

Nigerian Dentists Knowledge and Compliance with Changes in Infection Prevention and Control Protocols for Dental Treatment in the Covid-19 Era.

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ABSTRACT

Objective: To assess the knowledge, practice changes and level of compliance of dentists in Nigeria regarding infection prevention and control (IPC) measures required for dental treatment in the Covid-19 era.

Methods: This study was part of a national descriptive online survey conducted using google platforms. Information on socio-demographics, knowledge, management practices, access to dental care and willingness to treat patients during the COVID-19 pandemic were obtained using a 32 item validated self administered questionnaire. Chi-square test was used to determine the association between categorical variables.

Results: A total of 327 dentists in public (78.9%) and private (21.1%) owned clinics in 6 geopolitical zones of the country participated in the survey with a mean age of 39.9 ± 9.8 years.

The overall level of knowledge of COVID19-related IPC measures when managing dental patients was good (84.1%). However, knowledge of critical aspects of IPC such as appropriate use of personal protective equipment, was not optimal. Similarly, there were several changes in management practices for dental conditions by dentists but compliance levels with IPC protocols were poor (59.3%). There was a significant association between knowledge and level of compliance with IPC practices.

Conclusion: There was a good level of knowledge of IPC protocols and the attendant changes arising from the COVID19 pandemic among Nigerian Dentists, however, the compliance level to these IPC measures was poor. Also, knowledge was less than optimum in some aspect. Considering the high infectivity of the virus, there is a need to continuously educate dentists on all aspects of IPC against this very contagious disease to guarantee personnel and patient safety.

Keywords: Dentist, COVID-19, Knowledge, Practice, Pandemic.

INTRODUCTION

The Corona virus disease, (Covid-19) pandemic is arguably one of mankind's most devastating pandemic and is changing the world in so many ways. The disease is caused by the Severe Acute Respiratory Syndrome Corona Virus 2 (SARS-CoV2) infection, a member of the corona virus family. Since the emergence of the first case in Wuhan, China in December 2019, and its declaration as a pandemic by the World Health Organisation (WHO) on the 11th of March, 2020, there has been an unprecedented increase in the number of confirmed cases globally. Millions of people have been infected, died and still

counting (WHO 2020): Nigeria, the most populous African nation has recorded over two hundred and ten thousand cases and more than two thousand, nine

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hundred deaths as at November 1st, 2021 (NCDC Report 2021). This is an obviously modest estimate considering the gross inadequacies in testing.

The SARS-CoV2 is a highly contagious virus that can be spread via respiratory droplets generated when a person talks, coughs or sneezes in close proximity of less than 6 feet to others. The virus is also spread indirectly by contact with contaminated surfaces and items (Van Doremalen et al., 2020). Studies have shown more viral stability on plastic and stainless steel surfaces when compared with copper and cardboard with viability of up to 72 hours (van Doremalen et al., 2020; Zhang, 2020).

SARS-CoV2 has a strong binding affinity to the angiotensin converting enzyme 2 (ACE 2), through its receptor binding domain (Zhang H, 2020, Hamming I et al, 2020). ACE 2 has been found to be expressed in the nasal and oral mucosa as well as in the type I and II alveolar epithelial cells in the normal lungs (Zhang, 2020, Hamming et al, 2020.). As a result, there is a high risk of transmission to health care workers and especially to dental healthcare workers who are constantly exposed to the oral mucosa (Zhang et al., 2020, Hamming et al, 2020, CDC 2020; Gamio, 2020). The nature of most dental procedures and practices are predominantly invasive and may include frequent use of aerosol generating instruments (Peditto et al., 2020). Added to this fact is that dentistry entails working in close proximity to the patient's oral and nasal mucosa, thus rendering the dental work-place a potential point of transmission of the SARS-CoV2 virus for the dental professional and the patient (CDC 2020). Further, with increasing knowledge and evolving data on the dynamic nature of the infection, its mode of transmission and sometimes asymptomatic presentation, various international and national health associations have developed guidelines for enhanced infection prevention and control in the dental clinic environment. (CDC, 2020; Peditto, et al., 2020; NDA, 2020; ADA 2020; Alharbi, 2020). Prominent among these is the directive for dental treatment to be restricted to only urgent complaints. Such complaints include but are not limited to severe dental pain from pulpal infection, dental emergencies such uncontrolled bleeding, rapidly spreading infections and maxillofacial fractures that may compromise the airway (Alharbi, 2020; CDC 2020).

In Nigeria, at the inception of the pandemic, the Nigerian Dental Association (NDA) recommended dental treatment for only emergency cases, advising for a drastic down scaling of other activities in consonance with WHO, Nigeria Center for Disease Control (NCDC) and the Federation Dentine International (FDI) guidelines (NDA 2020).

Generally, retraining of staff, triaging of patients, tele-health consultation, maintenance of IPC measures including appropriate use of PPE have been promoted to reduce spread of the infection. In addition, measures such as minimal intervention dentistry, use of pre-procedural mouth wash, rubber dam and high- efficiency particulate air (HEPA) filters have been advocated. Other strategies include: pre-procedural mouthwash use, use of rubber dam, use of dental hand pieces with anti-retraction valves, use of a high volume evacuator and high efficiency particulate (HEPA) filter (Ge et al., 2020;

Peng et al., 2020). Extra precautionary measures such as use of powered air purifying respirators (PAPR) have also been recommended for suspected or confirmed cases of the infection who present with emergency dental complaints (CDC, 2020).

COVID-19 has challenged health systems globally and the proportion of health care professionals that have been infected globally is high (Legnani, 1994; Peditto et al., 2020; Peng et al., 2020). With the high prevalence of COVID-19 cases in a resource constrained country like Nigeria, it is yet to be ascertained how dental professionals are adjusting to the changes in IPC criteria during management of patients in dental clinics.

In order to ensure adherence to new IPC protocols in clinical settings, there is need to first assess the level of knowledge of dentists on the new IPC guidelines. Also, the necessity to critically review processes to improve service delivery and ensure safety of personnel and patients cannot be over emphasized. It is therefore important to audit practices and compliance with standard guidelines during care for patients at such times. Thus, this study aims to assess the knowledge and compliance of Nigerian dentists to infection prevention and control protocols while treating patients in the COVID-19 pandemic era.

MATERIALS AND METHODS

The study was a descriptive cross-sectional study that was conducted between September and October, 2020. Ethical approval (Ref no ADM/DSCT/HREC/APP/3818) for the study was obtained from the Health Research and Ethics Committee of the Lagos University Teaching Hospital, Idi-araba Lagos, Nigeria. Consent was implied by the filling of the questionnaire after reading the purpose and intent of the research which was well explained in the introductory part of the questionnaire. A national online electronic survey of dentist in Nigeria was done. A directory of registered dentists in Nigeria was obtained from the Nigeria Dental Association (NDA) and participants were reached directly via electronic mails and through the NDA social media handle on whatsapp. The study population consisted of 327 practicing dentists spread across the geopolitical zones in the country after arriving at a calculated sample size of 318 using the Cochran formula for sample size calculation when conducting surveys. An estimated Nigerian dentist population of 4000 (NDA, 2020) was used.

A 32-item validated, self-administered questionnaire was distributed to consenting participants through an online data collection platform (Google forms). The questionnaire was designed by a group of experts using the NCDC, CDC and WHO guidelines. Face and content validity for comprehensibility, relevance and straightforwardness with a score of 0.92 respectively was done. A pretesting of the instrument was done in a pilot study conducted among 15 dentists and the reliability of the instrument was ascertained with a Cronbach's alpha score of 0.81. The questionnaire began with an introductory explanation of the purpose of the study and

anonymity of each participant was emphasized and ensured. The questionnaire consisted of 3 sections. Section A obtained socio demographic information of the participants; section B assessed their level of knowledge of the current infection control protocol recommended when managing dental conditions during the COVID-19 pandemic. Level of knowledge was assessed using 9 questions with 55 options. Each correct answer was scored 1 and incorrect answer score 0. Total score for each questionnaire was thus 100 and the scores were graded as good (70% and above) and poor (69% and below) according to a previous study (Alhumaid et al., 2021). Similarly, section C evaluated the infection control and preventive measures adopted among dentists practicing in Nigeria during the COVID-19 era. Here, four questions with 25 options were used to assess compliance to COVID-19 guidelines. Each questionnaire was multiplied by 4 to give a total score of 100. A score of 69% and less was considered poor compliance while a score of 70% and above was considered good compliance (Alhumaid et al., 2021).

Data analysis was carried out with the IBM SPSS version 20.0. Frequencies and percentages were determined to present categorical variables while mean and standard deviation represented numerical data. Shapiro-Will's normal distribution test was used to determine the normality of variables. Chi-square test was used to test for association of categorical variables with the level of significance set at $p < 0.05$ with a 95% confidence interval.

RESULTS

A total of 327 dentists practising in government and private owned clinics in the 6 geopolitical zones of the country participated in the survey. There were 185 males (56.6%) and 142 females (43.4%) with a mean age of 39.9 ± 9.8 years. A total of 78.9% of the respondents work in the public sector and 21.1% in the private sector. The highest proportion of dentists, 124 (37.9%) are in General Dental Practice while Prosthodontists were the least with 11 (3.4%) respectively (Table 1).

Table 1: Sociodemographic characteristics of the participants.

Variable	Frequency (n=327)	Percent (%)
Age group (years)		
20-29	52	15.9
30-39	126	38.5
40-49	90	27.5
50-59	43	13.1
≥ 60	16	4.9
Mean \pm SD	39.95 \pm 9.8	
Gender		
Male	185	56.6
Female	142	43.4
Years of practice		
1-5 years	92	28.1
6-10 years	60	18.3
11-15 years	77	23.5
16-20 years	18	5.5
≥ 21 years	80	25.4
Specialty		
Community dentistry	28	8.6
Conservative dentistry	24	7.3
General dental practice	124	37.9
Oral and maxillofacial surgery	49	15
Oral medicine	12	3.7
Oral pathology	14	4.3
Orthodontics	23	7.0
Pediatric dentistry	18	5.5
Periodontology	24	7.3
Prosthetic dentistry	11	3.4
Type of Practice		
Private	69	21.1
Public	258	78.9

Nearly all respondents were knowledgeable about hand hygiene guidelines. However, as much as 21.7% were unaware that hand sanitizer should not be used on visibly soiled hands. Also, a sizeable number knew

administrative control was an essential part of infection control (Table 2).

Regarding the appropriate use of personal protective equipment, 68.2% thought disposable aprons and use of

N95 respirators were compulsory before examining every patient.

On knowledge of aerosol generating procedures, nearly half of the respondents (41.1%) could not identify the use of low speed hand piece as aerosol generating and 34.6% of them did not know surgical extraction was aerosol generating (Table 3). Similarly, as much as 16.2% of the participants were unaware that goggles should be worn when carrying out aerosol generating procedures. Also, 27.2% and 11.7% of the dentists did not know that four handed dentistry and the use of rubber dam were compulsory when undertaking aerosol generating procedures during the COVID-19 era respectively. Generally, a large proportion of the respondents (84.1%) demonstrated good knowledge with a score of 70 and above (Figure 1). However, 15.9% of respondents had poor knowledge. Greater than half, {57.5%} of the

respondents failed to remove magazines, toys, and other objects that could constitute fomites in the dental clinic (Table 4). Also, as much as 29.3% were still not implementing 6 feet-apart social distancing rule in their practice. Slightly greater than half {52.3%} of respondents staggered and gave at least 30 minutes in between procedures in their clinics while as much as 57.5% did not see the need to employ remote consultation when appropriate. There was poor use of pre-procedural practices. Less than half {50%} of respondents used pre-procedural mouth rinses and as high as 82% of the respondents were still taking intra-oral radiographs. A majority of the respondents had poor level of compliance with infection prevention and control practices. (Table 5). There was a statistically significant association between knowledge and compliance with infection prevention and control protocols (Table 6).

Table 2: Knowledge of recommended infection control guidelines for Covid-19.

Variable	Frequency (327)	Percent (%)
Infection control procedure required for dental care during COVID-19 period		
Regular hand washing with alcohol based hand sanitizer and water for 20-30secs	324	99.1
Administrative control	241	73.7
Use of appropriate personal protective equipment	318	97.2
Use of hand sanitizer when hand is visibly soiled	71	21.7
Washing hand only after touching patients	25	7.6
When handwashing should be done when treating dental patients		
Before examination of patients	287	87.8
After examination of patients	298	91.1
After treating patients	317	96.9
Before treating patients	284	86.9
After touching environmental surface when treating patients	265	81.0
Method of Hand hygiene		
Alcohol based sanitizer for 30-40seconds	139	42.5
Alcohol based sanitizer for at least 20 secs	239	73.1
Soap and water for 30-40seconds	289	88.4
Soap and water when hand is visibly soiled	271	82.9
Alcohol based sanitizer when hand is visibly soiled	22	6.7
PPE appropriate for the examination of dental patients include		
Surgical face mask	304	93.0
Face shield	286	87.5
Gloves	323	98.8
Respirator N95	177	54.1
Goggles	240	73.4
Disposable aprons	223	68.2
PPE appropriate for non-aerosol generating procedure in dentistry		
Surgical face mask	293	89.6
Face shield	261	79.8
Respirator N95	64	19.6
Gloves	311	95.1
Goggles	225	68.8
Disposable aprons	236	72.2
Measures recommended for prevention of COVID-19 while treating dental patients		
Use of appropriate PPE	326	99.7
Use of extra oral radiograph	190	58.1
Time scheduling dental appointment	298	91.1
Practice of regular hand hygiene	319	97.6
Use of pre-procedural mouth rinse	288	88.1

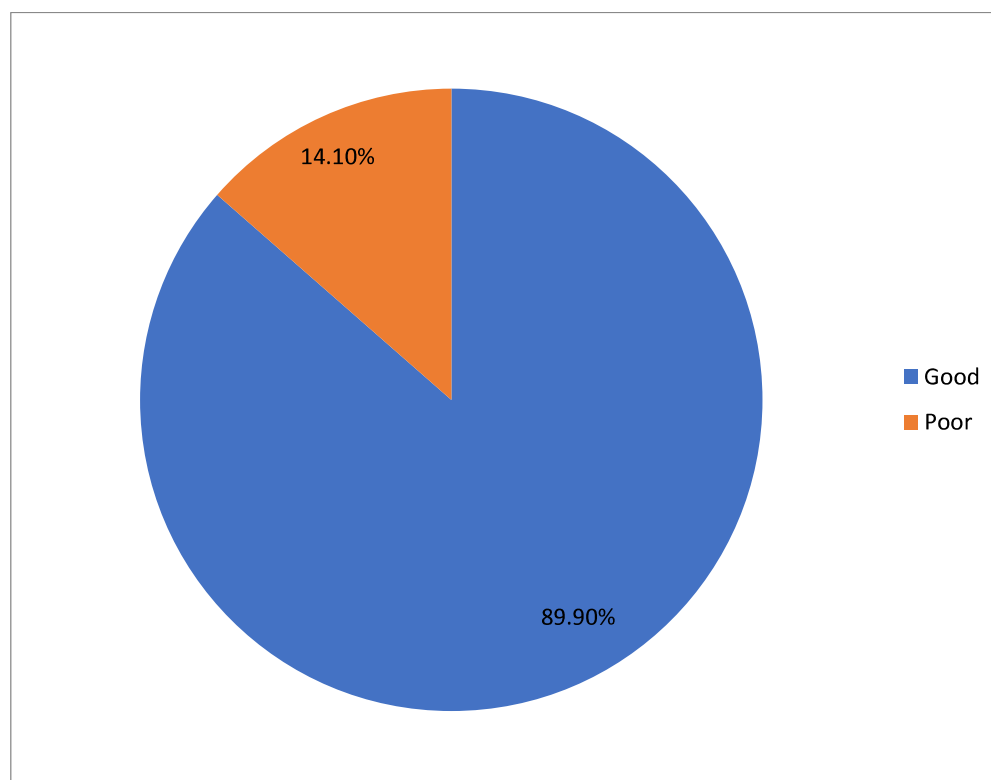


Figure 1:.Overall infection and prevention control knowledge of respondents.

Table 3: Knowledge of recommendations for aerosol generating procedures.

Infection control procedure required for dental care during COVID-19 period.	Frequency (327)	Percent (%)
Dental aerosol generating procedure		
Use of high speed hand pieces for routine restorative procedure	322	98.5
Use of Cavitron, Pizosonic or other mechanized scaler	309	94.5
High pressure 3:1 air syringe	245	74.9
Taking intraoral radiograph	47	14.4
Surgical extraction	214	65.4
Use of low speed hand piece	196	59.9
PPE appropriate for aerosol generating procedure in dentistry		
Face shield	315	96.3
Surgical face mask	220	67.3
Disposable aprons	310	94.8
Respirator Ng5	309	94.5
Gloves	316	96.6
Goggles	274	83.8
Preventive measures that can be applied when undertaking aerosol generating procedure		
Use of positive pressure room	64	19.6
Use of high speed dental hand pieces with anti-retraction valves	98	30.0
Use of air-condition and close window	22	6.7
Use of High efficiency particulate filter (HEPA)	249	76.1
Use of rubber dam	292	89.3
Taking intraoral radiograph	47	14.4

Table 4: Work practices and compliance with infection prevention and control protocol in the Covid-19 era.

Variable	Frequency (n)	Percent (%)
Appointment staggered giving at least 30 minutes to 1 hour in-between patients appointment	171	52.3
Use of telephone to conduct remote problem focused evaluation	139	42.5
Schedule appointment to minimize the number in waiting room	262	80.1
Limit patient care to one patient operating/room in a multi-chair centre	175	53.5
Magazine, toy and objects that may be touched were removed	132	40.4
Seating arrangement in the waiting room at least 6 feet apart	230	70.3
Limiting facility visitor essential services	118	70.3
Pre-procedural changes adopted in your dental clinic		
Use of chlorohexidine mouthwash as pre-procedural mouthwash	111	33.9
Use of extra oral panoramic radiograph instead of of intra oral radiograph	59	18.0
Use of 1.5% hydrogen peroxidase as pre-procedural mouthwash	156	47.7
Dental procedure carried out in individual dental clinic		
All dental procedure	133	40.7
All non-aerosol generating procedure	53	16.2
Only emergency dental procedure	139	42.5
Clinic not attending to dental patient	2	0.6
PPE used for examination of dental patients in clinic		
Surgical face mask	307	93.9
Face shield	261	79.8
Latex glove	310	94.8
Disposable apron	146	44.6
Respirator Ng	98	30.0
Goggles	185	56.6

Table 5: Overall level of compliance with infection prevention and control practices

Compliance	Frequency (n)	Percent (%)
Poor	194	59.3%
Good	133	40.7%

Table 6: Association between knowledge of infection prevention and control protocol and compliance.

Knowledge	Compliance	
	Poor	Good
Poor	35	11
Good	159	122
	P Value	0.013

DISCUSSION

The challenge of patient management with regards to infection control in the COVID-19 era transcends all disciplines of medicine, and dentistry inclusive. The Dental profession appears to be the most affected due to the peculiarity of the dental procedures (Legnani, 1994; Zhang et al., 2020; Hamming et al 2020; CDC 2020, Gamio et al., 2020). With the constantly evolving nature of this novel infection, information on, and evaluation of dental practitioner's knowledge and management practices at such times could prove invaluable for improving preventive and control measures as the pandemic continues to unfold.

Generally, the findings of the current study revealed a good level of knowledge of infection prevention and control measures while managing dental patients during a COVID-19 Pandemic. The majority of the respondents were aware of the appropriate hand and respiratory hygiene practices, use of administrative control and

appropriate use of personal protective equipment. These findings are consistent with those reported in an Asian study (Asma et al., 2020) among faculty members in a tertiary institution. It also mirrors findings from global surveys of dentists (Ahmed et al., 2020; Kamate et al., 2020).

The reasons for the good display of knowledge in this study may be connected to an up-scaling of education on preventive and control measures by different relevant authorities and stakeholders using different methods and channels. In the wake of the outbreak, the government, the WHO, CDC, FDI, NCDC, NGOS and various stakeholders including hospitals/facilities conducted training for citizens, their workers and members. Besides, the role the print and electronic media and especially the internet played in creating awareness and sensitizing the public cannot be overemphasized. There was a plethora of educational campaigns and messages by media houses and outfits on ways of preventing and controlling

the spread of the infection. Also, acknowledging their responsibilities to their patients, families and immediate society, dentists may have been encouraged to consciously undertake and search for information from a variety of verifiable sources as reported also by Kamate et al in their study. However, when the current study is evaluated on certain aspects of knowledge such as appropriate use of personal protective equipment before routine examination of patients, a majority thought disposable aprons and use of N95 was necessary respectively for routine examination of patients.

In addition, almost a quarter of the respondents were unaware that hand sanitizer should not be used on visibly soiled hands and not everyone considered administrative control as an essential part of infection control. Furthermore, at least, greater than 10% of respondents were unaware that goggles should be worn when carrying out aerosol generating procedures, that four handed dentistry and the use of rubber dam were compulsory when undertaking aerosol generating procedures during a COVID-19 era. The implication of this lies in the fact that although the proportion of respondents with poor knowledge appears low, failure to adhere to the recommended protocol by any member no matter how insignificant, may pose a serious threat and possible exposure of the other team members. As dental professionals, the highest levels of knowledge on infection prevention and control are imperative at all times if the safety of the dental workplace is to be guaranteed. These positions of inadequate knowledge in certain respects were also reported by other studies (Khader et al., 2020; Horzov et al., 2020). In a study among Jordanian dentist with varied levels of training, as much as 63.9% were not aware of the incubation period of the virus and majority had limited knowledge of extra precautionary measures to protect staffs and patients from corona virus infection (Khader et al., 2020). The study attributed the reasons for some of the poor responses to the dentist perception that these extra measures were unnecessary, coupled with their limited understanding of the various sources of infection (Khader Y 2020). Similarly, in the current study, when the respondents were evaluated on the knowledge of aerosol generating procedures, almost half of respondents did not consider the use of low speed hand piece as aerosol generating and more than half of the respondents did not consider surgical extraction as an aerosol generating procedure. This clearly underscores a gap in knowledge and may be due to the inadequacy in instructions given during periods of training and the lack of emphasis on such areas during dental training. However, such knowledge is crucial as a duty of care to effectively prevent transmission of the virus in the dental setting. There is therefore a need to emphasize, re-emphasize and sustain education of dentists on such critical aspects for infection control and prevention in the dental setting. Globally, dentistry has undergone major revisions to ensure patient and public safety in response to the pandemic (Meng et al., 2020). Reports from various

authors have acknowledged changes to practice with modifications along the lines of standard recommended guidelines (Ahmed et al., 2020; Kamate et al., 2020). The present study's findings are no different. For instances, more than half of the respondents in the present study reported staggered and timed patient appointments. They also limited the number of patients being treated in a multi dental chair operator. Leveraging on technology and innovation, there was an increase in the use of telephone to carry out e-consultation and conduct remote problem focused evaluation by almost half of the respondents. Most dentist removed magazines, toys and all objects that could be contaminated by touching from the waiting room and there were some levels of compliance with social distancing as majority of the respondents ensured a seating arrangement of at least 6 feet apart in the waiting room. There were changes with regards to pre-procedural measures adopted in the dental clinics with more than half of the respondents reporting the use of hydrogen peroxide or chlorhexidine mouthwashes before embarking on any procedures. These positive changes reported in this study are similar to those reported in other studies (Kamate et al., 2020; Nasser et al., 2020.). However, some respondents (28.1%) did not see the need to effect any pre-procedural changes, and only a small fraction, less than a quarter (18%) of the respondents used extra oral panoramic radiographs instead of intra oral radiographs. Though the reason for these poor compliances was not included in this study, they may be due to the lack of easy access to extra oral radiography. This report of inappropriate practices is similar to findings from other studies (Hannah et al., 2020; Duruk et al., 2020).

PPEs play an invaluable role in the prevention and control of highly contagious infections as COVID-19 (Federico AV 2020). However, it is important that practitioners use appropriate PPE according to the risk estimation of the procedure being undertaken to reduce waste and minimize cost in a resource constrained country where supply of PPE can be inadequate and irregular. This study found inappropriate use of N95 respirators for the examination of dental patients in about a third of the respondents. This is much higher than studies in other climes which reported between 10-15% (Ahmed et al., 2020, Duruk et al., 2020). This may be due to fear and poor knowledge of the risk involved and thus calls for improvement in the dissemination of knowledge to dentist via various methods by relevant authorities. Other PPE practices displayed by dentist while examining patients in the current study include the use of latex hand gloves (94.8%). Also, 261(79.8%) used face shields while over half, 185 (56.6%) of the respondents used goggles and 98(30%) used a disposable apron. Thus, overall, the majority of the respondents had poor level of compliance with infection prevention and control protocol in this study.

There was a significant association between level of knowledge and compliance with infection prevention and control practices by the respondents. Knowledge is

critical to adequate attitudinal change to ensure proper practice compliance. The result from this study confirms this as do findings from other studies (Nasser et al., 2020; Alhumaid et al., 2021).

This study was limited by the reliance on the respondents to provide information on their management practices for their patients. There was no way of verifying if responses reflected actual practices of the respondents. This has however been recognized as a shortcoming of self administered questionnaires.

CONCLUSION

In conclusion, there was good level of knowledge for the prevention and control of the spread of corona virus in the dental settings by Nigerian dentist during COVID-19 pandemic. However, knowledge was less than optimum in some aspects such as practices involving aerosol generating procedures and appropriate use of PPE. Also, though they were several changes in practices for the prevention and control of the spread of corona virus in the dental settings by Nigerian dentist during COVID-19 pandemic, overall compliance level was poor. Considering the high infectivity of the virus, there is a need to continuously educate dentists on all aspects of infection prevention and control against this very contagious disease if personnel and patient safety are to be guaranteed.

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