Exposure Risk and Clinical Characteristics of COVID-19 Patient Admitted into 3 Tertiary Hospitals in Northeastern Nigeria

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Abstract

Objectives: This study is aimed at determining the pattern of acquiring and clinical features of COVID-19 among patients admitted at the isolation centers tertiary hospitals in Nigeria. All patients who were confirmed COVID positive from February 2020 till January 2021 were considered for this study. All patients were tested using the RT-PCR. COVID-19 was confirmed by detecting SARS-CoV-2 RNA in throat swab samples. A total of 319 patients that met the criteria were used for this study, data on pattern of acquiring and mode of infection, clinical presentation and RT-PCR was obtained from the patient's record.

Results: Of thee 319 patients there were more patients within 16-30 and 31 to 45 age bracket 90 (28%) and 79 (24.8) respectively,

History of recent travels within the last 14 days before diagnoses amongst cases was the highest identifiable risk factor among the study population 169 (46.9), this was followed by contact with undiagnosed symptomatic patients 81 (22.5%), History of contact with COVID-19 patients was also a significant risk amongst the study group 43 (11.9), a visit to crowded places like market and religious gathering (church/mosque) also carried a significant risk among the study group 30 (8.3%) and28 (7.8%) respectively, there was less risk associated with participation /or attending burial rite among the study group.

Fever 81(19.9%), cough 77(18.9%) and sore throat 40 (9.8%) were among the commonest presenting symptoms, other symptoms of Sneezing, sputum, rhinorrhea, diarrhoea, Anosmia, vomiting and ageusia were also seen at varying frequencies. There were 22% of cases with co-morbidity, the most common among which were Hypertension 43 (60.6%), diabetes 16(22.5%), chronic kidney disease 4 (5.6%), heart failure 3 (4.2%), Ischemic heart disease 2 (2.8%) and chronic diseases 3 (4.2%). Within 3 weeks of isolation 86.2% of patient had negative RT-PCR repeat test and 96% (306) had there symptoms resolved and a negative repeat RT-PCR at the end of the 6 weeks isolation period. There were 4.1% (13) mortality (p = 0.000).

Conclusion: History of recent travels within 14 days during outbreak of COVID-19, contact with asymptomatic COVID-19 patients were associated with increased risk of acquiring COVID-19.

Fever, cough and sore throat were among the commonest presenting symptoms, other symptoms of Sneezing, sputum, rhinorrhea, diarrhoea, Anosmia, vomiting and ageusia were also seen at varying frequencies.

***Keywords:** Exposure, Risk, clinical features, COVID-19*

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Introduction

Since the outbreak of the corona virus disease (SAR COV 2) in Wuhan city in the Hubei province in China. in 31st December 2019, [1] A novel corona virus was eventually identified and the genetic sequencing of corona virus infectious disease (COVID-19) was made public by 12th January 2020[1,2]. Though infection is thought to have occurred much earlier [3,4].

The COVID-19 pandemic, also known as the corona virus pandemic, is an ongoing pandemic of COVID19 caused by severe acute respiratory syndrome corona virus 2 (SARSCoV2) [4].

The animal reservoir of the virus has not yet been identified, but genomics of COVID-19 is so similar to bat coronavirus (98%), reinforcing the presumption that the virus was transmitted by an animal in the shopping center in Wuhan. With regard to genomic similarity, the virus differs from its predecessors, namely SARS (79%) and Middle East respiratory syndrome (MERS) (50%). As indicated by genetic data, CVOID-19 pathogen is classified as a member of the beta-coronavirus genus, and can bind to the angiotensin-converting enzyme 2 receptor in humans [5,6].

SARS-CoV-2 showed high genome sequence identities (87.6%–87.8%) to SARSr-Rp-BatCoV-ZXC21/ZC45, detected in *Rhinolophus pusillus* bats from Zhoushan). A closer-related strain, SARSr-Ra-BatCoV-RaTG13 (96.1% genome identity with SARS-CoV-2), was recently reported in *Rhinolophus affinis* bats captured in Pu'er. Subsequently, Pangolin-SARSr-CoV/P4L/Guangxi/2017 and Pangolin-SARSr-CoV/Guangdong/1/2019 (85.3% and 89.7% genome identities, respectively, to SARS-CoV-2) were also detected in smuggled pangolins captured in Nanning, China, during 2017) and Guangzhou, China, during 2019 [7,8].

As of 12 November 2021, more than 258 million cases of COVID-19 have been reported in over 222 countries and territories, resulting in more than 5million deaths. More than 232 million people have recovered [9].

Over the past few decades, a large number of people have been affected with the 3 epidemics caused by corona virus family (SARS-2003, MERS-2012, and COVID-2019) in the world. Nevertheless, there is substantial genetic dissimilarity between pathogens of the three previous epidemics, in particular MERS with COVID-19. In the previous epidemics, initial hotspots of diseases were Middle East, Saudi Arabia (MERS) and China and animal to human, and then human to human transmissions of pathogens were reported in other countries [9,10].

There have been a few studies done especially on the African continent which looked into the mode of acquiring and clinical characteristics among hospitalized/ isolated COVID-19 patients, this study sort to bridge that knowledge gap.

Human migration and war has been the hall mark of almost all the previous epidemics. [10] The current SARS CoV2 epidemic has also resulted from human migration since its early identification in Wuhan china, today almost all countries of the world has been affected by this virus [9].

Exposure risk, transmission and incubation period

Right from the identification of SARS CoV 2 infection among humans there has been a lot of controversies regarding its actual mode of transmission and our knowledge of its transmissibility has been dynamic and it continue to evolve as we gain more understanding of its behavior among humans. Human to human transmission via either respiratory droplets or close contacts was initially proposed as the main routes of transmission of the pathogen based on experience gained in the previous two epidemics caused by corona viruses (MERS-CoV and SARS-CoV). [10] Based on world Health Organization (WHO) report, 2019-nCoV is a unique virus that causes respiratory disease, which spreads via oral and nasal droplets. The pathogen of COVID-19 can float in the air in the form of aerosols and cause infection in

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healthy people. [11] some studies among COVID-19 patient shows increase level of viral load during early stage of the disease which decreases dramatically over time as the patient's condition improves [12,13].

SARS CoV2 has been found to be a highly contagious virus, however a lot of scientific models with clear and acceptable assumptions have been used to ascertain the infectivity index of this virus, which is termed as basic reproduction number (R_0). This is the expected number of cases directly infected by one contagious case in a susceptible population. [13] For viral pathogens in MERS and SARS epidemics, the index value was approximated to be 2, indicating that each infected person could infect two people on average in an effective contact. However, for COVID-19, the calculated value in a study was slightly higher and the index value based on data calculated in Wuhan, China was 2.2 (95% CI, 1.4 to 3.9). [13] There are still limited data on the conclusive evidence of fecal-oral transmission. However COVID-19 RNA has been isolated in the fecal specimens of about 10% of confirmed COVID-19 cases who presented with gastrointestinal symptoms [14]. It has been established than human to human infection is the main driving force of the spread of SARS CoV2, therefore migration, contact with undiagnosed host, social activities and dynamics has further propelled the spread of the COVID-19 that has resulted in this global pandemic [13].

Symptoms of COVID-19 can be relatively non-specific and infected people may present in diverse ways, some may be asymptomatic but yet transmitting infection seen in about 44%. Fever (88%) and initial dry cough (68%) are the two most common symptoms. Less common symptoms include fatigue, respiratory sputum production (phlegm), anosmia, ageusia, shortness of breath, muscle and joint pain, sore throat, headache, chills, vomiting, coughing out blood, and diarrhea. [1] One out of every five patient will experience difficulty in breathing and some will have severe form of disease requiring emergency medical treatment and or oxygen therapy, these is characterized by difficulty breathing, persistent chest pain or pressure, sudden confusion, difficulty walking, and bluish face or lips. Further progression of the disease process could lead to potentially fatal complications including pneumonia, acute respiratory distress syndrome, sepsis, septic shock, and kidney failure [1].

Diagnoses

Pathogen of COVID-19 has been detected in upper and lower respiratory tracts in initial assessments. Moreover, viral RNA has been detected in fecal and blood samples in later studies. According to WHO guideline, laboratory diagnosis of COVID-19 is based on a positive RT-PCR test. Target gene for diagnosis may differ in various countries. Accordingly, target genes for screening and confirmatory assays by Real time RT-PCR are ORF1ab and N in Chinese laboratory protocol, while RdRP, E and N are checked in Germany. Furthermore, three targets in N gene are considered in the US protocol. [14] computerized tomography (CT) scan is also a diagnostic tool of significance in COVID -19 as this will indicate the pathological damage associated with COVID-19 and disease progression, the sensitivity of CT scan when compared with RT-PCR which is the gold standard was appropriate [14] CT scan with RT-PCR as a gold standard, sensitivity of CT scan was appropriate [14]. However, the large number of hospitalized cases due to false positive results by CT scan may increase the risk of transmission to healthy people. On the other hand, RT-PCR test may be subject to some limitations [14,15].

Study objective

- To look at possible risk exposure and pattern of transmission among COVID-19 patient

- To determine the clinical features associated with exposure to COVID-19

- To determine the demographic pattern of COVID-19 among patients

- To determine the possible outcome associated with COVID-19 in our settings.

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Methodology

The study is a case control study in which all patients with positive RT-PCR were admitted into isolation centers at ATBU Teaching Hospital, Bauchi, Federal Medical Center Azare, Bauchi and Federal medical center Yola in Adamawa state.

A COVID-19 case report form was designed to document primary data regarding demographic characteristics, risk of exposure which include history of recent travels, contact with confirmed or suspected cases, attending gathering and social activities in the last 14 days. similarly clinical, laboratory, co-morbidity characteristics of the patients were captured.

All patients were tested using the RT-PCR, this was confirmed by detecting SARS-CoV-2 RNA in throat swab samples using a virus nucleic acid detection kit according to the manufacturer's protocol (BioGerm Medical Biotechnology Co., Ltd.) which targets RdRp, E and N genes. In monitored patient a detection of one gene was considered positive. All patients were admitted and isolated for treatment within 1 week from onset of symptoms.

All case files of COVID -19 patients were used for this study, Patient case files without confirmatory result by RT-PCR were excluded from this study.

All follow up RT-PCR results of patients admitted into the isolation centers were obtained after 14 days of admission and a second repeat test separated by 3-7days from the last test were also obtained. Patients were declared negative if repeat RT-PCR of 1st and 2nd test were found negative in the presence of resolution of symptoms of fever, cough and dyspnoea.

Sample size

All patients who were confirmed COVID positive from February 2020 till January 2021 were considered for this study. A total of 319 patient's data was extracted from case file into our preformed questionnaire and was inputted to excel spread sheet before exporting into SPSS version 27.0 on a secured PC for analysis.

Results

Results are presented as the risk of exposure and pattern of clinical characteristic of patients with COVID-19. Frequency of occurrence of symptoms is shown as rates, difference in the rate among age groups and co-morbid patients is shown with 95% C.I. along with P-values from Fisher's exact test. Continuous variables like age, sex, weight is presented as means.

Ethical approval

This was obtained from the ethical committee of the different facilities in which this study was conducted.

Data management

Data collected from the patient folder was entered into the proforma, then into excel spread sheet, coded and exported into the SPSS software for analysis with a secured pass word.

Analysis of results

Demography of the study group

There were 319 patients who met the inclusion criteria for this study, there were more patients among the 16-30yr 90 (28%) and 31 to 45yr 79 (24.8) respectively, patient greater than 60years were among the third highest 64 (20.1%) among the study group. There were

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less number of cases among those between 1-15 age group 23 (7.2%). There were more males 229 (71.8%) than females 90 (28.2%) among the study group. similarly cases were seen more among Senior secondary school and First primary leaving certificate (SSCE/FPSLC) holders representing 169 (59.8%) and National Diploma/National Certificate on Education (ND/NCE) holder 86 (27%), there were fewer cases among graduates with degree/ HND 74 (23.2%). More than half of the study population were un employed 176 (55.2%) compared to civil servants 107 (35.5%), there were less cases among students 36 (11.3). see table 1 and figure 1 above.

Variables		Frequencies	%
Age	1-15	23	7.2
	16-30	90	28.2
	31-45	79	24.8
	46-60	63	19.7
	>60	64	20.1
	Total	**319**	**100**
Gender	Male	229	71.8
	Female	90	28.2
	Total	**319**	**100.0**
Edu. Qual	Degree/HND	74	23.2
	ND/NCE	86	27
	SSCE/FSLS	159	49.8
	Total	**319**	**100.0**
Occupation	Civil servants	107	35.5
	Un employed	176	55.2
	Students	36	11.3
	Total	**319**	**100.0**

Table 1: *Bio data analysis.*
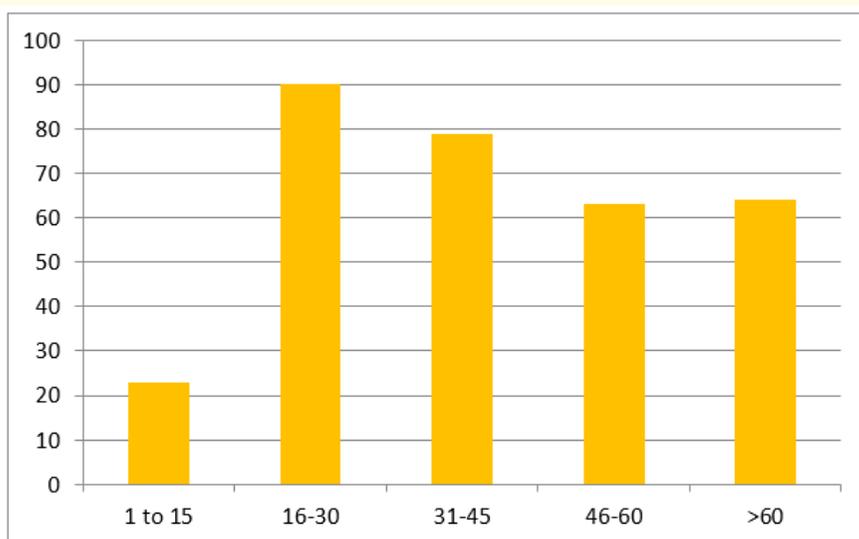
Figure 1: *Age Categories of COVID-19 Patients.*

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Exposure history among cases

History of recent travels within the last 14 days before diagnoses amongst cases was the highest identifiable risk factor among the study population 169 (46.9), this was followed by contact with undiagnosed symptomatic patients 81 (22.5%), History of contact with COVID-19 patients was also a significant risk amongst the study group 43 (11.9), a visit to crowded places like market and religious gathering (church/mosque) also carried a significant risk among the study group 30 (8.3%) and 28 (7.8%) respectively, there was less risk associated with participation /or attending burial rite among the study group. See table 2.

History	Frequencies	Percentage
Travels Within The Past 14 Days	169	46.9
Contact With Known Covid-19 Patient In Past 14 Days	43	11.9
Contact With A Person With Persistent Cough & Fever	81	22.5
Visit To A Crowded Market In Past 14 Days	30	8.3
Attended Mosque/Church Prayer In Past 14 Days	28	7.8
Attended/Participated In Burial Ceremony In Past 14 Days	9	2.5
Total	**360**	**100.0**

Table 2*: Exposure History of COVID-19 Patients.*

Pattern of symptoms among cases

The symptomatology pattern amongst the study group showed that fever was seen more frequent 81 (19.9%), this was followed by cough and sore throat 77(18.9%) and 40 (9.8%) respectively. Sneezing, sputum, rhinorrhea, diarrhoea, Anosmia, vomiting and ageusia were also seen at varying frequencies 27 (6.6), 27 (6.6), 20 (4.9), 19 (4.7), 16 (3.9%), 14 (3.4%), 9 (2.2%) respectively. With exception of headache there were fewer CNS symptoms amongst the study population with coma, seizure, cranial nerve palsy/ cerebella signs and convulsions occurring at 6%, 4%, 4% and 3% respectively See table 3.

Clinical presentation	Frequencies	%
Fever	81	19.1
Cough	77	18.9
Sore throat	40	9.8
Headache	35	8.6
Sneezing	27	6.6
Sputum	27	6.6
Rhinorrhea	20	4.9
Diarrhoea	19	4.7
Anosmia	16	3.9
Limb weakness	15	3.7
Vomiting	14	3.4
Myalgia	10	2.5
Ageusia	9	2.2
Coma	6	1.5
Seizure	4	1.0
Cranial nervepalsy/cerebellar sign	4	1.0
Convulsions	3	0.7
Total	**407**	**100.0**

Table 3: *Clinical Presenting Symptoms displayed by COVID-19 Patients.*

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Treatment outcome among COVID-19 patients

Out of the 319 patient review about 96% (306) of them had there symptoms resolved and negative repeat RT-PCR at the end of the 6 weeks isolation period, there were however 4.1% (13) mortality among the study group *p=0.000*, the mortality rate was 4/100 patients.

Outcome	Frequencies	Percentage	mortality rate
Died	13	4.1	4/100 patients
			P=0.000
Cured	306	95.9	
Total	319	100.0	

***Table 4:** Treatment outcome among COVID-19 cases.*

Discussion

The novel respiratory virus SARS-CoV-2, which causes COVID-19, has caused global pandemic and has infected more than 258 million people globally with over 5 million related death as at November 2021, about 91% of the infected persons have recovered fully or with some form of disabilities [9]. In the United States alone it has affected over 48 million people with over 793 thousand deaths as of November 2021 [9]. Nigeria with an estimated over 200 million population has over 213 thousand persons infected with COVID-19 ranking 91st globally as at November 2021, with almost 3 thousand deaths recorded so far [9].

There were 319 patients who met the inclusion criteria for this study, there were more patients among the 16-30 and 31 to 45 age bracket 90 (28%) and 79 (24.8) respectively, patient greater than 60years were among the third highest 64 (20.1%) among the study group, there were less number of cases among those between 1-15 age group 23 (7.2%). There were more males 229 (71.8%) than females 90 (28.2%) among the study group, though most studies have shown equal distribution of COVID-19 among both male and females, however some studies have shown male preponderance among infected individuals with additional greater cases of severe form of disease and mortality [16]. One biological theory centers on the genetic differences between men and women, particularly with regard to the immune system. The X chromosome is known to contain the largest number of immune-related genes in the whole genome [16,17]. With their XX chromosome, women have a double copy of key immune genes compared to the single copy in XY men. This can boost extents to both the general reaction to infection (the innate response) and also to the more specific response to microbes including antibody formation (adaptive immunity) [18].

History of recent travels within the last 14 days before diagnoses amongst cases was the highest identifiable risk factor among the study population 169 (46.9), this was followed by contact with undiagnosed symptomatic patients 81 (22.5%), History of contact with COVID-19 patients was also a significant risk amongst the study group 43 (11.9), a visit to crowded places like market and religious gathering (church/mosque) also carried a significant risk among the study group 30 (8.3%) and28 (7.8%) respectively, there was less risk associated with participation /or attending burial rite among the study group [1,6,7].

The average range of the incubation time from exposure to symptoms is reported to be between 2–14 days [18]. We determined the proportion and time to negative conversion after COVID-19 infection, as determine by negative RT-PCR test.

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The overall median days to conversion was found to be greater between the first and the second weeks of isolation in the facilities, this is similar to other studies conducted elsewhere [19].

The pattern of symptoms amongst the study group showed that fever was seen more frequent 81(19.9%), cough and sore throat were also common among these patient 77(18.9%) and 40 (9.8%) respectively. Sneezing, sputum, rhinorrhea, diarrhoea, Anosmia, vomiting and ageusia were also seen at varying frequencies 27 (6.6), 27 (6.6), 20 (4.9), 19 (4.7), 16 (3.9%), 14 (3.4%), 9 (2.2%) respectively. With exception of headache there were fewer CNS symptoms amongst the study population with coma, seizure, cranial nerve palsy/ cerebella signs and convulsions occurring at 6%, 4%, 4% and 3% respectively similar pattern has also been observed in most countries globally [34,35,36]. Hypertension 43 (60.6%), diabetes 16 (22.5%), chronic kidney disease 4 (5.6%), heart failure 3(4.2%). Ischemic heart disease 2 (2.8%) and other chronic diseases constitute 3 (4.2%) Mortality was seen among 13(4.1%) in this study group p = 0.001, the mortality rate was 4/100 patients.

Conclusion

In conclusion COVID-19 is a global pandemic whose negative impact on the global stage has continued since it first identification in Wuhan, Hubei province in China in November 2019. This study has looked into risk of acquiring COVID-19 and their clinical characteristics. History of recent travels within the last 14days before diagnosis was found to be an important factor for acquiring infection. Fever, cough, sore throat and headache are the most frequent symptoms presented by patients among others. There is a median 2 weeks period of negative conversion among infected patient, mortality was seen in about 4.3% among the studied patients.

Acknowledgements

Conflict of Interest

The author(s) hereby declare that, there are potential conflicts of interest with respect to this research, authorship, and publication of this article.

Funding

Availability of Data and Materials

The data sets collated and analyzed during this study will be are available from the corresponding author on request.

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