

Safer Restorative Dentistry during the Covid-19 Pandemic

Louis O. IBHAWOH, Fate O. OKPIAIFO, Joan E. ENABULELE

*Department of Restorative Dentistry,
University of Benin Teaching Hospital,
Benin City*

ABSTRACT

The onset of the Coronavirus disease (COVID-19) in Wuhan, China in early December 2019 was regarded as a local, severe respiratory disease. This perception has been changed due to the shocking impact and the way the disease has overwhelmed the public healthcare of many nations with grave illness and deaths affecting millions of persons around the world. The COVID-19 pandemic has led to emerging challenges and responsibilities worldwide, with increased risk of the infection to healthcare professionals. This is apparent with the increasing numbers of infected cases detected among health care workers.

There is need for safer restorative dental practice in the COVID-19 era, which can be achieved by instituting and sustaining measures that will prevent the spread of the disease during restorative dental care. These measures include the vaccination of both clinical and non-clinical restorative dental staff, tele triaging of patients, strict implementation of appointment-based treatments as well as maintaining physical distancing of at least 2 meters in operative and non-operative areas like receptions. Other measures include entry level hand sanitization, proper hand hygiene before and after procedures, use of PPEs, utilization of individualized operatories with doors, limitation of aerosol-generating procedures, the practice of four-handed dentistry with high suction, the avoidance of periapical radiographs where possible, ensuring adequate ventilation, employment of proper sterilization and disinfection after each procedure and the sterilization of phones or wristwatches using ultra-violet light at the end of the working day.

Correspondence

*Dr L.O. Ibhawoh
Department of Restorative Dentistry,
University of Benin Teaching Hospital
Email: louis.ibhawoh@uniben.edu.*

Keywords: Corona virus, Restorative Dentistry, safety

INTRODUCTION

The onset of Coronavirus disease (COVID-19) in Wuhan, China in early December 2019 was regarded as a severe respiratory disease localized to that city. This perception has since changed due to the shocking impact and the way the disease has overwhelmed the public healthcare of many nations with associated grave illness and deaths affecting millions of persons around the world. On the 8th of January 2020, it was officially announced that a novel Corona virus was the causative pathogen of COVID-19 by the Chinese Centre for Disease Control and Prevention (Sede et al., 2020; WHO 2020). Due to its high infectivity and speed of spread across international borders, the World Health Organization (WHO) on 11th March, 2020, declared COVID-19 a global pandemic (WHO 2020). Nigeria reported her first case of COVID-19 on the 27th of February, 2020 (NCDC 2021) in an Italian man. The ensuing spread of the disease was enabled by Nigerian elites returning to the country after vacation or

business trips as entry across the Nigerian borders remained unrestricted. COVID-19 has since spread all over Nigeria with the commercial city of Lagos being

Citation: Ibhawoh LO, Okpiaifo FO, Enabulele JE (2020). Safer Restorative Dentistry during the Covid-19 Pandemic. *Nig J Res Orofac Infect Oncol*; 3(2):45-54.

the epicenter.

According to the updated report for 11th March, 2021 by the Nigeria Centre for Disease Control (NCDC), the total number of infected Nigerians was 159,646 with the total number of deaths reported to be 1,993 and Edo state recording the 2nd highest deaths at 184 (NCDC, 2021).

The COVID-19 pandemic has led to emerging challenges and responsibilities worldwide, with increased risk of the infection to healthcare professionals. This is apparent with the increasing numbers of infected cases detected among health care workers. Although, Amnesty international (2021)

documented the fatality of health care workers worldwide from COVID-19 at a minimum of 17,000 over the last year, there is no national count of the number of health workers infected with COVID-19 in Nigeria. However, a total of 75 health workers were reported to have been infected in one week alone in January 2021 as reported by Premium Times (2021). The characteristics of the dental clinic setting are believed to increase the risk of cross infection between the dental health workforce and patients especially as the pathogen causes both upper and lower respiratory tracts infections (Chen, 2020), which are both connected to the oral cavity- the working area of the dentist. This risk presents once extra-oral and intra-oral examinations are commenced, with the patient compulsorily removing his facemask, irrespective of the clinical subspecialty of dentistry being practiced.

PATHOGENESIS

SARS-Cov-2 (Severe Acute Respiratory Syndrome Coronavirus 2) has a single-stranded RNA. It encodes 4 major structural proteins: Spike Glycoprotein Trimer (S), Envelope protein (E), Membrane glycoprotein (M), Nucleocapsid protein (N). S: Neutralizes the antibodies, attaches to the host receptor. E: Determines the formation and composition of the coronavirus membrane. M: Spans the membrane bilayer three times & helps in intracellular formation of viral particles. N: Associated with RNA (Patolia, 2021). The receptor-binding domain (RBD) of the S protein of SARS-Cov-2 precisely identifies the host Angiotensin Converting Enzyme 2 (ACE-2) receptor and binds to it. Upon binding, the host serine protease TMPRSS2 cleaves S protein with resultant fusion of the viral and host cellular membranes. The ACE-2 is expressed in type 2 alveolar epithelial cells in the lungs, heart, kidney and GIT. Nevertheless, the lungs appear to be predominantly susceptible to the virus because of the large surface area. Furthermore, the alveolar type 2 cells act as a reservoir for viral replication (Patolia, 2021).

Direct damage to the pulmonary tissues is from a viral infection-mediated local inflammatory reaction. However, in immunosuppressive states, there is excess release of pro-inflammatory substances (IL- 2,6,7,12, TNF etc.) resulting in cytokine storm syndrome which leads to multi-organ failure and finally death (Patolia, 2021).

RISK FACTORS

Various risk factors have been associated with COVID-19. These include: Advanced age (elderly persons, 65years or older), immunosuppressive states commonly seen in those who have had organ transplants, cancer patients on chemotherapy and radiotherapy and those on the chronic use of steroids. Persons with cardiovascular diseases such as hypertension and coronary heart disease, metabolic conditions such as diabetes mellitus and morbid

obesity, respiratory illnesses such as obstructive airway disease and pregnant women, also fall into high-risk groups for COVID-19 infections.

MODE OF TRANSMISSION

The mode of transmission of COVID-19 is essentially via droplets inhalation of spatter of respiratory secretions via coughing and sneezing or even speaking by infected persons. It can also be transmitted through contact transmission from contaminated surfaces through the fingers to the oral, nasal and eye mucous membranes. The restorative dental workforce faces the risk of contracting COVID-19 when an infected patient breathes heavily, sneezes, sings, coughs or speaks (COVID, 2019) so closely to their faces during examination or treatment. This is particularly so in asymptomatic infected individuals who do not raise red flags at preliminary screening as most restorative procedures are done well within the 2-meter recommended safety margin for physical distancing, in confined places. Furthermore, medical procedures, especially aerosol-generating procedures (AGPs) which form the bulk of restorative procedures, pose increased risks to the restorative dental workforce. Not only are the restorative dental workforce exposed, the patients too, on the other hand are exposed once they have to remove their face masks for examination and treatment. It has also been suggested that COVID-19 infections could be spread via vertical transmission from a mother to her unborn child (WHO, 2021a).

CLINICAL SYMPTOMS

The asymptomatic incubation period for individuals infected with SARS-COV-2 has been reported to be within 1–14 days, and it has been confirmed that those with asymptomatic illness can spread the virus (WHO, 2021a), as was documented in a case of SARS-Cov-2 infection in Germany which showed that transmission of the virus may also occur through contact with asymptomatic patients (Singh, 2020). According to Johns Hopkins Guide, viral shedding by asymptomatic people may represent 25–50% of total infections (Paul and Auwaerter, 2021). Symptoms of the infection are generally non-specific and include fever, cough, shortness of breath, anosmia, diarrhea, ageusia, muscle pain, vomiting, confusion and headache.

DIAGNOSIS

Diagnosis should be based on a high index of suspicion using detailed travel, medical and contact histories and laboratory testing using rapid Reverse Transcription Polymerase Chain Reaction (rRT-PCR) as recommended by the World Health Organization. Serology test for antibodies to SARS-CoV-2 is being studied and imaging investigations such as plain chest radiographs and computed tomography scan can be done.

TREATMENT

COVID-19 infection can be treated via prophylactic and supportive therapy. The prophylactic therapy is further subdivided into non-pharmacological and pharmacological therapies.

NON-PHARMACOLOGICAL MEASURES (NCDC PROTOCOL)

The Nigeria Center for Disease Control (NCDC) has recommended the adoption of general preventive measures which include the regular and thorough washing of hands with soap under clean, running water and the use of alcohol-based hand sanitizer where running water is not available, the covering of one's mouth and nose during coughing or sneezing with the bent elbow or a piece of tissue which is promptly and safely discarded, as part of cough etiquette during this pandemic. Other recommendations of the NCDC include the avoidance of making finger contact with one's eyes, nose and mouth with unwashed hands, the maintenance of a distance of at least 2 meters (six feet) between one's self and anybody coughing or sneezing, the notification the NCDC through a toll-free line (#6232), before going to the hospital if one develops a fever, cough or respiratory difficulties after return, within the previous fortnight, from a country with COVID-19 outbreak, the avoidance of contact with people if one has just returned from a country with COVID-19 in the preceding 14 days and the avoidance of crowded places.

PHARMACOLOGIC PROPHYLAXIS

COVID-19 vaccine: one of the unique aspects of the SARS-Cov-2 pandemic has been the swift pace at which vaccines have been developed. The usual time frame for the development of a vaccine ranges from 3-9 years. However, during this unprecedented time, the completion of phase 1 trials took only about 6 months. Available vaccines include Pfizer-BioTech's (USA), Moderna (USA), AstraZeneca/Oxford (England), Sputnik V(Russia), Sinopharm's vaccine (China) and Sinovac's CoronaVac (China) etc.

SUPPORTIVE TREATMENT

Symptomatic, infected patients typically need some form of supportive treatment which is dependent on the presenting symptoms. These include hospital admission, the use of antipyretics, antibiotics (Azithromycin), corticosteroids (Dexamethasone), fluid therapy, hyperbaric oxygen, treatment of comorbidities and antiviral agents. Remdesivir is the only Food and Drug Administration (FDA)-approved antiviral agent for the treatment of COVID-19 (Antiviral drugs that are approved or under evaluation for the treatment of COVID-19, 2021). Anti-SARS-CoV-2 monoclonal antibodies, Bamlanivimab and Etesevimab combination have also been recommended.

IMPLICATIONS FOR RESTORATIVE DENTISTRY

The high rate of infectivity as well as the modes of transmission via droplets, aerosols, direct contact and surface contamination places the dental health workforce at high risk of exposure (Sede et al., 2020). In practical terms, COVID-19 has been considered an occupational disease if the health worker contracts the infection through occupational exposure (WHO, 2021b). Critical to designating dental health workforce as high exposure risk category is the fact that they have to work in very close proximity to the oral cavities of patients during treatment, offering dental care at much shorter distances than the one-meter safe physical distance threshold defined by the World Health Organization (WHO, 2021b). Dentists, especially those in restorative dental practice or those who routinely perform aerosol-generating procedures AGPs, (Sede et al., 2020) using the dental ultra-speed (turbine) handpiece, ultrasonic handpieces or piezoelectric instruments as well as Sprayvit[®] syringe (Dentsply Sirona, Charlotte, NC, USA) without adequate protection are particularly vulnerable (Peditto et al., 2020). The confined space of the dental operatory for the restorative dentist and his team as well as the nature of their exposure to potentially infected patients and asymptomatic colleagues, meet the WHO definition (WHO, 2021b) to qualify for high-risk exposure.

Although these are the usual procedures and equipment which are more commonly known to produce aerosols, others procedures which are less invasive such as oral examination, impression making and intraoral dental radiography, may trigger coughing through the gag reflex, producing droplets as a consequence. In addition to bio-aerosol and/or aerosols generated during restorative procedures, studies have indicated that the skin and mucous membranes of the mouth, respiratory passages and eyes of dental health workforce may be contaminated by microorganisms in spatter of saliva (Sede et al, 2020; WHO, 2020a). Hence, rigorous infection control protocols are recommended.

Consequently, it is important for the restorative dentist to be familiar with the mode of spread of COVID-19, as well as be familiar with the procedure for the identification of patients with COVID-19 and the additional precautionary steps to be taken to protect all clinical staff during everyday practice for the prevention COVID-19 transmission.

PATIENT ASSESSMENT

Where tele-medicine facilities are available, a pre-hospital screening should be done to determine how urgently the dental intervention may actually be needed and to assess, through history taking, the level of COVID-19 transmission risk that the patient could pose to the dental workforce and other patients. Even though overtly ill and acutely febrile COVID-19 patients with respiratory symptoms are generally not expected to present to the dental practice for dental

treatment in that phase of the illness, such cases should, however, be readily recognizable to the restorative dentist and should be flagged as cases with high indices of suspicion of being COVID-19 cases. Such patients should not receive dental care in the clinic in such a state. The dentist should notify the Infection Control Unit of such cases for the possible quarantine of such patients. Similarly, less acute cases should be recognized in dental practices through body temperature checks using contact-free infrared thermometers and pulse oximetry readings as possible cases of COVID-19 and referred to the Infection Control Unit as well, for possible isolation.

Once through with physical screening for elevated body temperature and diminished oxygen saturation, dental patients attending dental practices without pre-hospital on-line screening, are screened using questionnaires for the assessment of their COVID infection risks before being taken into the dental operatory for dental examination or dental treatment. This questionnaire should be incorporated into the patients' medical records. A questionnaire which has been provided by the Nigeria Center for Disease Control (NCDC) (*What dental practitioners need to know about CORONAVIRUS*, 2020), which can be useful in restorative dental practices, asks questions about fever within the preceding 14 days, recent experience of respiratory difficulties like coughing and difficult breathing, also in the preceding fortnight, recent travel within the previous 2 weeks, to a country listed by the World Health Organization as having documented high levels of COVID-19 infection and transmission rates or recent contact with confirmed COVID-19 case(s) within the prior 14 days. Other questions in the questionnaire include inquiries on contact by the patient with persons from communities, neighborhoods and regions which have been listed by the WHO as having documented cases or high COVID-19 infection rates, the experience of fever or respiratory difficulties by at least 2 persons in close contact with the patient and recent participation of the patient in public gatherings or close proximity to several unacquainted people.

With an affirmative response to any of these enquiries by a patient and a body temperature under 37.3°C, such patients should be advised to self-isolate at home, and report fever and other symptoms associated with COVID-19, if they develop, to the appropriate authorities and take another dental appointment until after 14 days after the suspected exposure.

When there is an affirmative response to the questionnaire queries and a body temperature in excess of 37.3°C, the patient should be immediately isolated in that facility in special isolation, and the restorative dentist should defer any planned treatment and make a report to the Infection Control Unit of the hospital or call NCDC.

Patients who do not respond in the affirmative to the questions posed in the questionnaire, and whose body

temperatures do not exceed 37.3°C, should receive dental treatment but with the clinician taking additional protective measures and avoiding spatter and AGPs as best as is possible. Other patients who have body temperatures above 37.3°C but give no affirmative response to any of the questionnaire questions should be referred to the appropriate medical clinic for further care, with their dental care deferred till when their body temperatures reduce below 37.3°C after receiving medical treatment.

WHEN TO TREAT?

Emergency Vs Urgent Dental Procedures.

Dental conditions which need to be managed promptly to relieve serious pain and reduce the risk of sepsis but do not imperil the patient to the point of raising their death risk can be deemed "URGENT" while conditions which imperil the patient to the point of death can be considered "EMERGENCY" conditions.

The ADA (2021) includes in the conditions requiring "Emergency" dental procedures such conditions as uncontrolled bleeding, cellulitis or diffuse soft tissue bacterial infection with intra-oral or extra-oral swelling that potentially compromise the patient's airway and trauma involving the facial bones, potentially compromising the patient's airway. Included in the category of conditions deemed "Urgent" are severe dental pain from pulpal inflammation, pericoronitis or third molar pain, surgical post-operative osteitis, dry socket dressing changes, abscesses or localized bacterial infection resulting in localized pain and swelling, tooth fracture leading to pain or soft tissue trauma, dental trauma with avulsion or luxation, dental treatment required prior to critical medical procedures, final crown/bridge cementation if the temporary restoration is broken or causing gingival irritation and the biopsy of abnormal tissue (ADA, 2021). Other emergency conditions include severe uncontrolled pain of dental origin and the need for radiographs in facial trauma or medico-legal cases. In stand-alone Restorative clinics, some of these conditions may have to be referred to a hospital setting for proper management.

Urgent dental procedures that can be managed in a restorative clinic include dental pain of pulpal origin which cannot be managed and controlled by counseling and reassurance, analgesics and/or antibiotics, the repair of broken complete dentures, implant prosthesis-related issues and already prepared teeth/implant abutments for crowns needing definitive restorations or appliances. Others include peri-implant infections compromising stability, broken teeth, restorations or fixed prostheses causing sensitivity of vital teeth and engendering pulpitis and significant difficulty in mastication or causing injury to soft tissues. Unavoidable dental extractions and post-extraction complications may also be considered as conditions needing urgent dental care.

In the situations outlined above, it is important to note that these are high-to-very high risk procedures which can predispose the dental team to COVID-19 infections. Therefore, appropriate safety precautions must be observed (Sumanth et al, 2019).

STANDARD PRECAUTIONS

Vaccinations

With the approval of different vaccines for emergency use for vaccination against COVID-19 by regulatory agencies with the endorsement and support of the World Health Organization, it is instructive that Restorative dentists as well all healthcare workers in the dental facility be vaccinated against COVID-19 to receive the protection offered by the approved vaccines to reduce the risk of cross infections from patients, visitors and other staff. Dentists and other staff of the dental practice should refrain from providing dental care and should get tested for COVID-19 when they feel unwell or have been exposed to confirmed COVID-19 cases. Routine and periodic testing of healthcare workers in a dental practice should be standard. COVID-19 positive health care workers who are asymptomatic should take paid leave from the workplace until they return a negative result.

Hand hygiene

Since the hands are the main pathways for germ transmission during health care, resulting in health care-associated infections which lead to the deaths of thousands of people daily around the world, the World Health Organization (2020c) considers hand hygiene the most important measure to be taken to avoid the transmission of harmful germs to prevent health care-associated infections. The WHO therefore, expects health-care workers, caregivers and persons involved in direct and indirect patient care, to be concerned enough to perform it correctly and at the right time (WHO 2020c). When the hands are not visibly soiled, it is recommended that rubbing them with an alcohol-based formulation is to be preferred for routine hygiene hand antisepsis as it is faster, more effective and better tolerated by the hands than washing with soap and water. Using soap and clean running water is however recommended when the hands are visibly dirty or soiled with blood or other body secretions and after using the toilet. The WHO also considers this the preferred method of hand hygiene if exposure to spore-forming pathogens, particularly during *Clostridium difficile* outbreaks, is strongly suspected or proven. Given the mode of spread of SARS-CoV-2, additional caution is to be exercised in avoiding finger contact with the dental health care worker's own eyes, nose and mouth.

Use of Personal Protective Equipment (PPE)

Three levels of barrier protection have been recommended for the dental health care worker in the

dental practice against infections with the SARS-CoV-2 virus because of its main route of transmission which is air-borne (*What dental practitioners need to know about CORONAVIRUS*, 2020). These barrier protection paraphernalia include protective eyewear, masks, gloves, caps, face shields, and protective outer wear. These should be readily available and routinely used by all the health workers in the restorative dental practice, depending on the likelihood of infection transmission depending on the situation and COVID status of the patient. The three different levels of protective paraphernalia which have been recommended are:

- i. For primary level protection which should be standard protection for staff in a clinical setting, the equipment should comprise a disposable working cap, a disposable surgical mask, work clothes (white coat), protective goggles or face shield and disposable latex or nitrile gloves.
- ii. For secondary level protection which should be advanced protection for dental care workers, this should comprise a disposable doctor's cap, a disposable surgical mask worn over N95 mask, work wear (white coat) with disposable isolation clothing or surgical clothes over it and disposable latex gloves.
- iii. For tertiary level protection to provide enhanced protection for dental health workers in safely treating suspected or confirmed COVID-19 cases on urgency or emergency basis, when treatment is given in close proximity to the patient, extra protective paraphernalia should be worn for barrier protection. These should include: work wear (clinical white coat) with an overlay of disposable, waterproof, protective clothing. If this external overlay wear is not available, barrier protection will then include a disposable cap, protective goggles and face shield, disposable surgical mask over an N95 mask which should also be disposed of after use to permit the longer use of the more expensive N95 masks, double gloving using surgical gloves and waterproof disposable shoe cover should be worn.

Mouth rinses before dental procedures

The preoperative use of chemical agents with antimicrobial action as mouth rinse is thought to reduce intra-oral salivary microbial counts (WHO, 2021b). Agents which have been employed include those which contain 1% hydrogen peroxide or 0.2% povidone iodine and have been recommended for reducing the salivary load of oral microbes, including SARS-COV-2 (*What dental practitioners need to know about CORONAVIRUS*, 2020; Sumanth et al, 2019), present in aerosols generated from saliva, crevicular fluid and cooling water spray during restorative dental procedures. It must be noted however, that the viral

load in the patient's breath through the mouth and nares remain, a potent risk to the dentist and dental surgery assistant, given the high concentration of infective viral matter in the lower and upper airways of infectious COVID-19 patients.

Rubber dam isolation

Moisture control using the rubber dam and saliva ejector is invaluable during conservation procedures, which involve the use of conventional ultra-speed and ultrasonic hand pieces, to prevent the generation of aerosols tainted with blood, crevicular fluid and saliva which may contain highly infectious microbes. It has been suggested that extra high-volume suction should be used to supplement the use of the saliva ejector when the rubber dam is used for moisture control during restorative procedures (What dental practitioners need to know about CORONAVIRUS, 2020). It has also been suggested that manual devices, chemo-mechanical means of caries removal and hand scalers be used in those cases where rubber dam use is not feasible and that periodontal scaling be employed to reduce aerosol generation. (What dental practitioners need to know about CORONAVIRUS, 2020; Centers for Disease Control and Prevention, 2019).

Anti-retraction hand pieces

Conventional high-speed dental handpieces without anti-retraction valves are known to aspirate and expel debris and fluids during conservation dental procedures. More importantly, micro-organisms including bacteria and viruses, may further contaminate the air and water tubes within the dental unit with the potential to cause cross-infection, hence they have been discouraged from use during the period of the COVID-19 pandemic. Thus, anti-retraction dental handpieces with specially designed anti-retraction valves or other anti-reflux designs are to be preferred for use in conservation procedures to reduce the risk of cross-infections in the dental practice (What dental practitioners need to know about CORONAVIRUS, 2020; Centers for Disease Control and Prevention, 2019).

Disinfecting the practice environment

Clinics and public areas of dental practices and all health institutions generally, should receive high levels of disinfection. Clinic settings should be cleaned and disinfected following the protocol (2-step cleaning process). As the coronavirus has been proven to remain active on surfaces for more than 24 hours (Centers for Disease Control and Prevention, 2019), it is crucial to keep all surfaces, including door handles, chairs and desks, clean and sanitized. While this pertains to the waiting room, the bathroom and the front desk, it is particularly vital to disinfect the operatory as frequently as is feasible (What dental practitioners need to know about CORONAVIRUS, 2020). Rails for support

of the infirm and elderly, where present should also be sanitized regularly. Dental practices which operate with computers, computerized monitors and similar devices should implement measures for the frequent sanitization of such surfaces as keyboards and monitors after use on every patient.

Contact disinfection systems involving the use of common cleaners like 0.1% sodium hypochlorite, 0.5% hydrogen peroxide or 62-71% ethanol have been shown to be effective (What dental practitioners need to know about CORONAVIRUS, 2020). Operatory air disinfection with 70% ethanol should be done in between seeing patients. Non-contact disinfection systems like UV light sterilizer and fogging disinfection can also be used (UVC sterilization works in large health settings, 2020; What is fogging disinfection, 2020). Fixed fixture or mobile versions of UV light sterilizers may be used in multi-clinic dental practices.

Managing medical waste

The medical waste (including disposable protective equipment after use) generated during the treatment of patients with suspected or confirmed COVID-19 infection should be considered infectious waste which should be taken to the temporary, less busy storage area of the restorative clinic. Disposable versions of materials and instruments are to be preferred during this COVID-19 pandemic while reusable instruments and items should be pretreated, cleaned, sterilized, and appropriately stored following the Protocol. Double-layer yellow colored medical waste package bags and goose neck ligation should be used. The surface of the package bags should be marked and disposed of according to the protocol (What dental practitioners need to know about CORONAVIRUS, 2020).

PRACTICE MODIFICATION

Due to the challenges of the COVID-19 pandemic therefore, the way forward for the restorative dentist is to modify his practice in such a way as to reduce or prevent cross infection between members of the dental team and the patient and vice-versa. The practice modification for a dental practice setup can be divided into two phases (or three phases when the Implementation and Patient review stages are separated) (COVID-19 & Dentistry: Recent updates, 2020):

Phase I: Preparatory stage

Phase II: Implementation and Patient review stage

PREPARATORY STAGE:

Baseline COVID-19 testing for all staff working at the dental facility before resuming services in clinics closed due to the pandemic.

Prophylactic vaccination of the dentist and other dental health care workers and support staff against COVID 19.

Ventilation and air quality management

- i. Laminar flow of fresh, natural air is to be preferred to recirculated air-conditioned air where possible
- ii. Dispersal of possibly tainted aerosols during drilling restorative procedures should be prevented by the avoidance of air recirculation by ceiling fan or table fan use in the dental surgery.
- iii. Air extractors should be installed in dental operatories to evacuate aerosol-tainted air in one direction only.
- iv. Where laminar flow of fresh, natural air is not possible across the dental surgery and only central or single unit air conditioning is feasible or pre-installed, then regular servicing, including the changing of its filters, is strongly recommended.
- v. Mobile indoor devices with High Efficiency Particulate Air (HEPA) filtration systems provide additional margins of safety of inhaled air should be put into use.
- vi. UVC ultra violet light fixtures with blinking safety warning pilot lamps or/and soft alarms when they are being used may also be installed in operatories for air sanitization in the dental surgery.

Clinic entrance, reception and waiting area

- i. Instructional and informative notices as well as illustrations should be strategically and clearly put up in the reception and other initial pre-contact areas to provide information to intending patients and other visitors to the health facility. The information should cover basic responsibilities of the intending patient or visitors to the dental practice during this COVID-19 pandemic era (including truthful disclosures), the modified range of procedures being offered on urgent basis and the availability of pre-hospital telemedicine consultation to assess the urgency or emergency status of their dental cases. The latest factual information on the current understanding of the pandemic and public health regulations on coughing and sneezing, physical distancing and others, should form the basis of the notices.
- ii. Install plexiglass or any similar transparent barrier at the front desk, preferably with a two-way communication system.
- iii. Provide basic barrier and sanitization measures for intending patients and visitors to include easy-access wash stations, sensor-triggered alcohol-based sanitizer dispenser, medical grade (3-ply) face masks and sensor or pedal-operated bins for discarding used tissue.

- iv. Single waiting room chairs should be physically-distanced in positioning and multi-seaters marked or labeled not-for-sitting spaces between sitting places.
- v. Electronic payment methods with minimal human contact should be encouraged.

Changing Room

- Staff changing rooms with donning and doffing areas for work wear and personal protection equipment should be provided.

Sterilization and Storage Areas

A sizable, well-defined sterilization area for proper sterilization, packaging and orderly storage of essential barrier protection equipment, disinfectants and other chemical supplies as well as non-disposable workwear and instruments by well-trained staff should be available in the practice.

Restrooms

Rest rooms should be fitted with sensor-triggered faucets or swing –motion elbow faucets. Cloth towels are to be discouraged for the fear of spreading cross infections. Paper napkins are preferred as they can be easily disposed of into pedal or sensor-operated waste bins with lids. Hand dryers may spread aerosols and should not be used.

Equipment and instrumentation

The major equipment and instrumentation modifications required for dental practices during the COVID-19 pandemic before reopening for a fuller range of dental services include adequate and continuous supply of PPEs, acquisition and activation of broad-area sterilization and decontamination systems with requisite chemical agents, mobile indoor air sanitization devices, UVC (ultraviolet) light sanitization devices for air and surfaces, installation of anti-retraction valves along water supply lines and the use of anti-retraction valve hand pieces in dental units and increased training of dental health care facility staff

All health care workers in a dental facility, from front desk staff to clinical staff, should receive additional training in relation to modifications in discharging their job schedules during the COVID-19 pandemic. Medical transport and sanitation staff must also receive additional training for their safe handling of patients and medical wastes, respectively, following approved protocols. Members of staff may benefit from psychological support in recognition of the stress imposed by the Corona virus pandemic on society as a whole. Thus, paid sick leave policy should be reviewed to accommodate repeated needs for self-isolation upon exposure or prolonged stay at home before returning a negative COVID-19 test result after an initial positive test result, before returning to work.

Only the absolutely necessary number of staff should be rotated in a scheduled manner to come to work daily to reduce exposure risks to COVID infections in the work place while they are advised to modify their social lives in compliance with public health guidelines issued by local and federal authorities.

Dental Clinic Disinfection

- Surgery floors and other floors in the practice should be cleaned with detergent solution and one percent sodium hypochlorite solution after contact for ten minutes. This becomes mandatory after splashes involving body fluids like blood, saliva or vomitus. Other surfaces should also be disinfected using the same formula for ten minutes at the start and close of the working day and after each procedure, with a contact time of 10 minutes while electronic equipment should be gently buffed with damp, not dripping wet, methylated spirit cleaning pads or swabs.

• IMPLEMENTATION AND REVIEW STAGE

Remote consultations (Tele-Dentistry)

Online videocall or telephone interaction and assessment, when supported in a dental practice, should form the basis of tele-triage for screening potential dental cases during this COVID-19 pandemic. The intending patient's anamnesis, recent dental treatment history, travel and social history as well as the history of the presenting complaint are critical to determining the status of each case whether urgent or requiring emergency attention. They also help to assess the level of COVID-19 transmission risk the patient poses to staff and patients in the dental practice. History of recent symptoms of respiratory difficulties and fever within the preceding two weeks are particularly important in determining the scheduling of any planned in-person appointment and treatment.

Online questionnaires may also be filled by intending patients to elicit all relevant histories, as an option to telephone interactions.

Once given an appointment after screening via teledentistry, intending dental patients should be advised to wear minimal ornamental dressing accessories and leave carry-on bags behind on appointment day and obey all government-issued COVID-19 guidelines once in transit to and at the dental practice.

At the Practice on Appointment Day

At the practice, the patient should follow practice-based protocols (including wearing the face mask throughout the interface at the reception up until physical examination in the operatory) and guidelines on hand sanitization procedures, temperature checks, physical distancing and minimal person-to-person

contact and unnecessary contact with surfaces and equipment during the appointment. The patient should be provided with clean, disinfected footwear before proceeding to the surgery or operatory.

In the clinic operatory area, the patient should remove the face mask to permit examination, be draped with waterproof apron, and should rinse the mouth with a pre-procedural antimicrobial mouthwash.

The clinical staff should be well-kitted in protective barrier apparel with waterproof overlay draping and surgery footwear. The transmissibility of COVID-19 through asymptomatic spreaders, the non-mandatory nature of requests for negative COVID-19 testing before dental treatment, the cases of false negative test results and the close quarters (within 40 centimeters) in which restorative dentists have to work on their patients, all imply that the dentists have to assume that they are potentially dealing with high risk cases in every case. Full PPEs comprising N95 face masks, protective goggles, face shields and gloves along with overalls should be worn for drilling procedures which generate aerosols and other procedures like taking dental radiographs, which are likely to trigger the gag or coughing reflex in their dental patients. For economic reasons, N95 masks can be overlaid with a 3-ply surgical face mask to permit re-use, the superficial medical mask being discarded after the procedure. Ultra-violet light sterilization of the inner N95 mask assures of better infection control for re-use.

Drilling procedures should be avoided where possible but should be done, when inevitable, with anti-retraction valve hand pieces to reduce aerosol generation and saliva spatter while high volume suction should be combined with the use of the saliva ejector when rubber dam, which is strongly recommended, is used during the drilling procedure.

After treatment, the patient's waterproof protective drape is removed, the patient repeats handwashing or hand sanitization, is given post-treatment instructions and given back their own footwear at the reception and instructed to contact the practice by phone as part of an immediate after-treatment follow up.

Post-procedure disinfection

Used instruments should be rinsed to remove organic debris and then soaked in and disinfected with ultrasonic disinfection devices where available, before full standard sterilization is done. Suction tubes and water reservoirs should be flushed with 1% Sodium hypochlorite solution for about a minute while all contact surfaces of the dental unit including handles, arm rests, overhead lamp handles should be cleaned with pads or swabs impregnated with the solution, changing the pads often in the process. Ultraviolet light disinfection of the air, work surfaces and walls for 10 to 20 minutes may then follow. 70 % alcohol spray also disinfects the surgery air. Installed air expellers must be used both during procedures and afterwards.

Hand pieces should be cleaned with proprietary hand piece cleaner and then autoclaved. The floor should be mopped with detergent and sodium hypochlorite solution, especially if there were splashes.

A suggested protocol for clinic closure (*COVID-19 & Dentistry: Recent updates, 2020*) describes the processes to include:

- i. Fogging which is used as 'No-touch surface disinfection' but not for disinfection of air, after a large area has been contaminated and involves the use of a 20% working solution prepared from commercially available hydrogen peroxide which is supplied as 11% (w/v) solution, stabilized by 0.01% of silver nitrate. The volume of working solution required for fogging is approximately 1000ml per 1000 cubic feet.
- ii. Allowing a Dwell Time or Contact time of 45 minute
- iii. Closing the operatory for half an hour for the aerosols/droplets to settle down to allow for uninterrupted Dwell Time.
- iv. Opening the operatory and switching on the fans for aeration after the Dwell Time. Wet surfaces can then be dried/ cleaned by using a sterile cloth or clean cloth pad or (other surfaces).

Protocol for health care workers on reaching home

- i. Removal of the pair of dedicated work shoes (one of a few selected pairs dedicated to the work place) at the entrance to the home away from the core of the dwelling.
- ii. Change of work clothes (one of a few selected and dedicated work clothes) with the used one dropped into a special laundry bag with a noose-type purse string closure which is pulled tight. These are not for laundry with the other household laundry
- iii. Thorough bath with soap (medicated soap preferred)
- iv. Disinfect mobile phones, wristwatch in portable home ultraviolet light sanitizing device (if not already sanitized at the close of work at the dental office)

CONCLUSION

Restorative dental practice can be continued safely in the COVID-19 era, by instituting and sustaining measures such as the vaccination of both clinical and non-clinical staff in dental practices, tele-triage, the strict implementation of appointment-based treatments and the maintenance of physical distancing of 2 meters in operative and non-operative areas like receptions. Others measures include proper hand hygiene before and after procedures, entry level hand sanitization and the use of PPEs, having isolated operatories with doors, limiting aerosol-generating procedures, practicing four-handed dentistry with high suction, avoiding periapical radiographs where possible, having adequate ventilation, employing proper sterilization and disinfection after each

procedure and sterilizing phones or wristwatches using ultra-violet light at the end of the working day.

REFERENCES

- American Dental Association: what constitutes a Dental Emergency. https://success.ada.org/media/CPS/Files/Open%20Files/ADA_COVID19_Dental_Emergency_DDS.pdf (Accessed 21 April 2021)
- Antiviral drugs that are approved or under evaluation for the treatment of COVID-19 (2021). Available from <https://www.covid19treatmentguidelines.nih.gov/antiviral-therapy> Last accessed on March 23, 2021.
- Centers for Disease Control and Prevention (2019). Interim Infection Prevention and Control Guidance for Dental Settings during the COVID-19 Response. <https://www.cdc.gov/coronavirus/2019-ncov/hcp/dental-settings.html>. Last accessed March 23, 2021
- Chen J (2020). Pathogenicity and transmissibility of 2019-nCoV-a quick overview and comparison with other emerging viruses. *Microbes Infection*, 22, pp. 69-71.
- Coronavirus disease (2019): How is it transmitted? Available from <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/question-and-answers-hub/q-a-detail/coronavirus-disease-covid-19-how-is-it-transmitted>. Last Accessed March 30, 2021
- COVID-19 & Dentistry: Recent updates (2020). Available from https://www.slideshare.net/harithark3/covid19-dentistry-recent-updates?from_m_app=android_pg_20-37. Last accessed March 23, 2021
- COVID-19 (2021): Health worker death toll rises at least 17000 as organisations call for rapid vaccine rollout. Available from <https://www.amnesty.org/en/latest/news/2021/03/covid19-health-worker-death-toll-rises-to-at-least-17000-as-organizations-call-for-rapid-vaccine-rollout/>. Last Accessed on April 11, 2021.
- Nigeria Centre for Disease Control (2021). COVID-19 outbreak in Nigeria: Situation Reports. 2021 March. Available from <https://ncdc.gov.ng/diseases/sitreps>. Last Accessed on 22 March 2021
- Patolia SK (2021). COVID-19 Pulmonary Management. Available from <https://emedicine.medscape.com/article/2500117-overview>. Last Accessed on April 11, 2021.
- Paul G, Auwaerter MD (2021). Coronavirus COVID-19 (SARS-CoV-2). *John Hopkins ABX Guide*. Available from https://www.hopkinsguides.com/hopkins/view/Johns_Hopkins_ABX_Guide/540747/all/Coronavirus

- [COVID 19 SARS CoV 2](#). Last accessed 26th April 2021.
- Peditto M, Scapellato S, Marciano A, Costa P, Oteri G. Dentistry during the Covid-19 Epidemic: An Italian Workflow for the Management of Dental Practice Int J Environ Res Pub Health 2020;17:3325
- Premium times (2021). Updated: COVID-19: 75 Nigerian health workers tested positive last week- Official. Available from <https://www.premiumtimesng.com/coronavirus/439966-updated-covid-19-75-nigerian-health-workers-tested-positive-last-week-official.html> Last accessed April 20, 2021.
- Sede MA, Enone LL, Makanjuola JO (2020). COVID-19 and its implication on Restorative dental practice in Nigeria. Nigeria Dental Journal, 28(1), pp. 5-17.
- Singh A (2020). COVID-19 and Dentistry. Available from https://www.slideshare.net/AabhaSingh5/covid-19-and-dentistry-232893008?from_m_app=android Last accessed March 22, 2021.
- Sumanth KS, Poovani S, Shetty G, Sonahalli NK, Kumaramara SS (2019). Infection control protocol in prosthodontics: a review. International Journal of Scientific Research, 8(3), pp.1-3
- UVc sterilization works in large health settings. What about dental offices? (2020). Available from <https://www.dentistryiq.com/dentistry/products/infection-control-and-instrument-management/article/14180067/uvc-sterilization-works-in-large-healthcare-settings-what-about-dental-offices>. Last accessed February 28, 2021.
- What dental practitioners need to know about CORONAVIRUS and precautions to be taken. Available from <https://www.straumann.com/en/discover/youtoot/h/article/education/2020/covid-19.html> Last accessed March 23, 2021.
- What is fogging disinfection and is it effective? (2020). Available from <https://ferrocanada.com/fogging-disinfection/> Last accessed March 3, 2021
- World Health Organization (2020)- WHO Rolling updates on coronavirus disease.2020. Available from <http://www.who.int/emergencies/diseases/novel-coronavirus-2019/events-as-they-happen..> Last Accessed on 22 March 2021
- World Health Organization (2020a). Modes of transmission of virus causing COVID-19: Implications for IPC precaution recommendations. Available from <https://www.who.int/publications-detail/modes-of-transmission-of-virus-causing-covid-19-implications-for-ipc-precaution-recommendations.2020>. Last accessed March 23, 2021.
- World Health Organization (2020c) -Hand Hygiene: Why, How & When? Available at <https://www.who.int/gpsc>. Last accessed 21 April 2021)
- World Health Organization (2021a)- WHO Definition and Categorization of the Timing of Mother-to-Child Transmission of SARS-CoV-2. Scientific brief 2021 Feb 7 Available from <https://www.who.int/publications/i/item/WHO-2019-nCoV-mother-to-child-transmission-2021.1> Last Accessed on 22 March 2021.
- World Health Organization. Coronavirus disease (2021b): Health and safety in the workplace. Available from <https://www.who.int/news-room/q-a-detail/coronavirus-disease-covid-19-health-and-safety-in-the-workplace>. Last accessed March 27, 2021