COVID -19. People aged 25-39 years were most affected and this is in line with national figures where age group 20 – 44 years was most affected [19]. The mean age of positive cases in this study was lower when compared to findings from another study at a testing center in Lagos [18], where the mean age of the positive cases was 42.2 ±15.9 years, though slightly higher than the 34.6 ± 11.0 years reported in Benin [22]. Females had a higher positivity rate which is contrary to the findings in other studies where males had a significantly higher positivity rate [18, 23]. Over half of the clients tested were residents of Sabon Gari LGA, the immediate catchment area of the hospital. Some clients came from other LGAs within the State and from other States in the country. The concentration of clients from the catchment area of the facility will also guide the implementation of public health control measures.

Close to half of clients who tested positive for SARS-CoV-2 were HCWs. A national study in Nigeria comparing the first and second waves of COVID-19 revealed that HCWs constituted 7.51% and 2.89% of all cases during the first wave and second wave respectively [16]. This is lower than the finding in this study. The difference may be due to the representativeness of the national study in Nigeria quoted previously, while this study reflected the findings of a single center, where about half of clients tested were HCWs.

Among the HCWs, doctors and nurses accounted for 80.1% of infections, this is higher than the finding in a facility based study in south-south Nigeria in 2020 where doctors and nurses constituted 57.7% of cases among HCWs [22]. This may be due to the fact that disproportionately higher number of core clinical staff were being tested compared to the other cadre of HCWs and also low rate of reporting among the other staff cadres. Due to their close interactions with patients, cases of COVID-19 among HCWs especially doctors and nurses is a very serious issue as this may result in health care associated infections, decreased workforce and enhanced community transmission as HCWs can serve as super spreaders when they leave the hospital and go to their homes [22]. Hence the need to implement strategies that will protect them using available means so that the system can withstand the effect of the pandemic [24].

Majority of clients tested were contacts of positive cases, who were identified either via contact tracing or who presented themselves for testing. Almost one-fifth of these contacts were positive for COVID-19. The test positivity rate among contacts in this study was lower when compared to a cross-sectional facility based studies in Mexico where there was a higher test positivity rate of 42% among contacts of COVID-19 cases [25]. This may mean that being a contact of a COVID-19 case comes with significant risk of being infected. Hence efforts made at searching for cases will help identify infected persons in health facilities and communities.

About a quarter of the hospital patients tested during the study period were found to be positive for SARS-CoV-2. However, very few of the caregivers were positive. Hence, ensuring proper control of infections among patients and relatives will contribute greatly in the overall control of spread of COVID-19 especially in and around the hospital [26].

Some limitations encountered during this study include incomplete information as a result of incomplete documentation which were mainly due to limited capacity of the COVID-19 response team in ABUTH at the initial phase of the pandemic as a result of which we had to use other data sources like original result sheets from the laboratory to verify and fill in missing details. However, despite the limitations this is the first study of its kind in this center, hence it will provide insight into dynamics of the COVID-19 outbreak in ABUTH and environs.

CONCLUSION

The second wave was larger and peaked faster than the first. Persons aged 20 - 39 years and healthcare workers, especially doctors and nurses, were most infected by COVID-19. With most of the cases among residents of Sabon Gari LGA. The positivity rate was high among contacts of COVID-19 cases. The ERT should ensure strict measures of infection prevention and control as well as risk communication should be enhanced and directed to the most at-risk population which includes persons aged 20 – 39 years and HCWs. Further studies should be conducted to understand the drivers of COVID-19 infection among the risk groups identified in this study.

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Table 1: Socio-demographic characteristics of clients tested for SARS-CoV-2 at ABUTH, Shika-Zaria testing site from May 2020 to March 2021*

Variable	Test result	
	Negative f (%)	Positive f (%)
Age group (years)		
< 10	144(87.3)	21(12.7)
10 – 19	108(83.1)	22(16.9)
20 – 29	352(78.4)	97(21.6)
30 – 39	466(81.2)	108(18.8)
40 – 49	219(76.3)	68(23.7)
50 – 59	176(73)	65(27)
≥60	108(76.6)	33(23.4)
Sex		
Female	749(77.9)	212(22.1)
Male	824(80.3)	202(19.7)
Occupation		
Health Care Worker	672(78.3)	186(21.7)
Non-Health Care Worker	901(79.8)	228(20.2)
LGA of residence		
Giwa	264(80.7)	63(19.3)
Sabon Gari	859(78.6)	234(21.4)
Zaria	323(79.0)	86(21.0)
Other LGAs in the State	95(78.5)	26(21.5)
LGAs outside Kaduna State	32(86.5)	5(13.5)

Mean age was 34.7±17.1 years
*The testing site was located at the ABUTH isolation and treatment center

Table 2: Test category of clients tested for SARS-CoV-2 at ABUTH isolation and treatment center from May 2020 to March 2021 (n=1,987)

Test category*	Test result	
	Negative f (%)	Positive f (%)
Suspect	421(72.2)	162(27.8)
Contact	898(82.8)	187(17.2)
Follow Up	26(63.4)	15(36.6)
Requested	228(82.0)	50(18.0)

*These test categories were assigned at the instance the client was tested. Follow up test was required before discharge of patients at the initial stage of the COVID-19 pandemic response. Requested test included mainly travellers and others who were tested on self-request

Table 3: Distribution of COVID-19 cases among health care workers at ABUTH, Shika-Zaria from May 2020 to March 2021. (n=858)

	Test result	
Cadre	**Negative f (%)**	**Positive f (%)**
Doctors	316(76.5)	97(23.5)
Nurses/Midwives	202(79.5)	52(20.5)
Pharmacy Professional	24(77.4)	7(22.6)
Laboratory	21(95.5)	1(4.5)
Administrative	24(70.6)	10(29.4)
Medical Records	3(100.0)	0(0.0)
Clinical Support*	53(85.5)	9(14.5)
Community Health Worker	5(100.0)	-
Non-Clinical Support	3(42.9)	4(57.1)
Optometrist/Optician	9(69.2)	4(30.8)
Physiotherapist	5(83.3)	1(16.7)
Psychologist	0(0.0)	1(100.0)
Dental Professional	7(100.0)	-

* Health assistants, the few cleaners and a Laboratory assistant

** Medical engineering /works/equipment maintenance officers, Security staff logistic staff such as drivers.

Table 4: COVID-19 test results among ABUTH patients and their caregivers during the study period, May 2020 to March 2021.

	Test result	
	Negative f (%)	**Positive f (%)**
Patient	126(76.4)	39(23.6)
Caregiver	24(88.9)	3(11.1)

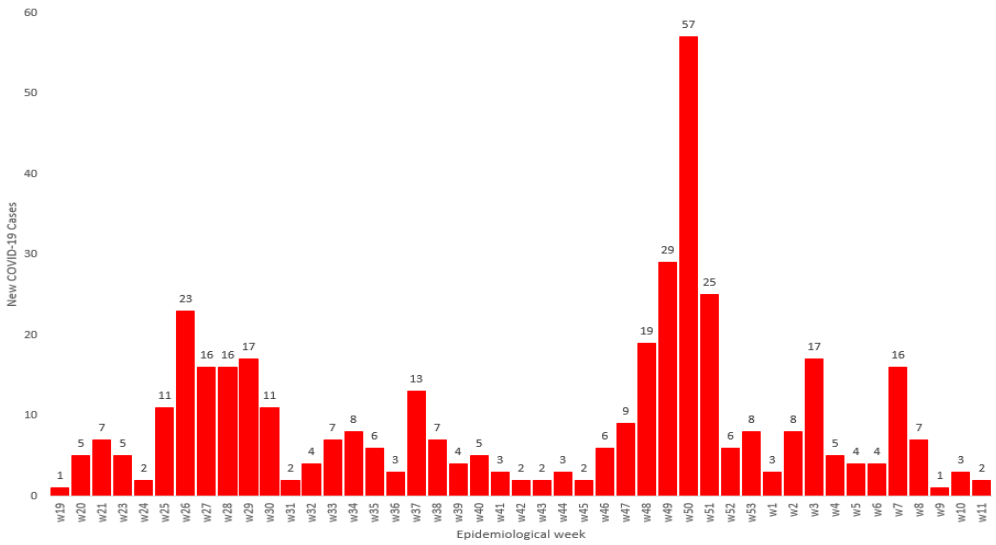

Figure 1: Epidemic curve showing the number of weekly new cases amongst clients tested for SARS-CoV-2 at ABUTH isolation and treatment center from May 2020 to March 2021