

New and Emerging Infections: Challenges and Impact on the Practice of Dentistry in Nigeria

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Abstract

Objective: To highlight the challenges and impacts of COVID 19 on dental practice in Nigeria.

Materials and Methods: A literature search was done using Electronic databases such as Medline, Pub Med and Google Scholar. Words that were searched included "New and Emerging Infections, challenges and Impact on Practice of Dentistry in Nigeria".

Results: New and emerging Infections have far reaching impacts on public health. The dental clinic is a probable environment for the airborne transmission of these infections due to the generation of aerosols and the close contact between the health workers and patients.

Conclusion: Strict infection control measures are mandatory in the dental clinic. This translates to prohibitive cost of treatment as most practices have to include additional cost for things as personal protective equipment, disinfectants.

Keywords: COVID-19, Infection control, Nigeria

Introduction

New Emerging infections (EIs) can be defined as "infections that have newly appeared in a population or have existed previously but are rapidly increasing in incidence or geographic range¹.

Over the past decades, the world has seen a number of new pathogenic microbes, which have been identified, as threat to humans. The majority (60.3%) of these infections are caused by zoonotic pathogens². Examples of which, include the Ebola virus (1977), SARS- CoV(2003), H1N1(2009), MERS CoV(2012) and most recent is the SARS- CoV-2 (COVID 19) in 2019.

The novel Corona virus SARS -CoV-2 was first described in December 2019 and was declared a pandemic by the World Health Organization (WHO) on the 11th of March 2020 and as at July 19th, 2020, over 14.3 million persons have been infected worldwide with 603,000 deaths. Although the African continent was the last to report occurrence of the pandemic, over 702,000 infections have been

reported in Africa as at 19th of July 2020 and 36,107 cases with 778 deaths in Nigeria. However, there are concerns that this may be an underreporting since the testing capacity for COVID 19 in Africa is inadequate³.

There are also infections that are described as Re-emerging and resurging infections and these are those, which previously existed in the past but are now rapidly increasing either in incidence or in geographical or human host range. One of the most important of which is tuberculosis, which re-emerged in the HIV/AIDS era.

New and re-emerging infections pose a special challenge to public health in the area of surveillance and control. Most of these infections usually spread via droplets and aerosols and these modes of transmission pose a peculiar challenge to dental practice due to the close proximity of the dental health care worker to the patients' respiratory tract and the generation of aerosols in the course of dental treatments. The increasing challenge of infectious

transmission in the dental clinic has a tremendous impact on dental practice especially in low income and developing economies like Nigeria.

Due to the characteristics of dental settings, the risk of cross infection may be high from patient to dental worker and vice versa as well as from patient to patient. For dental practices and hospitals in countries/regions with high rates of COVID-19, strict and effective infection control protocols are urgently needed⁴. Beyond the risk of transmission of the infection, the pandemic has tremendous impacts on other aspects of dental practice.

In this paper, we performed a review of the possible impacts on dental practice in Nigeria. We also proposed recommendations for dental practice in low-income settings that may help to address some of the challenges.

Infection Prevention and Control in Dental Practice

Infection control measures in dentistry have been largely based on the standard precautions supported with transmission based precautions⁵. However most acutely ill patients with diseases requiring transmission-based precautions may not attend the dental clinics and most dental patients are considered healthy and asymptomatic of diseases. The advent of SARS-CoV-2 has however changed the dynamics in terms of infection control measures especially since the confirmed asymptomatic spread of the infection, which can occur while undergoing aerosol generating dental procedures. The main transmission routes of SARS-CoV-2 comprise human-to-human droplet infection, including inhalation and contact infection of patient's saliva, blood and other body fluids through oral mucosa, nasal mucosa, and the eyes, and oro-fecal transmission⁶.

Unique to the dental healthcare setting is the profound production of aerosols during most treatment procedures. Aerosols are particles with a diameter of less than 50 micrometres which is due to their small particle size have the ability to become airborne, and can be distributed to surfaces and to the respiratory system of individuals, by inhalation thereby posing a health hazard for the dental staff and other patients⁷. Airborne transmission refers to the presence of microbes within droplet nuclei, which are generally considered to be particles <50µm in diameter, can remain in the air for long periods of time and be transmitted to others over distances greater than 1m.

The airborne transmission of Coronavirus has been a subject of debate among researchers and the lay

people. According to current evidence, SARS-CoV-2 virus is primarily transmitted between people through respiratory droplets which are released during coughing, sneezing, exhalation or speech and contact routes through contact with contaminated surfaces and subsequent touching of the eyes, nose or mouth⁸.

Airborne transmission may be possible in specific circumstances and settings in which procedures or support treatments that generate aerosols are performed such as cavity preparation, scaling and polishing, and procedures requiring the use of the dental hand-pieces, ultrasonic scalers, air abrasion units, 3-unit syringes and air polishers⁹. Generally, these are instruments that are powered by dental air compressors or high speed devices used in procedures that range from scaling and polishing, cavity preparation to surgical extractions. Studies have shown that ultrasonic and sonic scalers have the greatest risk for aerosol generation⁴. Van Doremalen et al reported that when hand pieces or ultrasonic devices are used, the aerosol generated can transmit the virus into the air where it can persist, viable, for more than 3 hours¹⁰. Therefore, dental procedures can be considered as one of the most probable modes of SARS-CoV-2 infection because such procedures require close proximity to the patient's mouth, possess a risk of contact with saliva, blood and other biological fluids and involve the use of instrumentation that creates large aerosols. The angiotensin –converting enzyme II (ACE2) has been found to be the cell receptor site for the novel corona virus (SARS-CoV-2) infection. This receptor is expressed generously on the dorsum of the tongue, as such the virus is found in saliva. Thus, AGPs in the Dental clinic are a very probable source of spread for SARS-CoV-2.¹¹

Efforts toward the prevention of transmission of SARS-CoV-2 and other infections that can be airborne include strategies to reduce or eliminate aerosol-generating procedures as much as possible. These strategies include: pre-procedural mouthwash, 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^{12,13}.

The introduction of a pre-procedural mouthwash for 20-30 seconds prior to an AGP has been recommended to reduce the oral microbes in saliva including SARS-CoV-2. Studies have shown that the SARS-CoV-2 is susceptible to oxidation and as such mouthwashes that contain oxidative agents have been effective in viral load reduction. 0.2% povidone iodine or 1% hydrogen peroxide mouth-wash have been recommended. Chlorhexidine mouthwash had been found to have no effect on the viral load and as

such is not recommended for use as a pre-procedural mouthwash against the SARS-CoV-2.^{13,14,15}

The rubber dam has been proven to form a physical barrier between the oral cavity and the environment, thereby minimizing to a significant degree the production of saliva and blood contaminated aerosols. As such, aerosols generated will be limited to only the organisms present in the exact tooth that is being worked on. Rubber dams have been found to reduce airborne particles by 70% within the operational field of the dentist. However, the use of a rubber dam is limited to procedures that require a sub-gingival component like scaling and polishing and crown preparation¹⁶⁻¹⁸.

The presence of anti-retraction valves in high-speed dental hand pieces helps to prevent contamination of the dental unit's water and air outlets, by preventing the suck-back phenomenon. They have been shown to significantly reduce the backflow of oral bacteria and HBV into the tubes of the dental hand piece.^{13,19,20}

Another very useful equipment to limit aerosols is the high volume excavator (HVE), which has been found to be 90% to 98% effective in eliminating aerosols at the point of transmission. The HVE is not the same as the saliva ejector, as this is a low volume excavator that is placed beneath the rubber dam posteriorly. The HVE typically used in dentistry has a large opening (usually 8 mm) and is attached to a system that can clear up to approximately 2.8m³ of air in one minute^{7,15,21}.

High efficiency particulate (HEPA) filters developed by the US Atomic Energy Commission in the 1940's was originally designed to clear airborne radioactive particles. Presently, it is available for both commercial and residential use²².

A combination of these preventive strategies will serve as the new normal to reducing aerosol generation in dental procedures in addition to standard precaution measures. The practice and discipline of dentistry in Nigeria thus has to undergo major revisions to guarantee safe and effective management of patients and the public. Novel information on the dynamic nature of various infections and their modes of transmission have warranted the need to make adjustments. This obviously implies more cost for providing optimal oral health care. So who bears the cost?

Cost implications of Emerging Infections in Dental Practice

Cost for dental treatment has expectedly escalated. Most practices have had to factor in additional cost for such things as personal protective equipment, disinfectants, new measures to reduce or contain aerosol generation and motivation of care staffs in

the wake of increased risk of exposure to infection.

Oral health care financing in Nigeria is still largely private and out of pocket. The country's national health insurance program continues to grapple with the problems of underutilization as a result of its narrow scope and poor enrollment^{23,24}.

With only an insignificant number of enrollees, bulk of which comes from the formal sector, and the lingering argument over the acknowledgement and inclusion of dental health care services as basic services remaining unresolved, citizens continue to pay out of pocket for dental services. The purchasing power of the average Nigerian has been adversely impacted by inflation and high unemployment rate. Nigeria's GDP per capital is less than 3000 dollars²⁵. Yet the cost of getting registered to be seen including overnight stay as at 2012 in hospitals across the country is put at an average of #2,999²⁶. This is exclusive of fees to be paid for specific treatments.

Sub-Saharan Africa faces unique health sector challenges. Though every continent of the world has had to grapple with the burden of emerging and re-emerging diseases, Africa can be described as disproportionately affected²⁷. Whether in the area of population dynamics and demographic dividend ramifications or individual, family and government direct and indirect cost, the burden of new and re-emerging infections has remained real and pervasively disturbing. Most countries in Africa lack the financial capacity to adequately fund their health sector. In 2001, African countries pledged to strengthen the continent's health system and ensure better preparedness for disease outbreaks in an historic declaration tagged "Abuja Declaration". Regrettably, apart from participating countries signing an agreement to increase government budgetary allocation to health to 15%, not much has changed. Nineteen years after, less than 10 of these countries have been able to fulfill that promise.²⁷ Nigeria has never exceeded 5%. And of this proportion, less than 1% has been appropriated to address oral health care²⁹.

There is thus an unfavourable outcome for the Nigerian patient who gets to bear the burden of increased cost either by parting with required funds or delaying treatment with attendant risk of complications, pain, discomfort and diminished quality of life till he or she is able to get the needed cash to secure treatment. Despite the relative stable fees charged by government owned hospitals, the long waiting hours and other accessibility issues undermine the advantage of utilizing such facilities.

The dental practitioner also would bear the impact of reduced income as affordability and heightened

anxiety have reduced the demand for dental care by patients who also have other opportunity costs occasioned by the pandemic such as loss of jobs and income from other sources. There is also the added cost of contracting infections in the course of providing care and transmitting it to their families, friends and neighbours in the communities they reside. Though empirical data is sparse and not available to accurately determine how many dental health workers have been infected in Nigeria, the projection is expected to be substantial considering the nature of procedures undertaken in the dental clinics and the asymptomatic nature of most infected cases as well as inadequacy in testing.

Infections and deaths from new and re-emerging infections among dental and other health care workers are not uncommon in Nigeria as reports abound of deaths from Lassa fever, Ebola and most recently COVID-19³⁰.

Challenges of Access to Care for Dental Procedures.

The emergence of COVID-19 infection has become a real challenge for healthcare providers around the world and has significantly affected the dental professionals in carrying out various dental procedures, directly and indirectly reducing access to dental care and subsequently decline in dental health^{31,32}. This is due to the strict measures established to contain COVID-19 spread by limiting access to only emergency or life threatening dental procedures, urgent dental visits and surgeries¹³. In the future, in addition to containing the current pandemic, health systems will face an avalanche of patients whose health has been compromised due to untreated chronic diseases, including oral conditions such as periodontal diseases and dental caries, currently considered non communicable diseases³³.

Apart from restrictions on non-urgent dental treatments, the lockdown placed on most countries and the fear of contracting the infection within the clinic setting may also cause a number of patients to stay away from the dental clinic. Consequently, there would be an increased risk for future dental related complications and need for more complex and expensive dental treatments thus increasing the burden of dental treatment. A study reported that patients were presenting in the emergency clinic with more severe diseases such as advanced odontogenic infection, extensive extra-oral swelling, and trismus with serious complications including dysphagia and partial airway obstruction requiring immediate referral to hospital emergency departments³⁴. In addition, there is an increase in extractions performed and a decrease in endodontic treatment

possibly due to the clinical and economic repercussions of the COVID-19 crisis^{34,35}.

Two strategies have been proposed as potential solutions to deliver dental care to the population during the COVID-19 pandemic and in the future: teledentistry^{36,37} and minimal intervention dentistry (MID)³⁸.

Teledentistry is the remote facilitating of dental care, guidance, education or treatment via the use of information technology rather than through direct face-to-face contact with the patient. With the increasing and extended use of cell phones and computers and more affordable access to the Internet, people living under strict confinement or in remote and rural areas can have access to dental care via teledentistry³³. While this may be true for developed countries, there are various challenges to implementing this in Nigeria and a lot of developing countries where the cost of data purchase and delays from connectivity due to poor Internet networks are a concern. Moreover, there will be widened inequality of access to oral health care for the majority of the population who do not have access to Internet connectivity. Teledentistry has also been observed to come with its peculiar challenges such as communication problems, limited diagnostic accuracy and inappropriate use of antibiotics³⁴.

With the new restrictions in dental treatments, Minimal intervention dentistry (MID) such as atraumatic restorative treatment may become the new standard of care in restorative dentistry, as it does not generate aerosols like the conventional restorative treatments. This is desirable in low-income countries where this has already been advocated in the basic package for oral care (BPOC). In addition, it serves the dual purpose of providing access to dental care for untreated caries which is a public health problem in underserved areas as well as provide care without the concerns for aerosol transmitted infections.

Recommendations

In the wake of the COVID 19 pandemic, various professional bodies and government agencies have issued guidelines for dental practice. In Nigeria, the Nigerian Dental Association, Nigerian Centre for Disease Control and the Federal Ministry of Health have done same.

As dental clinics begin to gradually ease back into routine dental practice, it is important that measures are put in place to ensure safety of both the health care worker and patients. These measures should ideally become the new normal because new infections will continue to emerge even after the

current pandemic has subsided. While a number of desirable measures and equipment may be unavailable or unaffordable due to cost, we would recommend a minimum standard that is practicable even in low income settings. These recommendations include:

1. Increased use of teledentistry as much as possible and practicable. This can be used in triaging and evaluating patients before presentation at the dental clinic. Procedures that can be concluded by this means such as follow up appointments; dietary counseling and oral hygiene instructions should be done. Where teledentistry is not possible, a suitable screening questionnaire can be employed to triage and evaluate patients.
2. Strict enforcement of standard precautions measures especially hand hygiene and appropriate use of personal protective equipment. Disinfection of environmental surfaces with >70% ethanol, 0.5% hydrogen peroxide or 0.1% hypochlorite ensuring contact time of at least one minute which has been shown to be effective against SARS-CoV-2 and other pathogens in health care settings.
3. Environmental control: Adequate ventilation of the dental clinic environment is important to reduce airborne transmission of infections. Fans should not be used in the clinic environment. Aerosol generating procedures should be done in a well-ventilated and contained environment when necessary.
4. Safe work practice: The reduction or restriction of aerosol generating procedures with use of pre rinsing with 0.2% povidone iodine or 1% hydrogen peroxide. The use of four handed dentistry will help to reduce risk of cross infections in the dental clinic. Mandatory use of the rubber dam and the adoption of minimal intervention dentistry as much as practicable will help in reducing risk from aerosols in the dental clinic.
5. Administrative controls: Timed scheduling of appointments, physical distancing in waiting rooms, and restriction of number of people in the clinic. Routine monitoring and feedback of environmental cleaning will ensure compliance of staff with cleaning schedule.
6. Staff training and retraining: Routine and regular training of staff in infection prevention and control is essential

Conclusion

There will always be new infections emerging and re-

emergence of past infectious diseases. Therefore, it is essential that dental practice maintains a high standard of infection control always. All patients should be considered infectious and precautions should be taken for all patients. Dental practitioners should henceforth be prepared for any eventualities as presented by this present pandemic.

In light of the current COVID-19 pandemic, the principal message "be professional, stay safe, and be helpful" is valid and up to date at present. Dental teams should at least continue to deliver emergency services employing strategic plans, supported by guidelines, and appropriate use of PPE³⁹.

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