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Safety Precaution and Infection Control Practices among Dental Practitioners in Nigeria during the COVID-19 Pandemic

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ABSTRACT

***Background*: COVID-19 remains a major public health threat globally and dental practitioners are particularly at risk due to the proximity of care givers to the patient and the generation of aerosols during many dental treatment procedures. Dental practitioners are therefore required to strictly observe standard universal precautions in their clinical practice.**

***Objectives*: To determine the safety precaution and infection control practices among dental practitioners in Nigeria during the COVID-19 Pandemic.**

***Methods*: A cross-sectional self-administered pre-tested questionnaire based survey of consenting dental practitioners from different geopolitical zones in Nigeria was employed for the study. Study participants were recruited by non-random convenience sampling. Data were analyzed using Statistical Package for Social Sciences (SPSS) version 20.**

***Results*: A total of 105 out of 142 respondents completed and returned the survey questionnaire giving a response rate of 74%. About 24-55% of study respondents performed aerosol/splatter/droplet generating procedures. Hand hygiene and donning of face mask were the most common safety practices while the use of face shield and N95 facemask were common infection control practices. Over 60% of respondents practiced triaging of patients, pre-procedural mouth rinse and donning of disposable surgical gowns. Almost half of the respondents practiced decontamination of the clinic work environment and over 70% of respondents used N95 masks.**

***Conclusion*: Aerosol generating procedures were not uncommon dental practices in Nigeria during COVID-19 pandemic. However, use of N95 mask was relatively high and there was a reasonable level of practice of basic standard COVID-19 safety measures and infection prevention and control guidelines.**

Keywords: COVID-19 pandemic, dentists, infection control, Nigeria, safety measures.

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I. Introduction

Corona virus disease-19 (COVID-19), a recent major global public health burden caused by Severe Acute Respiratory Syndrome Corona Virus 2 (SARS-CoV-2) was first described in December 2019 in Wuhan, China's Hubei province capital city. The virus rapidly spread across the globe resulting in COVID-19 being declared a public health emergency of international concern (PHEIC) on January 30, 2020 by the World Health Organisation and subsequently a full blown pandemic on March 11, 2020 [1]. Nigeria reported her first case of COVID-19 on February 27, 2020 and by June 7, 2020 12,486 COVID-19 positive cases had been reported in the country of which 354 of the affected persons died [2]. Furthermore, between February 27, 2020 and July 8, 2022 a total of 257,637 cases of COVID-19 with 3,144 deaths were reported to the World Health Organization from Nigeria [3]. As at June 26, 2022, 50,619,238 COVID-19 vaccine doses had been administered in Nigeria [3].

COVID-19 remains a major public health threat globally and oral health care has been particularly impacted due to the proximity of care givers to the patient and the generation of aerosols, droplets and splatter during many dental treatment procedures. Dental practitioners in Nigeria were therefore required to adhere strictly to observing standard universal precautions and infection control guidelines in their clinical practice [4].

Aerosol-generating procedures have been the focal point of concern with respect to the challenge of COVID-19 to clinical dental practice since dental practitioners are among the most

vulnerable to infections transmitted through contaminated aerosols, saliva, bodily fluids, blood, or tissues [5]. There is evidence to suggest that three main pathways are important for SARS-CoV-2 transmission in dental settings namely: direct transmission through inhalation of cough, sneeze, or droplets containing the virus; transmission via eye, nasal, or oral mucous membranes; and contact transmission through contaminated surfaces [6].

Infection prevention and control armamentarium includes personal protective equipment (PPE) such as face masks, eye goggles, hand gloves, face shields and surgical gowns. It also involves hand hygiene, pre-procedural mouth rinsing, disinfection of all surfaces and other outside clinical areas commonly used by staff and patients, four-handed dental procedures, avoidance of aerosol generating procedures, and use of extra-oral radiography [6]-[10]. Personal protective equipment shields dental practitioners from contact with blood, saliva and droplets thereby preventing cross infection for all aerosol and non-aerosol generating procedures [11]-[13]. The use of pre-procedural mouth rinses should be considered routine in clinical dental practice because it could prevent the spread of the virus by reducing the number of microorganisms released from patient's saliva during splatter [14]. In clinical trials, povidone-iodine-based mouth rinses appeared to be the most effective oral pre-procedural mouth rinse in the context for SARS-CoV-2 viral load reduction [15].

A survey study of dental practitioners in Nigeria found that aerosol generating procedures (98.7%), contaminated surfaces (98.1%), droplets (97.5%), Saliva (90.8%) and contaminated instruments (86.9%) were the most important risks for SARS-Cov-2 transmission in the dental clinic setting [16]. The study also noted that ultrasonic scaling, crown preparation, third molar disimpaction, and root canal therapy were the highest aerosol generating procedures [16]. Also, about 38% of respondents reported the availability of a dedicated screening bay or tent to attend patients on arrival [16]. Moreover, most of respondents in that study had hand hygiene stations with alcohol-based sanitizer and wash hand basins being utilized in similar proportions. Furthermore, about 90% of respondents reported that surgical gloves and surgical masks were the most readily available PPE in the clinic followed by face shields and goggles [16]. Only about 46% and 10% of the study participants reported availability of N95 and KN95 masks respectively in the survey study [16]. Concerning the sufficiency and availability of the PPE, most respondents reported that the supply was either insufficient or not regular [16]. Furthermore, reported cases of PPE insufficiency and non-regular availability were significantly higher in public sector dental clinics [16].

In another study from Benin in south-south Nigeria, just over half of dental practitioners studied used PPE such as respiratory masks and isolation gowns [17]. The two types of PPE were similarly either generally unavailable or were limited in availability especially in the public sector practice setting [17]. Like in the study by [16], the most common available PPE were surgical face masks, hand gloves and face shields. The study also found that despite the fact that the use of rubber dams in restorative dental procedures helps provide barrier protection against aerosols thereby limiting or eliminating the spread of microorganisms from saliva of respiratory secretions of patients, majority of the dental practitioners in the study did not employ rubber dams routinely in their practice [17]. These observations were not unrelated to the increased cost of providing dental care in the face of limited available resources coupled with diminished patient turnover [17].

Thus, implementation of optimal guidelines and safety protocols for effective COVID-19 infection prevention and control is a major challenge for clinical dental practice in Nigeria due to paucity of available material resources. This study therefore sought to determine the safety measures and infection control practices among Nigerian dental practitioners in both the private and public sectors during the COVID-19 pandemic.

II. Materials and Methods

This was cross-sectional, descriptive study with non-random convenience sampling design. The sample size of 105 was completely based on convenience. The number of licensed dental practitioners in Nigeria has varied over the years from 2,598 in year 2000 (of which 35.1% were females) [18] to 3000 dentists in 2012 [19] and 4,060 by 2017 [20]. A significant number of these licensed dentists are in diaspora.

The setting was a Nigerian Dental Association (NDA) Annual Scientific Conference in Abuja, Nigeria's capital city and the study participants were dentists from different states and geopolitical zones of Nigeria attending the conference. The respondents which included dental professionals in public and private sector practice and from diverse clinical specialty backgrounds were physically contacted to complete the self-administered survey questionnaire designed for the study.

A self-administered questionnaire was employed for the study and was distributed to a total of 142 consenting dental practitioners. Of this number 105 study participants completed and returned their copies giving a response rate of 74%. The questionnaire had three main sections:

1. Sociodemographic.
2. COVID-19 pandemic safety measures observed by respondents, and
3. Infection control practices of study respondents.

Statistical Package for Social Sciences (SPSS) version 20 was used to analyze study data while descriptive statistics were used to compute mean and standard deviation and chi-square for association. Level of significance was set at $P < 0.05$.

III. Results

A total of 105 respondents completed and returned the survey questionnaire giving a response rate of 74%. The age of respondents ranged from less than 29 years to 60 years and above (Mean±SD 49.38±9.7 years). Fifty-seven respondents (54.3%) were males and 48 (45.7%) were females. In terms of professional qualifications 36 respondents (34.3%) had postgraduate fellowship qualifications while 13 respondents (12.3%) had a master's degree, and 4 respondents had a doctorate (PhD) degree. Also, 53 of the respondents (50.5%) were specialists while 52 (49.5%) were not.

Table I shows the distribution of number of years of clinical practice of respondents. In terms of sector of clinical practice, majority of the respondents (75.2%) were in public sector healthcare practice while 24.8% were in private sector practice.

With respect to geopolitical location of respondents' clinical practice southwest geopolitical zone was the commonest location of dental practitioners (41.9%) followed by the federal capital territory, Abuja (31.4%) (Fig. 1).

Table II shows 24-55% of study respondents performed aerosol/splatter/droplet generating procedures such as cavity preparation, surgical extraction, and endodontic procedures, third molar surgery, crown/bridge preparation, ultrasonic scaling and dental implant during the COVID-19 pandemic. While cavity preparation (54.7%) was the most common aerosol generating procedures, dental implant (12.4%) was the least common aerosol generating procedure carried out by respondents. There was no statistically significant difference in the practice of aerosol/splatter/droplet generating procedures between public sector and private sector practitioners (p = 0.076) (Table II).

With respect to respondents' practice of COVID-19 safety precaution measures, hand washing, use of hand sanitizers and donning of face mask were the commonest safety precaution practices (Table III). All the respondents practiced hand hygiene and use of face masks during the early period of the pandemic. The practice of donning facemask (97%) and hand washing (92.4%) remained very high among respondents even after pandemic lockdown while the practice of physical or social distancing (84.8%) and patient temperature checks (64.7%) reduced significantly after the pandemic lockdown was lifted, compared to 91.4% and 84% respectively during the early period of the pandemic (Table III). There was no statistically difference between respondents in public sector practice and those in the private sector practice with respect to observation of Safety precautions both during the early period of the pandemic (p= 0.645) and after the pandemic lockdown was lifted (p=0.204) (Table III).

The most common infection control practice in this study was use of face shield personal protective equipment (91.4%) while 74.3% of respondents reported using N95 masks (Table IV). Less than two-thirds of respondents practiced triaging of patients (59%), pre-procedural mouth rinse (61.9%) and donned disposable surgical gowns (64.8%) respectively. Less than half (46.7%) of the study respondents practiced decontamination of the clinic work environment. There was no statistically significant difference between respondents in public sector practice and those in the private sector with respect to practice of infection control measures (p= 0.924) (Table IV). Also, most (88.6%) of the respondents did not require a negative COVID-19 screening test result from their patients before attending to them and there was no statistically significant difference between respondents in public sector practice and those in the private sector with respect to this (p=0.490) (Table IV).

About thirty-five per cent of all the respondents took a COVID-19 test during the pandemic. While 42.3% of the respondents in private practice took the test, 32.9% of respondents in public sector practice also took the test. However, the difference in uptake of COVID-19 testing between the two clinical practice sectors was not statistically significant (p = 0.384) (Table V).

Also, just below 95% of respondents perceived the COVID-19 pandemic Safety measures to be effective and this perception did not differ significantly between respondents in public sector practice and those in the private sector with respect to this (p=0.63) (Table VI).

TABLE I: DEMOGRAPHICS

Variable	Frequency	Percent
Age of dentists		
Less than 29 years	5	4.8
30 – 39 years	43	41.0
40 – 49 years	28	26.7
50 – 59 years	23	21.9
60 years and above	6	5.7
Total	105	100.0
Mean ±SD = 49.38±9.7 years		
Gender of dentists		
Female	48	45.7
Male	57	54.3
Total	105	100.0
Postgraduate Educational Qualification		
Postgraduate Fellowship	36	34.3
Masters	13	12.3
PhD	4	3.8
Others	6	5.7
Respondents that are Specialists		
Non specialists	52	49.5
Specialists	53	50.5
Total	105	100.0
Respondents' Years of Clinical Practice		
1- 9 years	29	27.6
10-19	42	40.0
20-29	21	20.0
30-39	13	12.4
Total	105	100.0
Sector in which respondents work		
Private	26	24.8
Public	79	75.2
Total	105	100.0

TABLE II: AEROSOL/SPLATTER/DROPLET GENERATING PROCEDURES RESPONDENTS PERFORMED DURING COVID-19

Variable	Respondents' Sector of dental practice (No.)					
	Private	Public	Total (%)	X^2	df	P
				12.83	7	0.076
Cavity preparation	18	35	55(54.7)			
Surgical extraction	17	33	50(47.6)			
Endodontics	15	27	42(40)			
Crown/bridge preparation	13	20	33(31.4)			
Implant	7	6	13(12.4)			
Third molar surgery	14	29	43(41)			
Scaling with ultrasonics	18	15	33(31.4)			
Others	4	22	26(24.8)			

NB: ** means area of statistically significant relationship (P value ≤0.05)

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TABLE III: RESPONDENTS COVID-19 SAFETY PRACTICES

	Respondents' Sector of practice (No.)			X^2	df	P
Safety precautions respondents observed	Private	Public	Total (%)	3.35	5	0.645
Social distancing	26	70	96 (91.4)			
Use of facemask	25	79	104 (99)			
Hand washing	25	79	104 (99)			
Use of sanitizers	25	78	103 (98)			
Temperature checks	21	63	84 (80)			
Others	1	11	11 (11.4)			
Safety precautions still observed by respondents after pandemic lockdown				7.22	5	0.204
Social distancing	18	71	89 (84.8)			
Use of facemask	24	78	102 (97)			
Hand washing	22	75	97 (92.4)			
Use of sanitizers	23	69	92 (87.6)			
Temperature checks	16	52	68 (64.7)			
Others	2	4	6 (5.7)			

TABLE IV: INFECTION CONTROL PRACTICES OF RESPONDENTS

Infection control measures respondents observed in their clinics	Sector of respondents			X^2	df	P
	Private	Public	Total (%)	3.35	9	0.924
Decontaminating the air	16	33	49 (46.7)			
Face shield	24	72	96 (91.4)			
N95	20	58	78 (74.3)			
Mouth rinse for patients	18	47	65 (61.9)			
Temperature check for staff	22	54	76 (73.4)			
Temperature check for patient	23	64	87 (82.9)			
Reorganization of the clinic area	16	50	66 (62.9)			
Triaging of patients	13	49	62 (59)			
Use of disposable surgical gown	21	47	68 (64.8)			
Use of hazmat suit	4	19	23 (23.9)			
Did you require the patient to have a negative Covid-19 test for dental procedures?				0.477	1	0.490
No	24	69	93 (88.6)			
Yes	2	10	12 (11.4)			
Total	26	79	105 (100)			

TABLE V: UPTAKE OF COVID-19 TEST BY RESPONDENTS

	Private sector (%)		Public sector (%)		Total (%)		X^2	df	P value
No	15	57.7	53	67.1	68	64.8			
Yes	11	42.3	26	32.9	37	35.2	0.757	1	0.384
Total	26	100.0	79	100.0	105	100.0			

Public versus Private sector practitioners (p = 0.384)

TABLE VI: RESPONDENTS' PERCEPTION OF EFFECTIVENESS OF SAFETY MEASURES

What sector do you work in?	Do you think these safety precaution measures are effective?				Total		X^2	df	P value
	No		Yes						
	N	%	N	%	N	%			
Private	1	3.8	25	96.2	26	100			
Public	5	6.3	74	93.7	79	100	0.224	1	0.63
Total	6	5.7	99	94.3	105	100			

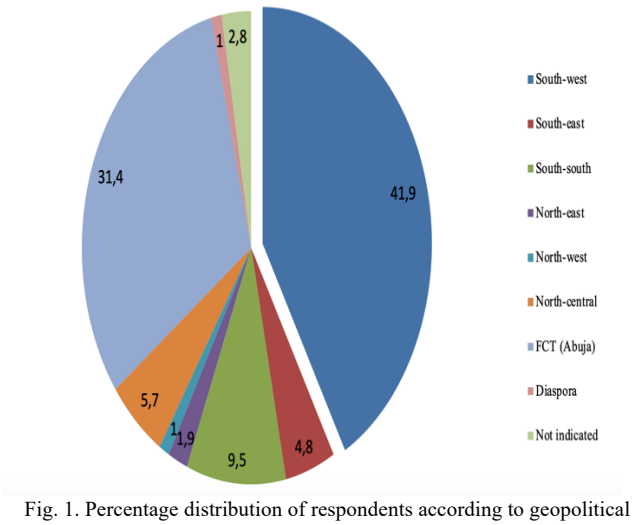

Fig. 1. Percentage distribution of respondents according to geopolitical zones of Nigeria.

IV. DISCUSSION

The response rate of 74% for respondents in this study was similar to the response rate of other previous studies such as 74.5% reported by [21] in a study of perceived impact of the COVID-19 pandemic on orthodontic practice in Nigeria, and 75% reported by [22] in a study of Nigerian dentists' knowledge of aggressive periodontitis. Also, the predominance of male dental practitioners and predominant age distribution of respondents in this study were similar to those of other studies both locally and internationally [17]-[19], [23]. The average number of years of clinical dental practice of respondents in this study was similar to that of another study from Nigeria [16]. Moreover, while private sector dental practitioners constituted about 25% of the respondents in this study, they comprised 14% of the respondents in the similar study from Nigeria [16]. Again,

just over half (50.5%) of respondents in this present study were specialists in various fields of dentistry compared to 28% of respondents in the study by [16] and 70.6% in a global survey study involving 29 countries [23]. The relatively higher distribution of location of dental practitioners in the south-west, south-south and north-central geopolitical zones of Nigeria in this study aligns with the pattern previously reported by [16] and [19] albeit there was a higher distribution in the north-west geopolitical zone than north-central geopolitical zone in the latter.

In the present study, about 24-55% of dental practitioners performed aerosol/splatter/droplet generating procedures such as cavity preparation, surgical extraction, and endodontic procedures during the COVID-19 pandemic. Third molar surgery, crown/bridge preparation ultrasonic scaling and implant were less common aerosol generating procedures carried out during the pandemic. A previous survey study of dental practitioners in Nigeria during the COVID-19 outbreak found that aerosol generating procedures were the most important risk factors for SARS-Cov-2 transmission in the dental clinic setting [16]. This practice was contrary to the recommendation from various guidelines for clinical dental practice on the avoidance of aerosol generating procedures in order to minimize risk of COVID-19 transmission in the dental clinic setting [6]-[10].

Most dental practitioners in this study practiced COVID-19 safety precaution measures such as social distancing, hand washing, use of hand sanitizers, donning of face mask and temperature checks; with hand washing, use of hand sanitizers, donning of face mask as the most common safety practices. Even at the time of this study, when the pandemic lockdown had since been lifted, the practice of hand washing and donning of face mask remained very high whereas the practice of physical distancing and temperature checks had dropped significantly. Reference [16] in a previous study from Nigeria also showed the use of face masks, hand hygiene and social distancing as the most commonly practiced general preventive measures for COVID-19. This present study, In this present study, there was no significant difference between o the public and private sector dental practitioners with respect to the observation of COVID-19 safety precaution measures.

The most common infection control practice in this study was use of face shield personal protective equipment (PPE). About sixty per cent of the dental practitioners practiced triaging of patients and pre-procedural mouth rinse and donned disposable surgical gowns. Less than half of the dental practitioners practiced decontamination of the clinic work environment. However, most of the dental practitioners (74%) also used N95 masks. This was higher than the figure of 46% of dental practitioners who used N95% in another Nigeria study [16]. Also, in a study from Benin City in south-south geopolitical zone of Nigeria involving restorative dental practitioners only about half of the dental practitioners used PPE such as respiratory masks and isolation gowns as the two types of PPE were either generally not available or were limited in availability especially in the public practice setting [17]. A collaborative study carried out during this COVID pandemic and based on an international survey found the use of N95/FFP2 masks significantly reduced the chances of the dental professionals reporting symptoms/signs related to the disease, while other types of PPEs seemed less relevant for SARS-CoV-2 protection [24]. There was no significant difference between infection control practices of the public and private sector dental practitioners in this present study.

In this study, most of the dental practitioners did not require prior negative COVID-19 screening test for patients. Furthermore, the uptake of COVID-19 screening test by dental practitioners themselves was about 35%. While real-time polymerase chain reaction (PCR) screening test is considered the 'gold standard' for the detection of SARS-CoV-2 due to its high sensitivity and specificity [25], it is too expensive to be employed for routine COVID-19 screening. Moreover, it requires specially trained personnel to carry out. The less expensive COVID-19 antigen based rapid diagnostic screening test (RDT) does not require specialized training to carry out and is approved by the World Health Organization [25].

Antigen-based COVID-19 RDT can deliver results within 30 minutes of testing and its sensitivity is above 80%. It could therefore be deployed in the triage process of clinical dental practice [26]. However, at a cost of about 25 USD per test, it is still too expensive for most people in a country like Nigeria where the current minimum monthly wage is less than 75 USD [26].

Nearly all the dental practitioners in this study considered their COVID-19 safety and infection control measures effective and this perception did not differ between the public and private sector dental practitioners. However, the implementation of optimal guidelines and safety protocols for effective COVID-19 infection prevention and control is a major challenge for dental care practice in low resource setting giving the paucity of material resources [26]. Universal guidelines and standard operating procedures for infection prevention and control, which cover clinical work, workspace environment as well as the principles guiding their practices have been well formulated and should be strictly followed to protect dental practitioners, other dental staff and the patients they serve [27].

Following the COVID-19 pandemic, the Federal Ministry of Health in Nigeria [2], other national public health agencies such as the United States Centers for Disease Control and Prevention (CDC [28], as well as professional associations [29]-[31] issued specific guidance for the control of SARS-CoV-2 in dental practice. These recommendations focus on three main areas namely: patient management and teledentistry to prevent sick or possibly infected patients from coming to the practice; enhanced infection-control measures that include stringent protocols for personal protective equipment (PPE); limiting dental care to urgent and emergency procedures [32]. In the United States, the Occupational Safety and Health Administration (OSHA) requires telephone triage, office engineering controls that include air circulation and patient isolation, universal precautions for airborne pathogens, the use of PPE appropriate for the pandemic, limiting care to urgent and emergency procedures that do not generate aerosols, and environmental cleaning post-care [33].

Measures that are beyond routine standard dental infection-control procedures like hand hygiene, pre-procedural mouth rinsing, use of PPE like face masks, hand gloves, surgical gowns, protective eye goggles or face

shields, require significant infrastructure investments that are out of reach for low-income countries due to limited availability or high cost of the supplies [26], [32]. For instance, providing dental care for COVID-19 infected individuals in special settings known as Airborne Infection Isolation Rooms (AIIRs) specially designed to isolate airborne pathogens to a safe containment area by creating negative differential pressure [34] is not available in low resource settings such as Nigeria. The implication of this is that COVID-19 positive individuals may not be able to access dental care services in low resource settings like Nigeria.

V. Conclusion

This study found a significant level of practice of aerosol generating procedures among dental practitioners in Nigeria contrary to the recommendation of clinical guidelines that such procedures be avoided in order to minimize risk of COVID-19 transmission in the dental clinic setting. The study also found a high level of practice of standard COVID-19 safety measures but relatively lower level of practice of infection prevention and control guidelines. The use of N95 mask which has been noted to significantly reduce the risk of COVID-19 in dental professionals [24] was also relatively high. Although nearly all the dental practitioners in this study considered their COVID-19 safety and infection control practices to be effective, the implementation of optimal guidelines and safety protocols for effective Covid-19 infection prevention and control is a major challenge for dental care practice in low resource settings such as Nigeria due to paucity of available material resources.

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Conflict of Interest

Authors declare that they do not have any conflict of interest.

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