Original Research Article

ASSESSMENT OF THE CHALLENGES TOWARDS COVID-19 TESTING AMONG FINAL YEAR MEDICAL STUDENTS IN ENUGU STATE, NIGERIA

ABSTRACT

***Background*:** Health infrastructure manned by trained personnel is very limited in sub-Saharan African countries, Nigeria inclusive. Testing for SARS-COV-2 met with this limitation hence causing a sub-optimal level of testing for the infection. Efforts to procure reliable testing kits have been limited by the willingness and capacity to pay for these services.

Objective: This study was aimed at assessing the knowledge level and challenges of the final year medical students towards COVID-19 testing in Enugu, a state in the Southeastern part of Nigeria.

Method: A descriptive and inferential cross-sectional study of 137 medical students in Enugu state was done. Ethical approval was obtained from the Health, Research and Ethical committee of the University of Nigeria Teaching Hospital, UNTH, Ituku-Ozalla, Enugu state, Nigeria. Data was collected using self-administered virtual questionnaires and a descriptive and inferential analysis were done using statistical package for social sciences (SPSS).

Results: A total of one hundred and thirty-seven (137) responses were gotten; 86.8% who had symptoms suggestive of Covid-19 never got tested. As regards to reasons for not being tested, 36.9% affirmed to perceived discomfort of the testing method; 36 % said delay at testing centers;33.5% inadequate testing centers; 31.4% lack of knowledge of available testing centers;31.4% unavailability of PCR testing kits; 10% percent indicated fear of result

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as their reason for not been tested, 8.3% indicated some levels of religious basis for not being tested. In terms of knowledge, 61.8% are aware of PCR as a testing method, and 33.6% aware of the serology tests. Females were more likely not to get tested for COVID-19 when symptomatic. Unlike the males, most of the females also did not agree that there are sufficient numbers of covid-19 testing centres; although analysis of both result were not statistically significant.

(P value- 0.49, Chi-square- 0.49; P value- 0.18, Chi-square value- 6.25 respectively).

Conclusion: COVID-19 diagnostic testing in Nigeria is sub-optimal and may result in an under-reporting of infections in Nigeria. Hence, the need for mass diagnostic testing and re-orientation cannot be overemphasized.

Recommendation: We recommend the provision of more affordable and reliable testing options by the government. Increased sensitization of the public on the need to test will be needed.

Keywords: COVID-19 testing, Challenges, Medical students, Southeastern Nigeria.

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INTRODUCTION

COVID-19 is a highly contagious respiratory tract disease that has imposed a serious threat to the global health system since it was first originated in the city of Wuhan in China as at December 2019.[1] It is caused by a viral organism known as severe acute respiratory system corona virus type 2 (SARS COV-2).[1,2] It was, however, declared a public health emergency of international concern and pandemic by World Health Organization (WHO) on 30th January, and in March 2020 respectively. Since the inception of this deadly disease, according to WHO, about 256 million cases have been confirmed globally with at least 5 million deaths, 6.2 million confirmed cases and 151 thousand deaths in Africa, and about 213,589 confirmed cases in Nigeria with about 2,974 deaths.[2]In addition, since the COVID-19 pandemic, there has been a significant negative effect on medical education for medical students and surgical residents in Nigeria. [3, 4]

In the case of serious biohazards, such as viral outbreaks, diagnostic laboratories play an essential role in the rapid and accurate detection and isolation of new microorganisms using the cornerstone in diagnostic virology, which are the molecular diagnostic techniques.[5] The diagnosis of SARS-CoV-2 infection based on clinical features alone is often confused with that of influenza and seasonal upper respiratory tract viral infections as they present with similar signs and symptoms.[6] As with any other infection, the gold standard for diagnosis is the identification of the infectious agent. In the case of viral infections, this identification can be made by visualizing viral particles at electron microscopy or identifying intracellular viral

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inclusions at light microscopy.[7] Since the initial cases of pneumonia of unknown cause were first reported, viral culture and genetic sequencing of isolates obtained from these patients identified a novel coronavirus as the etiology within 10 days in January 2020. This benefitted understanding of the disease occurrence and transmission, as well as diagnostic test development.[8] Although viral culture is relatively time-consuming and labor-intensive, it is much more useful in the initial phase of emerging epidemics before other diagnostic assays are clinically available.

The first test for COVID-19 diagnosis that Centre for Disease Control (CDC) distributed, released in February 2020, is the CDC 2019-Novel Coronavirus (2019-nCoV) Real-Time RT-PCR Diagnostic Panel, a test that accurately detects SARS-CoV-2 in respiratory specimens. A second assay was released in July 2020, the CDC Influenza SARS-CoV-2 (Flu SC2) Multiplex Assay, which permits public health laboratories to run three tests in a single reaction well. The Flu SC2 Multiplex is more efficient in its use of test reagents, allows higher throughput, and simultaneously gives accurate results about the presence of SARS-CoV-2, influenza A, and influenza B nucleic acid in a patient specimen. Since CDC's first test was developed, many commercially available options for SARS-CoV-2 testing have been authorize.[9] Up till now, the gold standard method for identifying genetic material from SARS-CoV-2 remains real-time polymerase chain reaction (RT-PCR). Serological assays provide an alternative diagnostic approach for the current rapidly growing demand for rapid diagnosis of suspected patients and asymptomatic infections. The entire test could be completed in a short time, and be independent of specific equipment or places. The deployment of COVID-19 diagnostic testing has varied widely across the globe. A few countries in Asia showed the power of investment in pandemic preparedness, flexible isolation systems, and intensive case finding in the epidemic containment. For example, in South Korea, they dramatically hindered the COVID-19 outbreak by establishing an unprecedented national testing effort as they successfully managed to perform more than 300,000 tests in the first 9 weeks after identifying the first case of COVID-19.[10] This implies that the ability of any country to curtail an invading pandemic is highly dependent on the

diagnostic capacities in terms of the highly equipped laboratories and the trained personnel. Generally, health infrastructure in particular, laboratory facilities with trained personnel is very limited in sub-Saharan African countries, Nigeria inclusive.[11]SARS-CoV-2 infection testing is problematic in this part of the world due to financial constraints[12] in both the aspects of the health care systems to procure trustworthy testing kits and the individuals to pay for testing. Many other factors in addition play key roles in hampering the effectiveness and progress of COVID-19 testing events. These countries have no domestic capacity to manufacture nasopharyngeal swabs, analytical reagents and COVID 19 kits for SARS-CoV-2 testing [13] and hence, depended on the provision from other highly equipped countries like China for the procurement of COVID-19 testing kits, and other reagents. When Nigeria reported its first case of the virus on 27th February 2020, it had only five laboratories in four states able to test for COVID-19.[14]

Currently, almost all the major hospitals in Nigeria have testing kits but still very minimal to sub-serve the most populated country in Africa. This is a cause of concern especially since the acceptance rate of COVID-19 vaccines among healthcare workers is still less than optimal. [(15)]Another problem lies in the willingness of the people to get tested especially now that the fatality of the disease seems to have been diluted. This work will find out the willingness of people to get tested of the COVID-19 disease by assessing the population considered to be very enlightened and should have positive health seeking attitudes. The focus of this study is on final year medical students being the future medical doctors. Ideally, final year medical students would have the expected level of knowledge about COVID-19.(16) The study aims to identify the major challenges towards COVID-19 testing among final year medical students in Enugu state, Nigeria.

METHODS

Study area and design

This study was a cross-sectional conducted among the final year medical students in Enugu State, Nigeria which is a low income country according to the World Health Organisation. There are a total of six universities in Enugu, of which four are privates, one federal and one state. Among these six universities, only two offers medicine and surgery as a discipline and these include: the University of Nigeria Enugu Campus, a subset of the University of Nigeria, Nsukka, Enugu, Nigeria, with about 180 final year medical students and the Enugu State University of Science and technology with about 80 final year medical students. Health service to students of the said institutions is sub-served by the medical centers located inside the campus but however, these hospitals don't have instruments for COVID-19 testing.

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Study population and procedure

Final year medical student in Enugu state participated in the research. Questionnaires were distributed through the social media, WhatsApp and Telegram. Responses were collected from the respondents who agreed to the terms of the research and willingly gave their consents.

Data collection and methods

The data was collected with digitalized self-administered questionnaire created using Google form. The questionnaire design was guided by recommendations from the strategic advisory group of experts on immunizations (SAGE) vaccine hesitancy survey sample questions which were adapted to suit the Nigerian setting.[17]

The questionnaire has three sections:

Section 1 assessed socio-demographic characteristics of the respondents like age, sex, marital status, religion, and ethnicity.

Section 2 assessed knowledge of COVID-19 disease. The awareness of the symptoms, incubation period, mode of transmission and those at risk were assessed from the respondents.

Section 3 assessed the challenges of COVID-19 testing. In this section, respondents were assessed on the knowledge of the availability of COVID-19 testing categories, and their testing status.

However, using a Likert scale, the factors affecting the respondents' willingness to be tested were assessed; a range of score 1-5 was assigned with one as the lowest and five as the highest.

Statistical Analysis

Data analysis was carried out using Statistical package for Social Sciences (SPSS) by IBM. The data was reviewed and cleaned before analysis. Descriptive analyses were conducted to determine frequencies and proportions of categorical variables in the total study sample.

Ethical Considerations

Ethical approval was obtained from the ethical committee of the University of Nigeria Enugu Teaching Hospital, Ituku-Ozalla, Enugu, Nigeria**.** The number assigned to the ethical clearance issue is NHREC/05/01/2008B-FWA0000245 8-1RB00002323.Theinformation obtained from the study was handled confidentially. Personal identifications of respondents

were precluded from the study tool. Respondents were informed that their participation was voluntary and consent was implied by completion of the questionnaire.

RESULTS

Social Demographics characteristics of Respondents

A total of 137 responses were received from the final year medical students. Majority of the respondents falls within the age range of 20-29 years (94.9%). Most were males (59.1%), 96% were Christians, 97% were single and 80.9% are of Igbo ethnicity.**(Table 1)**

Majority in our study believed that the incubation period ranges from 2-14 days (72.9%).

89.7% of the respondents believed the disease could be transmitted via droplet, airborne transmission (63.2%), direct contact with infected people (61%), contact with infected surfaces (60.3%%), and feco-oral transmission (9.6%).

Table 1 Demographic study results

Variables	Frequency (n, %)
Age(years)	
15-19	3(2.2)
20-24	78(56.9)
25-29	52(38)
>29	Nil
Gender	
Male	81(59.1)
Female	56(40.9)
Religion	
Christian	131(96.3)
Muslim	1(1.1)
African traditional religion	1(1.1)
Others	2(1.5)
Marital status	
Single	133 (97.1)
Married	4(2.9)

Divorced/separated	Nil
Widowed	Nil
Ethnicity	
Igbo	110(80.9)
Yoruba	4(2.9)
Others	14(16.2)

Table 2a- Is there a relationship between gender and likelihood of being tested when symptomatic? A Correlative analysis

	No	**Yes**	**p-value**	**chi-square**
Fema	50	6	0.49	0.49
le	42.0%	33.3%		
Male	69	12		
	58.0%	66.7%		

Table 2b- Are there enough COVID-19 testing centres in Enugu state Nigeria for symptomatic individuals? A Correlative analysis

			Agreed	Disagree	Neutral	Strongly agree	Strongly disagreed	p-value	chi-square
		Female	15	25	8	2	6	0.18	6.25
			32.6%	52.1%	44.4%	18.2%	42.9%		
		Male	31	23	10	9	8		
			67.4%	47.9%	55.6%	81.8%	57.1%		

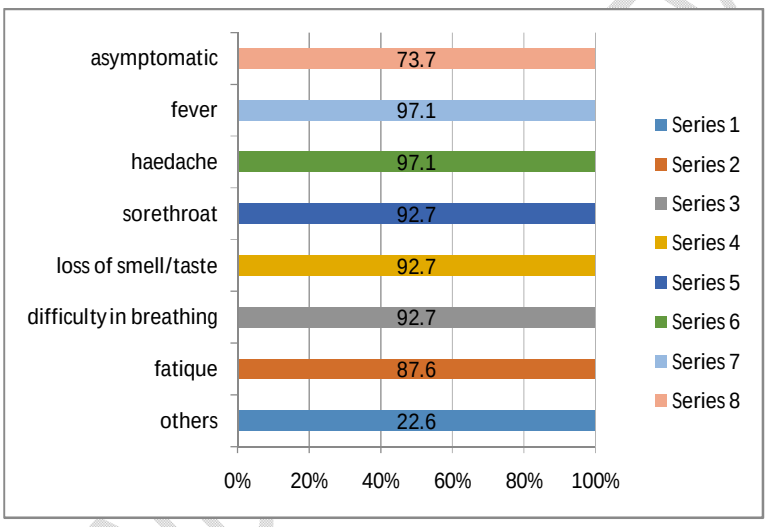


Figure 1- Knowledge of symptoms of COVID-19

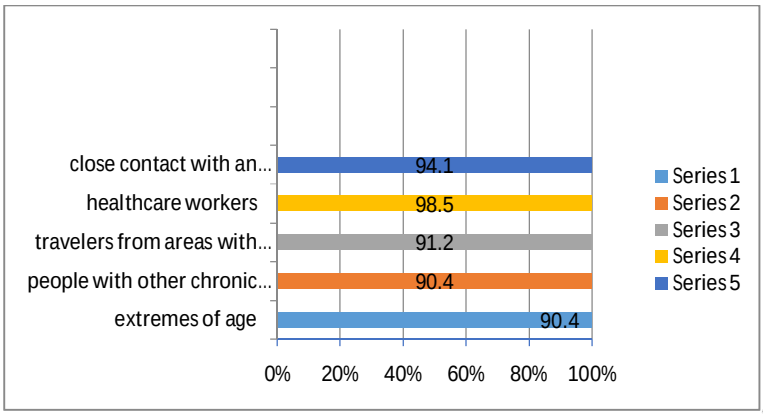


Figure 2- Risk of contracting the disease

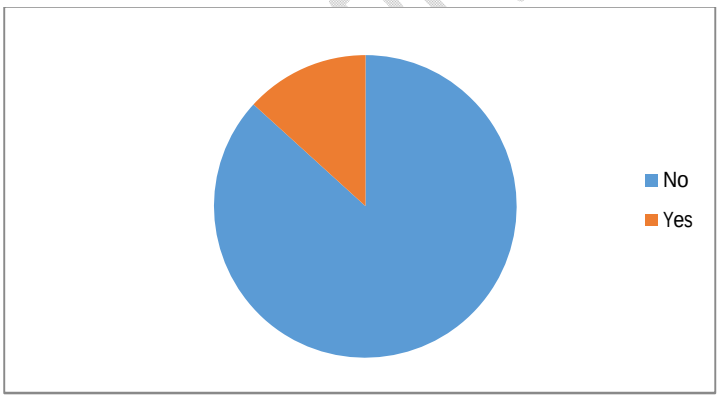


Figure 3- Have you being tested for Covid-19 during your symptomatic periods?

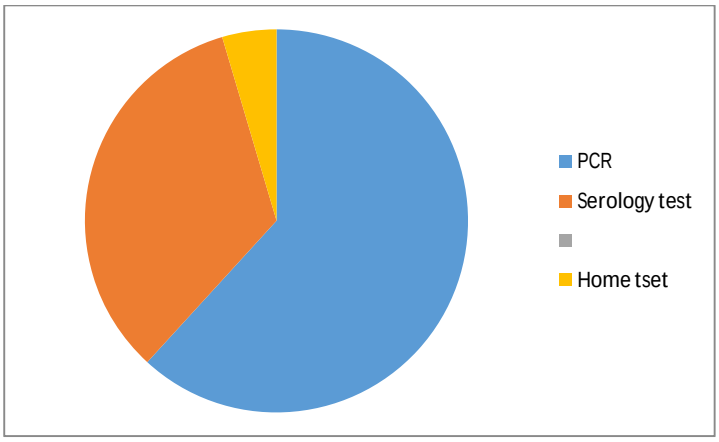
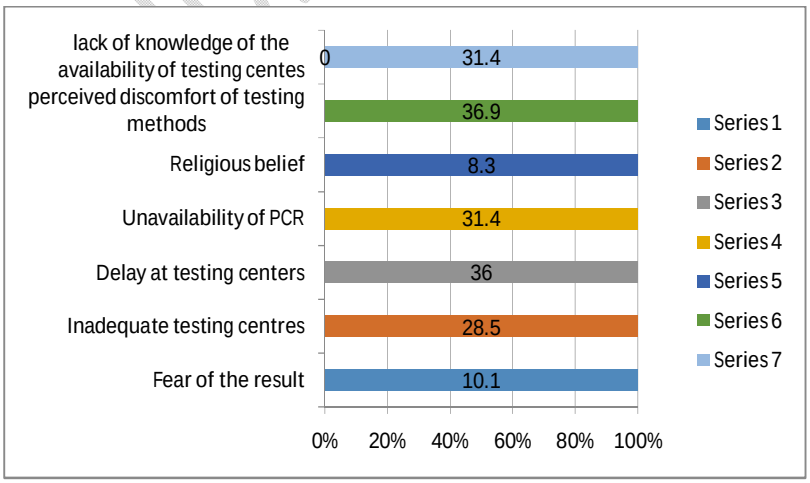


Figure 4- Awareness of Covid-19 testing methods

Figure 5- Major reason for not being tested



DISCUSSION

The result shows that 86.8% have not been tested which is in contrary to the intended and recommended mass testing by the World Health Organization. The two major reasons for reduced COVID-19 testing as portrayed in the result is delay at the testing centers, unavailability of testing centers and the perceived discomfort of testing processes.

The fear is that this population is among the elites that is expected to have a positive health seeking attitudes and should have significant number of the individuals tested but unfortunately, the reverse has become the case. This shows that it could even be worst outside in the general population.

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Knowledge of COVID-19

As shown in figure 1, most of the respondents believed the disease can be asymptomatic (73.7%), this is satisfactory, based on similar findings in a systematic review study by Zao G. et.al. which showed there is increasing evidence that many patients with COVID-19 are asymptomatic or have only mild symptoms, but they are able to transmit the virus to others.[18] Additionally, the percentage awareness of each symptom assessed showed an above 90% knowledge among the study participants for all symptoms assessed such as fever, headache, sore throat, loss of smell, cough, difficulty in breathing and fatigue. This gives more affirmation to the quality of the medical curriculum in giving adequate knowledge on prevention of transmissible diseases.

Respondents' view on those at high risk of contracting the disease is as follows can be seen from figure 2; it showed a very high level of belief of infectivity with above 90% for the various sources of infection risk assessed, with the healthcare workers believed to have the highest risk. This supports findings from a similar study by Naveed M. et.al were the rate of COVID-19 was high amongst healthcare workers. [19]

Awareness on the availability of COVID-19 testing categories (figure 3)

Among the respondents about 61.8% are aware that viral PCR test is available, and 33.6% believed antibody or serology test are also available. These commonly available testing methods (PCR and serology) for COVID-19 are proven to provide vital information about the corona virus disease and help in diagnosis. [20]

Majority of the respondents indicated that they have not been tested for COVID-19 infection (86.8%) (figure 3). This is not encouraging and calls for a more intense sensitization and medical education to help develop an in-depth level of understanding of the pathology and need for testing when they have the symptoms. While Figure 4 shows the percentage of

awareness of the testing methods; in figure 5, we found out that, in a decreasing order, the causes of not being tested for Covid-19 in our study amongst the participants include the a perceived discomfort in testing methods, delay at testing centres as topmost reasons; others were unavailability of enough testing centres, fear of the result outcome, religious belief, and others expressed lack of awareness of the available testing centres. This findings differ from a study by Amoo OS et.al were insufficient funds and a crowded testing centre were major reasons alluded to by the respondents as reasons for not getting tested. [21] The deficiency in the number of individual tested simply brings to light the limited supply of testing kits and the financial incapability of many individuals.

More importantly, from the correlative analysis done in this study, as shown in tables 2a and 2b, females were more likely not to get tested for COVID-19 when symptomatic. Unlike the males, most of the females also did not agree that there are sufficient numbers of covid-19 testing centres; although analysis of both result were not statistically significant. (P value- 0.49, Chi-square- 0.49; P value- 0.18, Chi-square value- 6.25 respectively).

The World health organization once said at the early phase of the pandemic that the absence of positive case in a country might not necessarily mean absence of the disease but the inability of the country to put up diagnostic testing measure to identify the ongoing cases.[22] This can as well be said in the case of Covid-19 pandemic in Nigeria, under reporting of cases does not mean the transmission has been reduced.

CONCLUSION

Majority of the respondents indicated that they were not tested for COVID-19 infection even when they had suggestive symptoms in the pandemic with most of the participants having a fair knowledge of available test options for Covid-19. The knowledge of symptoms, incubation period, and available testing methods was satisfactory among the final year

medical students in Enugu state, Nigeria. Perceived discomfort with the testing methods and delay at the test centre were the leading reasons for not being tested.

RECOMMENDATION

Large-scale testing is not without challenges; however, the needs cannot be overemphasized. African context is unique and so must be its responses to the SARS-CoV-2 pandemic especially as the hospital response to Covid-19 pandemic and awareness creation amongst institutions in Nigeria have been reported to be relatively inadequate.[23]

Making testing more available and affordable and re-orientation of the citizens on the need for COVID-19 testing while working on expanding the healthcare capacity will contribute to effective responses to the pandemic.

DATA: This would be released with permission of the corresponding author

REFERENCES

1. Younes N, Al-Sadeq DW, Al-Jighefee H, Younes S, Al-Jamal O, Daas HI, et al. Challenges in laboratory diagnosis of the novel Coronavirus SARS-CoV-2. Viruses [Internet]. 2020 [cited 2022 Feb 22];12(6):582. Available from: https://www.mdpi.com/1999-4915/12/6/582/htm
2. Kevadiya BD, Machhi J, Herskovitz J, Oleynikov MD, Blomberg WR, Bajwa N, et al. Diagnostics for SARS-CoV-2 infections. Nat Mater [Internet]. 2021 [cited 2022 Feb 21];20(5):593–605. Available from: https://www.nature.com/articles/s41563-020-00906-z
3. Imediegwu, Kelechi U, Onwuka, Paschaline C; Uwaezuoke, Angelica C., Abor, Jude C.; Oladiran, Ajibola. Effects of COVID-19 Pandemic on the Surgical Training of Final Year Medical Students in South-Eastern Nigeria. *Journal of West African College of Surgeons* 12(3): p 64-70, Jul–Sep 2022. | *DOI:* 10.4103/jwas.jwas_129_22

4. Imediegwu KU et.al. Assessment of the Effects of the COVID-19 Pandemic on Orthopaedic Surgery Training Among Orthopaedic Residents in Southern Nigeria. Journal of West African College of Surgeons, volume 14, issue 4, pages 380-383

5. Goudouris ES. Laboratory diagnosis of COVID-19. J Pediatr (Rio J) [Internet]. 2021 [cited 2022 Feb 21];97(1):7–12. Available from: https://www.ncbi.nlm.nih.gov/labs/pmc/articles/PMC7456621/

6. Xu Y, Cheng M, Chen X, Zhu J. Current approaches in laboratory testing for SARS-CoV-2. Int J Infect Dis [Internet]. 2020;100:7–9. Available from: https://www.sciencedirect.com/science/article/pii/S1201971220306718

7. CDC. CDC diagnostic tests for COVID-19 [Internet]. Centers for Disease Control and Prevention. 2021 [cited 2022 Feb 21]. Available from: https://www.cdc.gov/coronavirus/2019-ncov/lab/testing.html

8. Sethuraman N., Jeremiah S.S., Ryo A. Interpreting diagnostic tests for SARS-CoV-2. *JAMA.* 2020;323:2249–2251. [PubMed] [Google Scholar] [Ref list]

9. Murray P.R. The clinician and the microbiology laboratory. In: Bennett J.E., Dolin R., Blaser M.J., editors. *Mandell, Douglas and Bennett's principles and practice of infectious diseases.* Elsevier Inc.; Philadelphia, USA: 2015. pp. 191–223. [Google Scholar] [Ref list]

10. Song, J.-Y.; Yun, J.-G.; Noh, J.-Y.; Cheong, H.-J.; Kim, W.-J. Covid-19 in South Korea—Challenges of Subclinical Manifestations. *N. Engl. J. Med.* **2020**. [**Google Scholar**] [**CrossRef**]

11. Mellet, J.; Pepper, M.S. A COVID-19 Vaccine: Big Strides Come with Big Challenges. Vaccines **2021**,9, 39.[CrossRef]

12. Korber, B.; Fischer, W.M.; Gnanakaran, S.; Yoon, H.; Theiler, J.; Abfalterer, W.; Hengartner, N.; Giorgi, E.E.; Bhattacharya, T.; Foley, B.; et al. Tracking Changes in SARS-CoV-2 Spike: Evidence that D614G Increases Infectivity of the COVID-19 Virus. Cell **2020**, 182, 812–827.e819. [CrossRef] [PubMed].

13. Lin, C.; Tu, P.; Beitsch, L.M. Confidence, and Receptivity for COVID-19 Vaccines: A Rapid Systematic Review. Vaccines **2020**, 9, 16.[CrossRef] [PubMed]

14. Expanding COVID-19 tests in Africa's most populous nation - Nigeria [Internet]. ReliefWeb. [cited 2022 Feb 25]. Available from: https://reliefweb.int/report/nigeria/expanding-covid-19-tests-africa-s-most-populous-nation

15. Imediegwu KU et.al. Knowledge and acceptance of COVID-19 vaccine among healthcare workers in Enugu metropolis, Enugu state, Nigeria. Frontiers Public Health J. 22 June 2023, DOI: 10.3389/fpubh.2023.1084854

16. Imediegwu. KU et.al. Information and Knowledge Sources about COVID-19 amongst Final Year Medical Students in Enugu State, Nigeria: A Cross Sectional Study. Published: 2024-08-22. DOI: 10.9734/ijtdh/2024/v45i81581

17. SAGE working group on vaccine hesitancy: https://pharmac.govt.nz/assets/ss-paediatrics-4-immunisation-a-global-issue-update-from-sage-n-turner.pdf

18. Zhiru Gao [1], Yinghui Xu [1], Chao Sun [1], Xu Wang, Ye Guo, Shi Qiu, Kewei Ma. A systematic review of asymptomatic infections with COVID-19.Journal of Microbiology, Immunology and Infection. Volume 54, Issue 1, February 2021, Pages 12-16

19. M. Naveed,[1,*] M. Naeem,[4] M. ur Rahman,[5] M. Gul Hilal,[2] M.A. Kakakhel,[3] G. Ali,[3] and A. Hassan. Review of potential risk groups for coronavirus disease 2019 (COVID-19)New Microbes New Infect. 2021 May; 41: 100849.Published online 2021 Feb 12. doi: 10.1016/j.nmni.2021.100849

20. Bahar Hassanmirzaei, Zohreh Haratian, Ali Ahmadzadeh Amiri, Amir Ahmadzadeh Amiri, Navid Moghadam. SARS-CoV-2 serological assay and viral testing: a report of professional football setting. *Postgraduate Medical Journal*, Volume 98, Issue 1161, July 2022, Pages 529–532, https://doi.org/10.1136/postgradmedj-2021-140176

21. Amoo. OS et.al. Factors Affecting COVID-19 Testing Behaviours Among the Population in South Western Nigeria. Int J Public Health. 2022; 67: 1604993.Published online 2022 Oct 6. doi: 10.3389/ijph.2022.1604993 PMCID: PMC9582156. PMID: 36275434

22. Director-General's opening remarks at the World Health Assembly - 24 May 2021. https://www.who.int/director-general/speeches/detail/director-general-s-opening-remarks-at-the-world-health-assembly---24-may-2021.

23. Imediegwu KU et.al. The Adequacy of Hospital Response to COVID-19 Pandemic amongst Surgical Institutions in South-Eastern Nigeria. PMID: **36923801** PMCID: PMC10010586DOI: 10.4103/jwas.jwas_239_22 J West Afr Coll Surg. 2023 Jan-Mar;13(1):44-49.