Coronavirus Disease 2019: Implications to the Field and Practice of Oral Pathology

Omitola OG
Department of Oral Pathology and Oral Biology, Faculty of Dentistry, College of Health Sciences, University of Port Harcourt, Rivers State, Nigeria

Correspondence: Omitola OG
E-mail:olufemi.omitola@uniport.edu.ng

Abstract

Objective: To highlight the implications of COVID -19 disease to the field and practice of Oral Pathology.

Materials and Methods: Extensive PubMed and Google Scholar search using relevant mesh terms for articles on the effects of COVID-19 on the practice of Oral Pathology. The relevant articles were thereafter reviewed, and the implications drawn.

Results: The virus which is usually transmitted via droplet can survive for days on some materials which are commonly used in the laboratory; thereby constituting a potential source of infection to laboratory workers. In addition, the presence of the viral receptors in the oral mucosa has been established and so presenting the mouth as a possible route of entry. Viral particles are also shed heavily in the saliva. These observations have dual implications. First, it poses increased risk to the oral pathologists in handling oral tissue biopsy and secondly, it potentially makes the saliva an alternative medium of diagnosis. Furthermore, oral exfoliative cytology can be developed for viral detection especially in asymptomatic patients.

Conclusion: Maintenance of social distance while attending to patients in the laboratory, regular disinfectant of the working surfaces and careful handling of tissue specimens are essential for preventing the spread of COVID-19 in the laboratory. Research works in the use of saliva and oral exfoliative cytology for screening and diagnosis of COVID-19 patients should be a new area of interest to the oral pathologists.

Keywords: COVID-19, Oral Pathology, Saliva, Exfoliative cytology.

Introduction

The coronavirus disease 2019 simply called COVID-19, is caused by a novel coronavirus, and was first reported in the city of Wuhan, Hubei Province, China in December, 2019[1]. Since then, it has grown to become a major global pandemic. On January 30, 2020, the World Health Organization (WHO) declared COVID-19 a public health emergency of international concern which has affected millions of people worldwide and causing several deaths[2]. As at July 2020, the total number of people infected worldwide has exceeded fourteen million with over 600,000 deaths[3]. The International Committee on Taxonomy of Viruses (ICTV) has renamed this novel infective virus Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2)[4].

Oral and maxillofacial pathology (called oral pathology in some centres) is a speciality that is involved with the diagnosis and study of the causes and effects of diseases affecting the oral and maxillofacial region (i.e. the mouth, the jaws, the face and the associated structures). It can be considered a speciality of dentistry and pathology. Oral pathology is a close ally of oral and maxillofacial surgery and oral medicine specialities. In the process of making diagnosis of oral diseases, the oral pathologists will

need to make close contact with the patients and /or patients products which are potentials risk factors for the COVID-19 infections. Products from patients are also analysed in search for possible markers for screening and diagnosis of oro- facial lesions and other related systemic diseases.

In this article, a critical review of published articles on COVID-19 was done to determine the implications of the infection on the field and practice of oral pathology as well as potential role of the oral pathologists in the screening, diagnosis and management of the novel disease.

Pathogenesis of COVID-19 infection

The aetiological agent of COVID-19 infection is a novel coronavirus known as SARS-CoV-2; a member of the order Nidovirales, family Coronaviridae, and genus, Betacoronavirus (β-CoV). Its nucleotide is 80% similar to SARS-CoV and 50% similar to MERS-CoV which are other coronaviruses known to cause epidemics in humans[5]. SARS-CoV-2 structure consists of a nucleocapsid with a single stranded RNA core and a lipoprotein envelope with numerous spikes with which it attaches to angiotensin converting enzyme 2 (ACE 2) receptors on human cells to exert its effect.

Transmission of COVID-19 is usually through inhalation of respiratory droplets from infected individuals. These droplets can be generated through coughing, sneezing and talking. COVID-19, like other coronaviruses, can also be contracted from infected surfaces. It is known that at 24^{0}C, coronaviruses can survive for about 5 days in the sputum and faeces, 10 days in urine and blood. Thus, the possibility of faeco-oral transmission is very high. At room temperature, it could survive for about 3-5 days on the surfaces of filter paper, gauze, plastic, ceramic and glass which are often present in the laboratories, thereby putting the laboratory works at risk[6]. Also, through contact with infected surfaces and aerosols, mucosa infection can occur. This is made possible because of the presence of ACE 2 receptors on mucosae epithelia including the oral mucosa[7].

Once it finds a human host, the incubation period of this virus has been reported to be 2-14 days, but it can extend up to 24 days[8]. The common symptoms of COVID-19 are fever, chills, fatigue, shortness of breath and dry cough. Other uncommon symptoms are sore throat, muscle pain, diarrhoea, conjunctivitis, loss of taste or smell, headache, skin rashes on the fingers and or toes[9]. Most of the infected individuals show mild or no symptoms and are known as carriers[10]. These people are potential sources of infection to unsuspecting laboratory workers and those in the clinic. In hospitalized cases, aggravated conditions may give rise to pneumonia, multiple organs failure (mainly renal failure) and even death. The case fatality ratio declared by the WHO for COVID-19 infection is about 4.5%[9]. Currently, the development of vaccines and drugs is still on going, hence, the best strategy to limit this deadly infection is social distancing, contact tracing and vigorous testing to identify and quarantine the positive cases. For the health care provider, the use of personal protective equipment and regarding all patients as potential carrier will help to prevent the infection.

Oral manifestations of COVID-19 infection

Manifestation seen within the oral cavity of patients with COVID-19 infection may include the following; oral ulceration, gingival bleeding, glossitis, oral pain, halitosis. A recent publication suggested that recurrent oral ulcers may be the initial symptom of this infection [11]. Xerostomia has also been reported in a relatively high proportion of patients with COVID-19[12]. Hence, it may sometimes become necessary to perform oral examination and intervention in patients with COVID-19.

Diagnosis of COVID-19 infection

The main strategy for identification of COVID-19 is Reverse Transcription quantitative Polymerase Chain Reaction (PCR), which is commonly used to extract viral RNA from oropharyngeal and nasopharyngeal swabs or sputum samples[13]. Also, serological testing aimed at detecting antibodies to the virus in the blood of the patients has been suggested as a possible means of diagnosis[14].

Use of saliva in the diagnosis of COVID-19

The use of PCR technique is very expensive and is not readily available in a resource limited area like Nigeria. Serological test is also not very reliable because antibody may not be detected in all patients that have the infection. Taking the oropharyngeal or nasopharyngeal swab is very irritating and discomforting to most individuals and some patients may not be able to tolerate the procedure. Thus, some authors have suggested the use of saliva because the virus can be detected in medium[12,13.15]. It has been documented that thus far, three methods of sample taking capture saliva: saliva swabs, coughing out, and directly sample from the salivary gland duct. As regards clinical applications where a strong positive rate of virus identification is required, saliva from deep throat provides the strongest positive rate, which could enhance early-diagnosis of COVID-19[12]. Saliva extracted from salivary gland ducts is consistent for detecting acute COVID-19, thus may

likely be a reliable and non-invasive test for acute patients. The benefits of salivary diagnostic tests are:- being economical, non-invasive, healthier to apply than serum sampling, diagnostic values in real-time, no requirement for specialized healthcare workers, numerous samples are simple to obtain, collecting and monitoring are achievable at home, minimizing the possibility of cross-infection, better shipping and storage than serum sampling, much less agitation during the diagnostic process, screening assays are commercially available, more so, saliva does not clot and can be handled more efficiently than blood. Thus, salivary diagnostic testing can offer a convenient and cost-effective mechanism for early-diagnosis of COVID-19[16].

Use of exfoliative cytology in the diagnosis of COVID-19

The use of PCR as stated earlier is very expensive and is not readily available in resource limited areas and thus cannot be used to test every suspected cases. Also, asymptomatic patients which form about 80% of cases may not come forward for testing even when the test is available. Thus, it is important to develop a method of screening for COVID-19 which can be deployed for the whole population. ACE 2 receptor has been identified as the attachment domain for spike receptors on COVID-19 virus[7]. Furthermore, attachment of spike receptor also causes depletion of ACE2 receptors, which leads to various morbidities of the infection[17]. Thus, due to changes in the expressivity, ACE 2 expression can be exploited for the detection or screening of COVID 19[18]. ACE 2 receptors are readily available on oral epithelium and can be the route of COVID 19 infection[7]. Exfoliative cytology is routinely used in oral pathology practice for obtaining oral epithelial cells for investigation. With this technique, it is possible to retrieve cells from the deeper basilar and supra-basilar location. Hence, it is possible to retrieve COVID-19 positive epithelial cells from infected patients. This knowledge can be exploited for early detection of infection. Apart from routine haematoxylin and eosin stain, immunohistochemistry can be used on the exfoliated cells to identify and quantify various proteins[19]. Protein structures are better preserved in exfoliated cells as compared to formalin-fixed paraffin-embedded tissues. Hence, better sensitivity and specificity can be achieved on exfoliative cytology immunohistochemistry. Immunohisto-chemistry compatible anti-ACE2 antibodies are readily available with the reputed biotechnology companies. Therefore, identification and quantification of the ACE2 receptor on exfoliated cells using immunohistochemistry could be an efficient tool for the detection of asymptomatic cases[18]. This method is less time consuming, cheaper and very reliable[18]. The oral pathologists are expected to be in the fore front of researches using saliva and exfoliative cytology as a better alternative to the current method of diagnosis and screening.

Implications to the field and practice of oral pathology

The main route of spread of the infection through droplets infection implies that those working in the laboratory are also potentially exposed to being infected by patients and other carrier visitor to the laboratory as well as co-workers. Also, the fact that the virus particles can survive on paper gauze, plastic, ceramic and glass for days means they can serve as potential reservoir for infecting laboratory workers because these materials are commonly used in oral pathology laboratory. Thus, the need to observe the prescribed preventive procedures such as maintaining social distancing, wearing of face mask by both the workers and visitors to the laboratory alongside with regular cleaning of the work surfaces with potent disinfectants is recommended.

The incubation period of the virus is 2-14 days, the implication of this is that laboratory and oral diagnosis clinic workers exposed to suspected or diagnosed cases need to self-isolate for 14 days. If they develop symptoms during this period, they will need to take the diagnostic test to determine their status. Those that do not develop symptom would also be encouraged to take the test if available considering they could become asymptomatic carriers, so potential spreader of the infection.

The dentist including the oral pathologist especially those working in the oral diagnosis clinic need to be familiar with the oral manifestation of the infection. This may aid in the diagnosis of suspected cases or some asymptomatic carriers. Currently, the development of possible vaccine for this infection is still far from being concluded, yet, oral pathologists have to continue to see patients both in the clinics and in the laboratories. Therefore, the need to treat all patients as possible carriers and observe all preventive protocols is imperative. Personal protective equipment should be used at all time to protect the health workers and the patients alike.

Conclusion

COVID-19 is highly infective and the spread is through droplet contamination. It is currently diagnosed by identifying the causative agent in oropharyngeal or nasopharyngeal swab using PCR method. The oral pathologist can champion researches using saliva and oral exfoliative cytology in

the diagnosis and screening of this infection. These will be more acceptable and cheaper than the current method.

The laboratory staff and clinicians are exposed to the virus especially from asymptomatic patients and co-workers. Hence, there is a need to treat all individuals as potential carriers and to observe universal preventive protocols including wearing personal protective equipment and regular disinfection of work surfaces in the laboratories and clinics.

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