



## A Cross-Sectional Survey of Doctors in Nigeria Regarding Local Infection Prevention and Control Procedures for Coronavirus Disease 2019 (COVID-19)

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### Abstract

**Background:** Worldwide COVID-19-related mortalities have included healthcare workers in the frontline caring for COVID-19 infected patients. This necessitates the practice of infection prevention and control procedures to protect health professionals from contracting the virus at the workplace. We investigated the knowledge and practice of doctors working in Nigeria regarding infection prevention and control procedures in the workplace.

**Methodology:** This is a cross-sectional study of doctors and dentists working in Nigeria using a semi-structured self-administered questionnaire adapted from the World Health Organization "Perception of health workers regarding local infection prevention and control procedures for the Coronavirus Disease 2019" tool. Data were analyzed using SPSS version 25.

**Results:** 302 doctors participated in this survey. Most were female 195 (64.6%); 80.50% provided direct care to patients; 267 (88.4%) worked in hospitals with suspected or confirmed cases of COVID-19 while 179 (59.3) directly cared for patients with suspected or confirmed cases of COVID-19 infection. 137 (70.6%) had close contact with confirmed cases of COVID-19. Hand hygiene and gloves were the most common procedure/material available for the prevention of infections for the respondents in the healthcare settings, followed by other types of medical facemasks, N95 respirator masks, eye protection like goggles and disposable aprons.

**Conclusion:** In 2020, during the period of the COVID-19 pandemic, doctors in Nigeria were knowledgeable about infection prevention procedures but do not have access to personal protective equipment.

**Keywords:** COVID-19; Physicians; Personal protective equipment; Infection prevention.

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## Introduction

The coronavirus disease 2019 (COVID-19) which started in Wuhan, China 2019 was declared a pandemic in March 2020 by the World Health Organization.[1,2] The world was shocked by this pandemic and further pressure has been mounted on health systems.[3,4] The surge of the COVID-19 pandemic is receiving global attention.[5] This severe acute respiratory syndrome coronavirus-2 (SARSCoV-2) has caused a crisis in healthcare systems worldwide.

The disease is caused by a novel beta coronavirus which is transmitted by inhalation of infected droplets therefore it is now considered an airborne infection. These droplets are released into the atmosphere when an infected person sneezes or coughs. [6,7] Healthcare professionals looking after patients symptomatic of COVID-19 are at risk of contracting the virus as a nosocomial infection. Hence the importance of infection prevention and control procedures by healthcare workers, even more so as some patients are asymptomatic.

According to the World Health Organization, infection prevention and control (IPC) is a scientific approach and practical solution implemented to avoid the harm that is caused due to an infection to patients and healthcare professionals.[8] Even before the COVID-19 pandemic there are various measures put in place within the healthcare setting to curb the spread of the infection. Within healthcare settings, healthcare professionals are expected to practice infection control to reduce the transmission of infections within the healthcare facilities.[9] This cross-transmission of infectious diseases can occur between patients, patients to healthcare professionals and other non-clinical hospital staff, clinical to non-clinical staff and healthcare workers to patients.[10]

Infection prevention is also necessary for reducing the transmission of severe acute respiratory coronavirus-2. This means that robust infection prevention and control plans need to be implemented as a way of breaking the chain of infection and reducing the spread of the deadly virus. Due to the mode of spread of the virus, healthcare workers including doctors can get infected while caring for their patients. At this point, infection prevention and control are necessary for ensuring that healthcare workers do not contract the disease while at work and that there is no cross-infection between patients and their physicians, nurses and other categories of healthcare professionals.[9] Therefore infection control is of importance in combating the COVID-19 pandemic. [6,9]

There have been several studies set in low and middle-income countries (LMIC) that have studied PPE, knowledge, and availability of healthcare workers. Nkansah et al studied the knowledge, practice, and preparedness of healthcare workers for COVID-19 in the Offinso-North District of Ghana.[11] Infection prevention and control measures were adhered to by 57.5% of the healthcare workers studied. This was associated with the knowledge of infection prevention and control measures the respondents in the study had before the pandemic.[11] Bahadur et al studied infection prevention and control practiced by medical students of Jinnah Medical College, Jeshawar.[9] In this study, 85.6% of the students were aware of the various measures necessary for the prevention of infectious diseases; 85.6% practiced infection control while 54.4% knew personal protective equipment (PPE).[9] In a cross-sectional study on the compliance with infection prevention and control strategies among healthcare workers in the outpatient departments of Tanzania, 69.9% were compliant with hand hygiene, 74.8% with the use of gloves, 4.8% with the disinfection of reusable medical equipment and 43.3% with the management of medical waste.[12] This study was carried out among 220 health facilities in Tanzania and 734 healthcare professionals participated in the study out of which 7% were medical doctors.[12]

300 health workers were assessed on their knowledge, attitude, and practice of infection prevention procedures in Trinidad and Tobago, 44% of the study respondents practiced infection preventive measures. In this study, 20.3% of the healthcare workers studied had good knowledge about infection prevention while 46.7% had a good attitude towards it. [1,8]

Geberemariam et al assessed the knowledge and practice of infection control by 648 health workers in the West Arsi District of southeast Ethiopia including factors that prevent the compliance to infection prevention measures. In this study, 53.7% of the study respondents were knowledgeable about infection prevention practices within the healthcare setting. This was enhanced in healthcare workers who had worked for up to a decade, presence of infection prevention and control committees and guidelines at their place of work.[13]

In Nigeria, the standard precaution for infection control was studied among health workers in two tertiary hospitals and 91.6% of the study respondents knew about it.[14] Doctors must acquire training on infection control, especially practising it at this time of the COVID-19 pandemic. Most of the studies already conducted in published literature did not conduct the infection prevention and control measures among doctors.

This requires an urgent need for all doctors to be aware of infection prevention and control procedures including adhering to them. It is important at this point that health care professionals and doctors in particular practice infection prevention and

control measures vigorously.[15] Doctors must be protected from infections in the fight against COVID-19. Hence this study investigates infection and control measures among doctors practicing in Nigeria.

The objectives of the study are to assess the risk perception of Nigerian doctors towards COVID-19 and if doctors in Nigeria correctly practice infection prevention and control measures due to the COVID-19 pandemic.

## **Method**

### **Study Area**

This survey was conducted in Nigeria, a sub-Saharan country located in West Africa.

### **Study Design**

This is a cross-sectional survey carried out among medical and dental practitioners in Nigeria. Participants in the study were recruited online via social media.

### **Inclusion Criteria**

Inclusion criteria are medical and dental practitioners working in Nigeria.

### **Exclusion Criteria**

Non-doctors and non-dentists were excluded from the study including Nigerian doctors and dentists practicing outside Nigeria were also excluded from the study.

### **Recruitment**

Recruitment to this web-based survey was through various social media platforms (WhatsApp and Telegram) using an online link.

### **Study Instrument**

This is a self-administered questionnaire adopted and adapted from the World Health Organization (WHO) R & D Blueprint Novel Coronavirus Perception of HCWs Regarding Local Infection Prevention and Control Procedure for the COVID-19 Research Protocol in April 2020 to study the research variables.[16]

The questionnaire was self-administered and divided into two sections. Section A comprised the demographic characteristics of respondents. Section B of the questionnaire explored the experience of COVID-19, infection prevention and control procedures for the management of patients suspected or confirmed with COVID-19, service demand, knowledge of recommended infection prevention and control procedures, skills, beliefs about capabilities, social and professional roles, beliefs about consequences, intentions, environmental context and resources, social influences, and emotions.

### **Data Analysis**

Responses to the questionnaire were analyzed using SPSS version 25. Descriptive statistics were used for respondents' socio-demographic characteristics and knowledge about COVID-19. Inferential statistics was done for the various research variables.

### **Ethical consideration**

Ethical approval was sourced and obtained from the National Health Research and Ethics Committee of Nigeria (NHREC) with approval number NHREC/01/01/2007-25/08/2020. Eligible doctors' participation in this survey was voluntary and not compensated.

## **Results**

302 questionnaires were completed. The study population includes doctors who have finished their first degree in Medicine or Dentistry/Dental Surgery who are undergoing internship, residency training, or are Consultant, as well as those who are medical officers, Principal medical/ Dental Officers (PMO/PDO) and Senior Medical/Dental Officers within the public and private sectors. They have been certified by the Medical and Dental Council of Nigeria. The study participants were drawn from all 36 Nigerian states and the Federal Capital Territory.

Table 1 shows the socio-demographic profile of the respondents. Most respondents were females (n=195, 64.6%), and aged between 35 and 44 years (n=140, 46.36%).

Table 1: Demographic Distribution of Respondents

	Frequency (n=302)	Percent (%)
<b>Gender</b>		
Male	107	35.43
Female	195	64.57
<b>Age Group (years)</b>		
< 25	5	1.66
25 – 34	131	43.38
35 – 44	140	46.36
45 – 54	19	6.29
55 – 64	4	1.32
>65	3	0.99
Mean Age $\pm$ SD	36.1 $\pm$ 7.4 years	
<b>Location</b>		
Rural	21	6.95
Urban	281	93.05
<b>Cadre</b>		
Medical officer	68	22.6
Registrar	67	22.2
Senior Registrar	65	21.3
Consultant	38	12.6
Senior Medical Officer	21	7.0
House Officer	17	5.7
*NYSC Doctor	11	3.6
Principal Medical Officer	9	3.0
Chief medical officer	5	3.0
Public Health Officer with NGO	1	0.3
<b>Job Role</b>		
Full time	238	78.8
Part-time	37	12.3
Casual /locum staff	28	9.3
Retired	3	1
Others	5	1.7
<b>Grand Total</b>	<b>302</b>	<b>100.00</b>

NYSC doctor: National Youth Service Corps is a scheme in Nigeria in which every Nigerian graduate below the age of 30 years must undergo which they are posted out of their state of origin for one year. A certificate is issued at the end of the scheme.

Table 2: Contact with patients suspected and confirmed with COVID-19.

	Frequency (n=302)	Percent (%)
<b>Has a patient with suspected or confirmed COVID-19 attended the hospital in which you work?</b>		
Yes	267	88.41%
No	21	6.95%
Unsure	14	4.64%
<b>Have you cared for a patient with suspected or confirmed COVID-19 infections?</b>		
Yes	179	59.27%
No	92	30.46%
Unsure	31	10.26%
<b>Have you been infected with the COVID-19?</b>		
Yes	20	6.62%
No	270	89.40%
Prefer not to say	12	3.97%

Table 3: Knowledge of Recommended Infection Prevention and Control Procedures

Variable	Response		
	Yes	No	Not sure
Hand hygiene (n = 302)	301 (99.7)	1 (0.3)	0 (0.0)
N95 respirator (FFP2 or equivalent) (n = 302)	272 (90.1)	28 (9.3)	2 (0.7)
Other types of medical mask (n = 302)	170 (56.3)	87 (28.8)	45 (14.9)
Fluid-resistant gown (n = 302)	253 (83.8)	30 (9.9)	19 (6.3)
Disposable apron (n = 302)	251 (83.1)	30 (9.9)	21 (7.0)
Gloves (n = 302)	296 (98.0)	3 (1.0)	3 (1.0)
Full body suit (n = 302)	223 (73.8)	61 (20.2)	18 (6.0)
Eye protection (n = 302)	287 (95.0)	13 (4.3)	2 (0.7)
Single use equipment (n = 302)	216 (71.5)	47 (15.6)	39 (12.9)
Others (n = 302)	101 (33.4)	87 (28.8)	114 (37.8)

Table 4: Service Demand

Variable	Response				
	Strongly disagree	Disagree	Neither Agree nor disagree	Agree	Strongly agree
	n (%)	n (%)	n (%)	n (%)	n (%)
The facility can manage current patient demand related to COVID-19	27 (9.0)	53 (17.7)	58 (19.3)	97 (32.3)	65 (21.7)
The facility can manage COVID-19 patients for the next 3 months	28 (9.3)	59 (19.7)	65 (21.7)	96 (32.0)	52 (17.3)

Table 5: Skills/Beliefs about Capabilities/Professional Role/Beliefs about Consequences

Variable	Response				
	Strongly disagree	Disagree	Neither Agree nor disagree	Agree	Strongly agree
<b>Skill</b>					
Received training for infection prevention and control of COVID-19	11 (3.7)	42 (14.0)	64 (21.3)	124 (41.3)	59 (19.7)
Received general training for infection, prevention and control procedures for other communicable diseases	8 (2.7)	21 (7.0)	27 (9.0)	153 (51.0)	91 (30.3)
Can correctly don and doff personal protective equipment to prevent transmission of COVID-19	23 (7.7)	44 (14.7)	73 (24.3)	92 (30.7)	68 (22.7)
<b>Beliefs about Capabilities</b>					
Can follow recommended procedures related to PPE for COVID-19	3 (1.0)	16 (5.3)	49 (16.2)	126 (41.7)	108 (35.8)
<b>Social/Professional Role</b>					
Professional responsibility to care for COVID-19 patients	0 (0.0)	6 (2.0)	16 (5.3)	113 (37.4)	167 (55.3)
<b>Beliefs about Consequences</b>					
Believe protective procedures are sufficient to manage COVID-19 in your facility	28 (9.3)	78 (25.8)	62 (20.5)	97 (32.1)	37 (12.3)
Believe adherence to preventive and control procedures will prevent COVID-19 infection	3 (1.0)	17 (5.7)	33 (11.0)	156 (52.0)	91 (30.3)
Believe adherence to preventive and control procedures will add more strain on the workload	15 (5.0)	49 (16.3)	61 (20.3)	125 (41.7)	50 (16.7)

206 (88.4%) of respondents worked in hospitals that had attended to patients with suspected or confirmed SARS-CoV-2 infection and 179 (59.3%) have had contact with patients suspected or confirmed with COVID-19 with 137(70.60%) having close contact. Hand hygiene and gloves were the most common infection prevention equipment available for the prevention of infection for the respondents in the healthcare settings followed by other types of medical facemasks, N95 respirator facemasks and eye protection equipment like goggles. None of the respondents in this study had access to a fluid-resistant gown.

About half of the respondents agreed that the healthcare facility where they worked could manage patients infected with SARS-CoV-2. 233(60.8%) respondents had received training on infection prevention or control during a pandemic while 159 (53.1%) are confident that they can don and doff PPE correctly. However, most of the respondents (n=256, 95.0%) are concerned about contracting the SARS-CoV-2 as an occupational hazard.

## Discussion

### Summary of Main Findings

The cross-sectional survey of 302 Nigerian health professionals found that respondents have a good knowledge of the use of hand hygiene, facemasks, and other PPE. In this study, hand gloves and facemask were available while fluid-resistant gowns and full-body suits and eye protection equipment (such as goggles, and face shields) were not readily available. Most respondents (70.6%) have had close contact with suspected or confirmed patients with COVID-19, this puts the doctor at risk of contracting the infection as a nosocomial infection and occupational hazards and even infecting their household with an infection contracted at the workplace. The majority of the respondents agreed that they are confident that the healthcare service where they worked managed patients with COVID-19. They were also confident that they have enough knowledge and skill in donning and doffing the PPE as they have been trained on it, particularly important for physicians who work in the isolation centres. Generally, respondents had trust in their medical workplace.

### Strengths and Limitations

This is a pilot study, and it was conducted among medical and dental practitioners in Nigeria. The limitation of this study is that it is a pilot study so the results may not be generalized to the entire doctors practising in Nigeria.

### Comparison with Existing Literature

Doctors and other healthcare professionals whether they are working in the frontline or not are at risk of contracting the COVID-19 infection at the workplace. [17,18] Therefore the PPE is recommended to be used to avoid this new occupational hazard.

According to Amzat et al (2020) even with the scarcity of PPE as seen in this study, health workers including doctors still face a lot of challenges and risks.[3] Especially those working in the frontline during this pandemic. These risks and challenges are made worst by the poor managerial functions of the hospital managers and chief executives.[20] The result of this study is in contrast with a study conducted in the South-West and North-West Nigeria where healthcare workers had poor knowledge and attitude, beliefs and use of PPE.[18] Healthcare managers, therefore, help reduce the risks of exposure of doctors and other healthcare workers to COVID-19 by providing PPE.[21] The results of this study were similar to the study conducted in North-Central Nigeria where 96.4% had improved hand hygiene and 82.3% used facemask though the study conducted in North-Central Nigeria was carried out amongst the general populace and not healthcare workers.[22] Most of the study respondents work in health facilities that provide care for patients suspected or confirmed with COVID-19 (88.4%) while 59.3% have cared for such patients. This, therefore, puts the doctor at risk of contracting the infection from their patients.

### Implications for Policy and Practice

Doctors in Nigeria had good practice of infection prevention and control measures during the COVID-19 pandemic even though most of them did not have access to a fluid-resistant gown, full body suit and eye protection devices. There was good hand hygiene which is one of the measures of curtailing the SARS-CoV-2. There is a need for PPE to be provided for doctors during the COVID-19 pandemic.

### Author Contributions

The study was conceptualized by DYB, and she also wrote the introduction, rationale for the study, discussion, and conclusion. VIO and NE wrote the research methodology. DYB, VIO and OMI analyzed the data. DYB and EE wrote the results. EE transferred the questionnaire into the online (Google form) to elicit responses. Data was collected by DYB, NE, VIO, ESE, CO, MOA, ODE and AOJ.

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## References

1. White S, Omar M, Mohammad GN. Knowledge, attitude, and practice on prevention of airborne and droplet infections during the outbreak of coronavirus among the college students at the University of Bisha, Saudi Arabia. *International Contemporary Research and Review*. 2020. 10, 20773-20776.
2. Bao-Liang Z, Wei I, Qian-Qian L, Xiao-Ge L, Wen-Tian L, Yi L. Knowledge, attitudes, and practices towards COVID-19 among Chinese residents during the rapid rise period of the COVID-19 outbreak fast: a quick online cross-sectional survey. *International Journal of Biological Sciences*. 2020. 16, 1745-1752.
3. Amzat J, Aminu K, Kolo VI, Aakinyele AA, Ogundairo JA, Danjibo MC. Coronavirus outbreak in Nigeria: burden and socio-medical response during the first 100 days. *International Journal of Infectious Diseases* 2020; 98:218-224
4. Oruonye ED, Ahmed YM (2020) Covid-19 and Challenges of Management of Infectious Medical Waste in Nigeria: A Case of Taraba State, *Int J Waste Resour* 10:381. doi: 10.35248/2252-5211.20.10.381
5. Odour PM, Neum M, Bampoe S, Clark S, Heaton D, Hoogen-Boom EM, Patel A, Brown E et al. Anaesthesia and COVID-19: infection control. *British Journal of Anaesthesia*. 2020. 125, 16-24.
6. Lai X, Wang X, Yang Q, Xu X, Tang Y, Liu C, Lai R et al. Will healthcare workers improve infection prevention and control behaviours as COVID-19 risk emerges and increases in China. *Antimicrobial Resistance and Infection Control*. 2020. 9: 83. <https://doi.org/10.1186/s13756-020-00746-1>
7. Zachary ZS, Charmane JWO. Community pharmacy response to infection control during COVID-19, a cross-sectional survey. *Research in Social and Administrative pharmacy* 2021; 17:1845-1852.
8. WHO. Infection prevention and control - guidance to action tools. Copenhagen: WHO Regional Office for Europe; 2021. Licence: CC BY-NC-SA 3.0 IGO. Available at: <https://apps.who.int/iris/bitstream/handle/10665/341107/9789289055437-eng.pdf>. [Accessed 20th May 2020]
9. Bahadur S, Jan A, Younas A, Ahmed I, Javeed S, Amaar S, Murad S. Infection prevention and control practices observed by students of a medical college. *J Rehman Medical Institute*. 2017. 3, 38-45.
10. Edet OB, Asuzu MC, Ofi B, Asuquo EF, Basse P. Perception, and experiences of infection control practices among professional nurses in secondary health facilities in south-south Nigeria. *International Journal of Nursing, Midwife and Health-Related Ases*. 2017. 3, 21-37
11. Nkansah C, Serwaa D, Adarkwah LA, Osei-Bookye F, Mensah K, TettehP, Awudu p, Apodola a. novel coronavirus disease: knowledge, practice, and preparedness: a survey of healthcare workers in the Offinso-North District, Ghana. *Pan Africa Medical Journal*. 2020; 35:79
12. Powell-Jackson T, King JJC, Makungu C, Spieker N, Woodd S, Rishi P, Goodman C. Infection prevention and control compliance in Tanzania outpatient facilities, a cross-sectional study with implications for the control of COVID-19. *Lancet Global Health*. 2020. 8: e78-89.
13. Geberemariyan BS, Donka GM, Wordofa B. Assessment of knowledge and practices of healthcare workers towards infection prevention and associated factors in healthcare facilities of West Arsi district southeast Ethiopia: a facility-based cross-sectional study. *Archives of Public Health*. 2018, 76:69. <https://doi.org/10.1186/s13690-018-0314-0>
14. Ogoina D, Ponder K, Adetunji B, Chima G, Isichei C, Gidado S. Knowledge, attitude and practice of standard precautions of infection control by hospital workers in two tertiary hospitals in Nigeria. *Journal of Infection Prevention*. 2015. 16, 16-25.
15. Cooper S, Wiyeh A, Schmidt B, Wiysonge CS. Cochrane corner: factors that influence compliance by healthcare workers with infection prevention and control guidelines for COVID-19 and other respiratory infections. *Pan African Medical Journal*. 2020. 35, 33.
16. WHO. WHO COVID-19 Social Science in Outbreak Response Perceptions of Health workers regarding health facility infection prevention and control procedures for COVID-19: A Research Template 2021. Available at: [https://cdn.who.int/media/docs/default-source/blue-print/perceptions-of-health-workers-regarding-ipc-procedures-in-health-facilities-v2.0-18082021-finalc.pdf?sfvrsn=7d5d09aa\\_5&download=true](https://cdn.who.int/media/docs/default-source/blue-print/perceptions-of-health-workers-regarding-ipc-procedures-in-health-facilities-v2.0-18082021-finalc.pdf?sfvrsn=7d5d09aa_5&download=true) [Accessed 11th September 2021]
17. Enabulele A, Aihevba E. The risk perception of COVID-19 and practice of precautionary measures amongst healthcare workers in the National Health Insurance Scheme clinic of a tertiary hospital in Nigeria. *Pan African Medical Journal*. 2021, 38, 10.11604/pamj.2021.38.73.27427.
18. Alao MA, Durudola AO, Ibrahim OR, Asinobi OA. Assessment of health workers' knowledge, beliefs, attitudes, and use of PPE for prevention of COVID-19 infection in low-resource settings. *Advances in Public Health*. 2020. Article ID: 4619214
19. Ngeh NE, Kuaban C. COVID-19: challenges and the impact on care in clinical settings in Cameroun. *Pan African Medical Journal*. 2020;35(Suppl 2):122. doi: 10.11604/pamj.supp.2020.35.24929.
20. Obaseki DE, Akoria OA, Mokogwu N, Omuemu CE, Okwara BU, Ogbogbado EO. Staff risk stratification in preparation for COVID-19 in a tertiary healthcare facility in Nigeria. *Pan African Medical Journal*. 2020, 35(Suppl 2), 124. Doi.10.11604/pamj.supp.2020.35.2.25095
21. Reuben RC, Danladi MMA, Saleh DA, Ejembi PE. Knowledge, Attitudes and Practices Towards COVID-19: An Epidemiological Survey in North-Central Nigeria. *J Community Health*. 2021; 46:457-470.