

Patterns of Presentation and Clinical Criteria of COVID-19 Patients in Federal Medical Centre, Asaba, Nigeria

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Introduction

In recent times, there has been increased incidence of emerging and reemerging diseases which have posed a serious public health challenge in various regions of the world. The last two decades played host to a number of viral epidemics such as Severe Acute Respiratory Syndrome (SARS) in 2002-2003, the H1N1 Influenza (Bird flu) in 2009, Ebola in 2014-2016 and more recently, Lassa fever in 2018¹ and the current COVID-19 pandemic.^{2,3}

An epidemic of lower respiratory tract infections first classified as “pneumonia of unknown etiology” was detected in Wuhan, Hubei province in China and first reported to the World Health Organisation (WHO) Country Office in China in December, 2019. Following extensive investigation, the causative agent was attributed to a novel virus of the coronavirus family and experts of the International Committee on Taxonomy of Viruses (ICTV) named it Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).^{1,2}

The disease caused by this virus was later announced as coronavirus disease 2019 (COVID 19) by WHO on the 11th of February, 2020. Despite its emergence from East Asia, COVID-19 has

quickly spread worldwide attaining pandemic status and declared as such on the 11th of March, 2020. Currently, over twenty-five million people have been infected with more than 800,000 deaths globally.³ Most of this exponential rise in cases is attributed to community transmission of the disease facilitated by human to human spread compounded with the possibility of transmission by asymptomatic carriers.^{4,5} Disease presentation can be typical and atypical. Typical presentation of disease refers to the traditional signs and symptoms associated with diagnosing a disease condition. When these signs and symptoms deviate from the norm, atypical presentation of disease occurs.⁶ So far, the spectrum of this viral illness and patterns of its presentation range from asymptomatic infection, mild upper respiratory tract illness, severe pneumonia with respiratory failure (necessitating ventilators) to death.^{7,8} Typically, it was reported that patients with COVID-19 present with fever, cough and difficulty in breathing but with more cases reported worldwide and concurrent research being carried out, varying patterns of presentation have emerged.

Studies done in China amongst patients with the disease indicate fever as the most common symptom followed by cough, dyspnea, myalgia, headache and diarrhoea. Rhinorrhea and sore throat were only noted in a few patients.^{5,7} It was also reported in China that amongst adult patients, hypertension and cardiovascular disease were the most common underlying factors/diseases associated with fatality followed by Diabetes Mellitus.^{5,7,9} Also, a study concluded in New York found that the most common comorbidities were hypertension, obesity and diabetes which corroborates that done in China.^{7,10}

In Europe, olfactory and gustatory dysfunctions have been reported especially as patients with COVID-19 exhibited these symptoms without rhinorrhea or nasal obstruction.⁴ Severe cases of the disease in China were shown to evolve into Acute Respiratory Distress Syndrome (ARDS),

arrhythmia and septic shock while on admission.¹¹ Worthy of note is the fact that out of 5,700 patients involved in the New York study, only 1734 (30%) of them were febrile which differs from what was reported in China with 88- 94% of confirmed cases presenting with fever in various studies.^{7,9,10} There have also been reports of young COVID-19 patients in their thirties and forties having massive strokes without prior history of chronic conditions that may predispose to cerebrovascular accident.¹²

The first case of COVID-19 in Nigeria was confirmed on 27th February, 2020 and since then the country has recorded over 54,000 cases with slightly over 1000 deaths and a case fatality rate of 1.9% as at 30th of August, 2020.¹³ The Nigeria Center for Disease Control (NCDC) has continuously refined the case definitions for COVID-19 as more and more data has come to light therefore the clinical criteria for inclusion as a case has also undergone several modifications. The most recent case definitions are **Suspected Case** which is defined as any person (including severely ill patients) presenting with fever, cough or difficulty in breathing AND who within 14 days before the onset of illness had any of the following exposures: **1.** History of travel to and more than 24 hours transit through any high risk country with widespread community transmission of SARS-CoV-2 OR **2.** Close contact with a confirmed case of COVID-19 OR **3.** Exposure to a healthcare facility where COVID-19 cases(s) have been reported. **Probable Case** was defined as any suspected case **1.** Whose test result for COVID-19 is indeterminate OR **2.** whose test result is positive on a pan-coronavirus assay OR **3.** Where samples were not collected before the demise of a suspect case and **Confirmed Case** was defined as any person with laboratory confirmation of SARS-CoV-2 infection with or without signs and symptoms.¹⁴

The aim of this study is to report the patterns of presentation and clinical criteria of COVID-19 patients in Federal Medical Centre, Asaba. Studies so far published on patterns and clinical

criteria of COVID-19 patients have not extensively assessed those from Federal Medical Centre, Asaba in particular and Nigeria in general. We therefore believe that the outcome of this study will add to the growing body of knowledge of COVID-19 infection and assist clinicians in prompt identification of patients presenting with the disease.

METHODOLOGY

Study Area

Delta State has a population of about 4.1 million (as projected from the 2006 census). It is a predominantly oil and agricultural producing state located in the South-South region of the country. The capital city is Asaba which plays host to the Federal Medical Centre in the state, a foremost tertiary institution in the country. It has a 300 bedded capacity and provides tertiary health care services to patients within Delta and contiguous States. It has a Centre for Communicable Diseases' Control and Research (CCDCR) which runs the Isolation ward, with twelve (12) en-suite rooms consisting of ten (10) treatment rooms and two (2) holding rooms. It is run by a team of medical doctors from all specialties. Pharmacists, laboratory scientists, nurses, hygienists, environmental officers and biomedical engineers are among other health care providers engaged in the Centre. The Centre is purpose-built and provides services to infectious/communicable diseases patients while complying with the Nigeria Centre for Communicable Disease and Control (NCDC) guidelines and international best practices on the control and management of communicable diseases including COVID-19 infection.

Study Design

This is a cross-sectional retrospective study design

Study Population

All confirmed cases of COVID-19 managed in the Center for Communicable Diseases Control and Research in Federal Medical Center, Asaba from April, 2020-July, 2020 were included.

Inclusion Criteria:

1. All confirmed cases whose first contact was in Federal Medical Centre, Asaba, admitted and treated in the CCDCR isolation ward between April-July, 2020.
2. Those who consented for the study and for respondents <18 years, assent was obtained from their parents or guardians.

Exclusion Criteria:

1. Transferred in patients from another Centre.
2. Those who did not consent for the study

Sample size and Sampling Method

All patients eligible for the study within the specified period were recruited.

Data Management

Methods of Data Collection

Two research assistants were trained on data collection from the case notes and data entry for a week. These are resident doctors that were part of the COVID-19 management team of the Centre from inception of the pandemic.

Data for the study was collected from the selected eligible patient's case notes with review of clinical clerking, presenting complaints, history taking, examination, charts, treatment and nursing records. These were categorised into sections; Section A being socio-demographics of the respondents and duration of admission, Section B had questions on patterns of presentations which were modified and adapted from recent studies on COVID-19 and Section C had questions on clinical criteria of COVID-19 patients. Information retrieved include epidemiologic history, current and past medical history, symptoms, signs, laboratory confirmation, treatment measures and complications. All data was vetted by two physicians and interpretation was compared.

Data Analysis

The various patients' case notes was screened for completeness by the researchers and assistants, data and information was sought as specified above. These were then coded, entered and analyzed using the SPSS version 20.0 software. Qualitative data such as, educational status and marital status were presented as diagrams and percentages while continuous variables that are normal in distribution (such as age) were expressed as means $\pm$ standard deviation. Discrete data was expressed as proportions.

Ethical Considerations

Institutional Consent

Ethical clearance to conduct this research was obtained from the Federal Medical Centre, Asaba, Ethics and Research Committee and the Head of Department, Department of Public Health, Federal Medical Centre, Asaba, Delta State. Permission was also sought from the Director of the Centre of Communicable Disease Control and Research, Federal Medical Centre, Asaba.

All data was kept secure and made available to only members of the research team.

RESULTS

The first 50 patients in the Federal Medical Centre, Asaba treatment Centre for COVID-19 were the respondents in this study, giving a response rate of 100%. The findings and results are presented below in line with the study specific objectives.

Table 1: Socio-demographic characteristics of respondents

Variables	Frequency (n=50)	Percent
Age groups		
Age (years)		
1 – 19	3	6.0
20 – 49	26	52.0
50 – 79	21	42.0
Mean age of respondents	44.7 ± 17.3 years	
Sex		
Male	24	48.0
Female	26	52.0
Marital status of respondents		
Single	12	24.0
Married	33	66.0
Widowed	5	10.0

Religion of respondents		
Christianity	50	100.0
Islam	0	0.0
Level of Education		
None	1	2.0
Primary	2	4.0
Secondary	6	12.0
Tertiary	41	82.0
Social class		
Skilled	29	58.0
Semi-skilled	6	12.0
Unskilled	5	10.0
Retired	8	16.0
Ethnicity		
Igbo	19	38.0
Delta Ibo	11	22.0
Yoruba	1	2.0
Urhobo	13	26.0
Isoko	4	8.0
Esan	1	2.0
Itsekiri	2	4.0

A greater proportion 26 (52.0%) of the respondents were in the age group of 20-49 years, majority 33 (66.0%) were married and all the participants were Christians. Over 80.0% of the respondents had tertiary level of education, above half 29 (58.0%) were skilled workers with over 1/3rd 19 (38.0%) of the respondents of Igbo ethnicity respectively.

Table 2: Respondents Possible Source of Covid19 infection

Possible Source of infection	Frequency (n=50)	Percent
Close Contact with a confirmed Covid19 Case	33	66.0
Been to health facility where covid19 is managed	19	38.0
Been to health facility where covid19 is being managed and close contact of a confirmed covid19 case	03	6.0

Majority 33 (66.0%) of respondents had close contact with a confirmed case of COVID-19 infection, 19 (38.0%) had been to a health facility where COVID-19 infection was being managed and 3 (6.0%) had been in close contact with a confirmed COVID-19 case and in a health facility where COVID-19 infection was being managed.

Table 3: Presence of Symptom/Symptoms among respondents

Symptoms Present	Frequency (n=50)	Percent
Yes	38	76.0
No	12	24.0
Total	50	100.0

Well over 2/3rd 38 (76.0%) of the respondents presented with symptoms and 12 (24.0%) were asymptomatic.

Table 4: Presenting Signs and Symptoms of respondents

Symptom/Symptoms	Frequency (n=50)	Percent
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Fever	29	58.0
Cough	18	36.0
Headache	14	28.0
Sore throat	4	8.0
Body pains	8	16.0
Runny nose/catarrh	2	4.0
Breathing Difficulty	14	28.0
Loss of appetite	13	26.0
Loss of smell	13	26.0
Loss of taste	13	26.0
Malaise	19	38.0
Limb weakness	2	4.0
Frequent stooling	10	20.0
Vomiting	5	10.0
Respiratory distress	7	14.0
Convulsion	0	0.0

The most common presenting symptoms were fever 29(58.0%), followed by cough 18(36.0%), malaise 19(38.0%), difficulty breathing 14(28.0%) and headache 14(28.0%). Others are loss of appetite 13(26.0%), loss of smell 13(26.0%) and loss of taste 13(26.0%).

Table 5: Clinical Presentation of respondents

Clinical Presentation	Frequency (n=50)	Percent
Mild/Moderate	43	86.0
Severe	5	10.0

Critical	2	4.0
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Majority 43(86.0%) of the respondents had mild to moderate clinical presentation, 5(10.0%) were severe and 2(4.0%) were in critical condition as at time of presentation.

Table 6: Treatment uptake and outcome of respondents

Symptom/Symptoms	Frequency (n=50)	Percent
Antihypertensive medication	14	28.0
Oral Hypoglycaemic medication	03	06.0
Oxygenation	05	10.0
Blood transfusion	2	4.0
Intubation	1	2.0
Anticonvulsant	2	4.0
Dexamethasone	1	2.0
Recovered	48	96.0
Death	02	4.0

Fourteen (28.0%) of the respondents had hypertension and received antihypertensive medications, 3(6.0%) had Diabetes Mellitus and received Oral Hypoglycaemic medications, one person (2.0%) was intubated and given dexamethasone, oxygen was administered to 5(10.0%) of them and 48 (96.0%) recovered with 2 (4.0%) deaths.

DISCUSSION

Though a greater proportion of the respondents were in the age group of 20-49 years with mean of 44.7 ± 17.3 years, this was not surprising as the COVID-19 infection has been documented to affect all age groups. This finding could be attributed to the fact that more able-bodied adults are in this age bracket, these are the workforce that must go out to work daily and in so doing could get infected with SARS-CoV-2 virus. Though this was at variance with findings from other studies, where the mean age of respondents was 55 years and above^{7,8}. The variance in these findings could possibly be due to the kind of demographic population curve/transition in the countries where these studies were carried out, of having a younger population or an aging population, giving room for either more deaths among the younger or older/dependent age group.

There were three children with COVID-19 in this study, with age ranging from 1-12 years old. They were all close contacts of a confirmed case of COVID-19 in the family which was in keeping with findings from studies in Katsina, Nigeria where all five paediatric cases were in close contact with a family member with confirmed COVID-19 infection. They also had mild clinical presentation of the disease which corroborates what was reported in the largest paediatric

COVID-19 biospecimen repository in Massachusetts where it was found that children could have high levels of the virus in their upper airways and yet display relatively mild or no symptoms^{15, 16}

There was an almost equal proportion of male to female patients' ratio, as female were slightly more than male patients, a finding which is consistent with a multicenter European study⁴ but inconsistent with reports from several studies conducted in China that showed a male preponderance of the disease.^{5,7,8,9,17} The Nigerian Center for Disease Control (NCDC) also reported that males are twice more likely to contract COVID-19 than females¹⁸. This finding may be attributed to better health seeking behaviour of females, as there has been several documentation of better health seeking behaviour among women.^{19,20} Another possibly contributory factor to this slightly higher number of women in this study in addition to better health seeking behaviour could be educational level as over eighty percent of the respondents had higher level of education. Education has also been found and documented to be a significant influencer of health seeking behaviour.²⁰ Better health seeking behaviour will not only result in reduced morbidity and mortality but will also lead to reduced financial burden and better quality of life.

All the respondents were Christians and greater proportion of Igbo ethnicity, this could be attributed to the study being carried out in the South-South region of the Country, where the treatment centre is located given that a greater proportion of people in the South-South are of the Christian faith.²¹ In addition to the above, majority of our respondents had tertiary level of education and were skilled workers, which ultimately would result in better health care.

The most common possible source of infection in this study was being in close contact with a confirmed COVID-19 case, followed by attending a health facility where COVID-19 infection is

being managed. This corroborates the conclusion of person to person transmission as has been earlier documented.¹¹ We could say a possible contributory fact to the above was that at the start of the COVID-19 infection in Nigeria, there was this high conviction of COVID-19 infection being a hoax and not real. This, compounded with the poor or non-existent practice of infection prevention and control measures created a gap for more people to be infected unknowingly by being in close contact with already infected confirmed and unconfirmed COVID-19 cases. This finding was in-tandem with findings from other parts of the world where infection prevention and control measures were not properly implemented early enough.^{22,23} This belief by many that the disease is a hoax or propaganda has inadvertently led to non-acceptance of death from the disease by relatives of the dead making it very difficult and traumatizing for all concerned.

Regarding the pattern of presentation of the patients, over 2/3rd of the respondents presented symptomatic and among the clinical symptoms were fever 29(58.0%), malaise 19(38.0%), cough 18(36.0%), headache and breathing difficulty were 14(28%) respectively. These were in tandem with the clinical criteria of COVID-19 as published by World Health Organization (WHO) and NCDC respectively.^{13, 24} Others were loss of appetite, loss of smell and loss of taste with 13(26.0%) each respectively, which lends credence to reports of olfactory and gustatory dysfunctions as part of the clinical presentation of COVID-19 infection, especially in mild to moderate cases.⁴ This presentation of over 2/3rd of the respondents being symptomatic is in keeping with the fact that the study was a facility based study conducted in a COVID-19 treatment Centre and as such catered for sick people.

Of these symptomatic respondents, majority were of mild to moderate presentation with just over eighty percent, while about 10% and 4% were of severe and critical presentations, requiring not only hospitalization for treatment of symptoms but in addition, oxygen support and advanced

intensive care like intubation. This finding of over eighty percent of the respondents presenting clinically as mild to moderate cases was in keeping with findings from other conducted studies and also in line with the Nigeria Centre for Disease Control and Prevention (NCDC) and World Health Organization (WHO) guidelines on COVID-19 management.^{13,24} Also, part of what may have contributed to the low rate of critical and severe clinical presentations in this study could be the younger age group and the relatively low associated comorbidities among the patients as only about (three) 3(6.0%) of the fifty (50) patients had Diabetes Mellitus. Associated comorbidities, especially Diabetes Mellitus and Hypertension in addition to older age has been documented to negatively affect outcome and prognosis of the disease.^{25,26}

A meta-analysis conducted by Morgan Spencer Gold et al revealed increased prevalence of diabetes among fatal cases as a result of innate immunity being compromised amongst these group of patients.²⁵ while another by Sanyaolu A et al reported increased severity of COVID-19 in patients with type 2 Diabetes Mellitus and an all-round increased mortality rate with poor glycaemic control.²⁶

In conclusion, over 80.0% of the study respondents presented as mild to moderate cases of COVID-19 infection with a greater proportion contracting the infection as a result of being in close contact with a confirmed case. There is therefore urgent need for implementation and proper monitoring of infection prevention and control measures for not only the reduction of COVID-19 infection but also for the sake of sustainability in order to contain future emerging and reemerging infectious diseases in our Country.

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References

1. Cascella M, Rajnik M, Cuomo A, Dulebohn SC, Di Napoli R. Features, Evaluation and Treatment Coronavirus (COVID-19) [Updated 2020 Apr 6]. StatPearls [Internet]. StatPearls Publishing; 2020 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK554776/> Accessed 22/06/2020
2. Zu ZY, Jiang MD, Xu PP, Chen W, Ni QQ, Lu GM, Zhang LJ. Coronavirus Disease 2019 (COVID-19): A Perspective from China. Radiology 2020. Volume 296:2. E15-E25. <https://doi.org/10.1148/radiol.2020200490>
3. Rolling Updates on Coronavirus Disease (COVID 19) <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/events-as-they-happen>
4. Lechien JR, Chiesa-Estomba CM, De Siati DR, Horoi M, Le Bon SD, Rodriguez A, Dequanter D, Blecic S, El Afia F, Distinguin L, Chekkoury-Idrissi Y, Hans S, Delgado IL, Calvo-Henriquez C, Lavigne P, Falanga C, Barillari MR, Cammaroto G, Khalife M, Leich P, Souchay C, Rossi C, Journe F, Hsieh J, Edjlali M, Carlier R, Ris L, Lovato A, De Filippis C, Coppee F, Fakhry N, Ayad T, Saussez S. Olfactory and gustatory dysfunctions as a clinical presentation of mild-to-moderate forms of the coronavirus

- disease (COVID-19): a multicenter European study. *Eur Arch Otorhinolaryngol*. 2020; Apr 6:1–11. doi: 10.1007/s00405-020-05965-1. Epub ahead of print. PMCID: PMC713455
5. Lai CC, Shih TP, Ko WC, Tang HJ, Hsueh PR. Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and coronavirus disease-2019, (COVID-19): The epidemic and the challenges. 2020; *International journal of antimicrobial agents*, 55(3), 105924. <https://doi.org/10.1016/j.ijantimicag.2020.105924>
 6. "Disease Presentation." Encyclopedia of Aging. Retrieved April 28, 2020 from Encyclopedia.com: <https://www.encyclopedia.com/education/encyclopedias-almanacs-transcripts-and-maps/disease-presentation>.
 7. Fei Zhou, Ting Yu, Ronghui Du, Guohui Fan, Ying Liu, Zhibo Liu, Jie Xiang, Yeming Wang, Bin Song, Xiaoying Gu, Lulu Guan, Yuan Wei, Hui Li, Xudong Wu, Jiuyang Xu, Shengjin Tu, Yi Zhang, Hua Chen, Bin Cao. Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study. *The Lancet*, Volume 395, Issue 10229, 2020; Pp 1054-1062,ISSN 0140-6736,[https://doi.org/10.1016/S0140-6736\(20\)30566-3](https://doi.org/10.1016/S0140-6736(20)30566-3).
<http://www.sciencedirect.com/science/article/pii/S0140673620305663>
 8. Nanshan Chen, Min Zhou, Xuan Dong, Jieming Qu, Fengyun Gong, Yang Han, Yang Qiu, Jingli Wang, Ying Liu, Yuan Wei, Jia'an Xia, Ting Yu, Xinxin Zhang, Li Zhang. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. *The Lancet*, Volume 395, Issue 10223,2020,Pages 507-513,ISSN 0140-6736,[https://doi.org/10.1016/S0140-6736\(20\)30211-7](https://doi.org/10.1016/S0140-6736(20)30211-7).

<http://www.sciencedirect.com/science/article/pii/S0140673620302117>

9. Lai CC, Liu YH, Wang CY, Wang YH, Hsueh SC, Yen MY, Ko WC, Hsueh PR. Asymptomatic carrier state, acute respiratory disease, and pneumonia due to severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2): Facts and myths. *Journal of microbiology, immunology, and infection = Wei mian yu gan ran za zhi*. S1684-1182(20)30040-2. Advance online publication. 2020; <https://doi.org/10.1016/j.jmii.2020.02.012>. Accessed 22/06/2020
10. Richardson S, Hirsch JS, Narasimhan M, Crawford JM, McGrinn T, Davidson KW, Northwell COVID-19 Research Consortium. Presenting Characteristics, Comorbidities, and Outcomes Among 5700 Patients Hospitalized With COVID-19 in the New York City Area. *JAMA*. 2020;323(20):2052–2059. doi:10.1001/jama.2020.6775
11. Wan S, Xiang Y, Zheng Y, Li B, Hu Y, Lang C, Huang D, Sun Q, Xiong Y, Huang X, Lv J, Luo Y, Shen L, Yang H, Huang G, Yang R. Clinical features and treatment of COVID 19 patients in northeast Chongqing. *J Med Virol*. 2020; 1– 10. <https://doi.org/10.1002/jmv.25783>
12. The Washington Post. Coronavirus Outbreak. <https://www.washingtonpost.com/health/2020/04/24/strokes-coronavirus-young-patients/>
13. An update of COVID 19 outbreak in Nigeria. <https://ncdc.gov.ng/themes/common/files/sitreps/35112e91596699ab3982a107c9046bb0.pdf>
14. NCDC COVID-19 Case Definition Version 4 2020. https://covid19.ncdc.gov.ng/resource/guideline/NCDC_COVID-19%20Case%20Definition%20Version%204.pdf

15. Olayinka RI, Bello MS, Abdallah S, Taofeek O, Surajudeen OB, Umar IB, Shamsudeen Y, Adamu D, Sulaiman SB. COVID-19 in children: a case series from Nigeria. Pan African Medical Journal. 2020;35(2):53. [doi: 10.11604/pamj.supp.2020.35.2.23597]
16. Yonker LM, Neilan AM, Bartsch Y, Patel AB, Regan J, Arya P, Gootkind E, Park G, Hardcastle M, St. John A, Appleman L, Chiu ML, Fialkowski A, De la Flor D, Lima R, Bordt EA, Yockey LJ, D'Avino P, Fischinger S, Shui JE, Lerou PH, Bonventre JV, Yu XG, Ryan ET, Bassett IV, Irimia D, Edlow AG, Alter G, Li JZ, Fasano A, Pediatric SARS-CoV-2: Clinical Presentation, Infectivity, and Immune Responses, The Journal of Pediatrics (2020), doi: <https://doi.org/10.1016/j.jpeds.2020.08.037>.
17. Wei-jie Guan, Zheng-yi Ni, Yu Hu, Wen-hua Liang, Chun-quan Ou, Jian-xing He, Lei Liu, Hong Shan, Chun-liang Lei, David S.C. Hui, Bin Du, Lan-juan Li, et al., for the China Medical Treatment Expert Group for Covid-19. Clinical characteristics of coronavirus disease 2019 in China. N Engl J Med. 2020; 382: 1708-1720.
<https://www.nejm.org/doi/full/10.1056/nejmoa2002032>
18. An update of COVID-19 outbreak in Nigeria. NCDC COVID-19 Situation report. Situation Report 178. 24th August, 2020.
19. Owoyemi AJ, Ladi-Akinyemi TW. Health Seeking behaviour for infants by caregivers in a semi-urban area of Lagos State, Nigeria. Nigerian Journal of Health Sciences, 2017; 14-9.
20. Chukwuneke FN, Ezeonu CT, Onyire BN, Ezeonu PO, Ifebunandu N, Umeora MC. Health seeking behaviour and access to health care facilities at the primary level in Nigeria: Our experience. Ebonyi Med J 2012; 11:51-7.

21. National Population Commission (NPC) [Nigeria] and ICF International. 2014. Nigeria Demographic and Health Survey 2013. Abuja, Nigeria, and Rockville, Maryland, USA: NPC and ICF International.
22. Storr J, Twyman A, Zingg W, Damani N, Kilpatrick C, Reilly J, Price L, Eggar M, Grayson ML, Kelley E, Allegranzi B and the WHO Guidelines Development Group. Core components for effective infection prevention and control programmes: new WHO evidence-based recommendations. *Antimicrobial Resistant Infection Control* **6**, 6 (2017). <https://www.doi.org/10.1186/s13756-016-0149-9>.
23. World Health Organization (WHO) Infection prevention and control (IPC) is a scientific approach and practical solution designed to prevent harm caused by infection to patients and health workers. 2020. <https://www.who.int/infection-prevention/publications/en>. Accessed 30/08/2020.
24. World Health Organization (WHO) COVID-19 Case Definition. Updated in Public Health surveillance for COVID-19, 7th August, 2020. https://www.who.int/publications/i/item/WHO-2019-nCoV-Surveillance_Case_Definition-2020.1
25. Morgan Spencer Gold , Daniel Sehayek , Sofianne Gabrielli , Xun Zhang , Christine McCusker & Moshe Ben-Shoshan (2020): COVID-19 and comorbidities: a systematic review and meta-analysis, *Postgraduate Medicine*, DOI:10.1080/00325481.2020.1786964
26. Sanyaolu A, Okorie C, Marinkovic A, Patidar R, Younis K, Desai P, Hosein Z, Padda I, Mangat J, Altaf M. (2020). Comorbidity and its Impact on Patients with COVID-19. *SN comprehensive clinical medicine*, 1–8. Advance online publication. <https://doi.org/10.1007/s42399-020-00363-4>

