Saliva and COVID 19: Current dental perspective

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Abstract

Oral health care providers are at a higher risk of being infected by novel coronavirus due to close proximity to patient's face and exposure to saliva while working on the patient. Thus, there is an urgent need to interpret the available literature in order to establish safe practices for dental professionals as well as limit the spread of infection through saliva. The study intends to provide up-to-date, compiled evidence-based information related to saliva and its association with COVID-19. It further provides suggestions for safe practices in dentistry in current pandemic times. Oral symptoms may be strongly suggestive of early diagnosis and disease progression in COVID-19 patients. Viral loads in saliva are reported higher than standard nasopharyngeal swabs in few studies, majorly in the 1st week of symptom onset. Besides, salivary diagnostics has many additional advantages of being noninvasive, comfortable to the patients with the possibility of point-of-care testing for diagnosing COVID-19. High-efficiency particulate arrestor filter, rubber dam application and high-volume evacuator can reduce spatter and droplets/aerosol production. Povidone-iodine-based mouthwash maybe mouthwash of choice before any dental examination or procedures due to its ability to decrease severe acute respiratory syndrome- coronavirus 2 viral loads in the mouth. Salivary diagnostics related to COVID-19 should be integral part of dental teaching programs. There is a tremendous scope to study saliva in health and diseases.

Keywords: COVID-19, point-of-care testing, salivary diagnostics

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INTRODUCTION

There has been an ongoing discussion about novel coronavirus (nCoV), as few characteristics of this virus are still unknown, and new information is pouring in every day, every moment influencing diagnostic and management approaches. Health care workers are at an increased risk of COVID-19 infection due to the nature of their work, such as sample collection and close association with infected patients. Wang *et al.*, 2020 found a high percentage of hospitalized patients infected with COVID-19 in Wuhan to be healthcare workers (40 out of 138).[1] Among health care professionals, dental surgeons and ophthalmologists are at a higher risk due to proximity to patients' face and oral cavity while performing procedures. The aerosol-generating procedures lead to consistent exposure to saliva and blood.[2,3] The requirements and considerations related to essential oral health services in COVID-19 have been prepared in sync with World Health Organization protocols for the maintenance of essential health care. These guidelines have been addressed in a document,

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released on August 3, 2020, and are subject to change as more evidence-based (EB) literature gets published.[4] There is an urgent need to interpret the evidence that is generated related to oral practices and the spread of infection through saliva and saliva mixed with blood.

This article is an attempt to provide up-to-date evidence-based information (EBI) related to saliva and its association with COVID-19 and suggestions for safe practices in dentistry in current pandemic times.

EVIDENCE-BASED INFORMATION 1: ORAL SYMPTOMS OF COVID-19

Questionnaire-based study on COVID 19 patients has shown that oral clinical features including amblygeustia and dry mouth have high prevalence, therefore these oral symptoms can be initial warning signs of COVID-19 infection.[5] The documented oral sites of involvement in affected patients include "tongue (38%), labial mucosa (26%), palate (22%), gingiva (8%), buccal mucosa (5%), oropharynx (4%) and tonsil (1%)." They usually present with oral manifestations including "ulcers, erosions, bulla, vesicles, pustules, fissured or de-papillated tongue, macule, papule, plaque, pigmentation, halitosis, whitish areas, hemorrhagic crust, necrosis, petechiae, swelling, erythema and spontaneous bleeding".[6] In addition, these patients report with taste disorders in 45% of cases.[7] However, the sex predilection for oral lesions in COVID-19 affected individuals was almost equal in males (51%) and females (49%).[6]

Amorim Dos Santos *et al*. 2020 while discussing a single case report, however, have pointed out that some of the oral manifestations could be secondary to the decline of systemic health or due to medical management of COVID-19.[8]

Suggestions
Oral symptoms could be a valuable aid in early diagnosis and monitoring disease progression in COVID-19 patients. Hence, dental professionals may be trained to diagnose initial oral lesions and early symptoms and generate more evidence associated to it.

EVIDENCE-BASED INFORMATION 2: SALIVA TESTING FOR COVID-19

A recent study by Kapoor *et al*. has explored the applicability of saliva as a diagnostic sample for COVID-19, studying multiple aspects of salivary viral load, sensitivity, specificity in comparison with the standard practice of nasopharyngeal swabs (NPSs), along with the temporal variation and associated antibody response. The review highlighted a high severe acute respiratory syndrome- 2 CoV (SARS-CoV)-2 salivary viral load during the 1st week of symptom beginning, with evidence showing a positive correlation of viral load with disease severity and age of patients and a higher sensitivity in saliva than NPS in few studies.[9]

Reverse transcription-polymerase chain reaction analysis on specimens collected from naso-and/or oropharynx swabs (NOS) is the most widely used COVID-19 diagnostic test.[10] NOS, although easy and sensitive, has limitations of being unsafe for healthcare personnel.[10,11] However, the use of salivary swabs instead of NOS for detection of COVID-19 has been suggested,[11,12] since salivary diagnostics in COVID-19 offers many advantages.[13] Unlike NOS, saliva specimen does not require close contact between healthcare workers and patients; hence, there is less risk of transmitting the virus to the healthcare workers.[13,14]

Suggestions
Literature suggests that saliva as a diagnostic specimen is an economical, less technique sensitive and safer option for patient/investigator than NOS. SARS-CoV-2 in respiratory/salivary specimens has shown high detection in mild and severe diseases and critically ill patients. Studies show a gradual reduction in salivary viral load from the 1st to 4th week of symptom onset, which supports salivary specimen in early detection of SARS-CoV-2. In addition, salivary samples effectiveness compared to NPS has been proven in few studies which show high sensitivity and higher viral load in salivary samples compared to NPS samples.[9] The dental setup may be ideal for salivary specimen collection when air borne-infection isolation rooms are not available. However, high levels of salivary SARS-CoV-2 also send across a word of caution to dental professionals who may be treating asymptomatic COVID-19 patients.

EVIDENCE-BASED INFORMATION 3: SALIVA-BASED POINT-OF-CARE TESTING FOR DIAGNOSING COVID-19

Point-of-care testing (POCT) employing salivary specimens have been explored in COVID-19 testing, with the advantage of being noninvasive and used at patients' side.[15] The accuracy of salivary POCT in COVID-19 has been proven by high positive percent agreement in paired saliva and PCR-positive NPS samples.[9] Research in this domain has led to the development of saliva-based COVID-19 testing kits. Few Indian research initiatives to develop these saliva testing kits have been successful, including

those done by the Multidisciplinary Centre for Advanced Research and Studies (at Jamia Millia Islamia, New Delhi)[16] and RICOVR Healthcare collaboration with the Indian Institute of Technology (Madras).[17]

Suggestions

Commercial availability of handy and accurate inventions as these saliva-based COVID-19 detection kits might change the future of dental practice, and more resources are required to be diverted in these directions. In addition, integration of saliva-based POC detection systems with smartphones and artificial intelligence can provide fast and effective communication with better surveillance.[18]

EVIDENCE-BASED INFORMATION 4: REDUCING SALIVA RELATED TRANSMISSION IN THE DENTAL CLINIC

Present epidemiological data points out that nCoV has higher transmissibility than previously infecting viruses such as SARS-CoV and middle east respiratory syndrome (MERS)-CoV.[19] Patients reporting to the clinic can be asymptomatically infected, and transmission can happen even before disease symptoms appear. Thus, adopting several measures such as wearing proper gear (personal protective equipment and surgical masks/N95 respirator shoe covers),[20,21] teledentistry for patient monitoring can avert transmission of COVID-19 by decreasing exposure.[22] In addition, high-efficiency particulate arrestor filter, rubber dam application and high-volume evacuator can reduce spatter and droplets/aerosol production.[23]

Although no cluster outbreak of COVID-19 has been reported in dental patients and oral health care providers (HCP), there is still a need to collect data related to infection incidence from dental HCP and the community to establish EB guidelines. Till then, national/international standard operating procedure and infection control regimen of dental set-up should be focussed toward curtailing COVID-19 spread.[24]

Suggestions

Modified triage of dental practice must include avoidance of nonemergency general dental procedures.[25] In addition, the practice of long gaps in aerosol procedures appointments should continue till the local population counts of COVID-19 infection decline.

EVIDENCE-BASED INFORMATION 5: USE OF MOUTHWASHES AGAINST COVID-19

Povidone-iodine (PVP-I) based mouthwashes which are typically 1% in concentration, have demonstrated antiviral and anti-bacterial properties.[26] An *in vitro* study has established that PVP-I-based products along with 70% ethanol are strongly effective in SARS-CoV inactivation.[27] Evidence suggests rapid inactivation of SARS-CoV, influenza A virus subtype H1N1, rotavirus and MERS-CoV when exposed for 15 s to 0.23% PVP-I.[28] A saliva-based study on two patients has found that chlorhexidine mouth wash (0.12%, 15 ml) for a period of 30 s leads to a fall in viral load levels for 2 h after gargling followed by a subsequent rise, questioning its efficacy.[29] A critical review by Carrouel *et al.*, 2021 to study the various reagents in commercial mouthwashes, including chlorhexidine, PVP-I, cyclodextrin, hydrogen peroxide, cetylpyridinium chloride, Citrox and essential oils, concluded that further clinical trials are necessary to provide quality evidence related to the antiviral properties of these active ingredients.[30]

Suggestions

Current findings indicate that PVP-I mouth wash can decrease COVID-19 viral loads in the mouth and therefore recommended as mouth wash of choice before any dental examination or procedures.

THE ROAD AHEAD, OPPORTUNITIES AND FUTURE CHALLENGES

Newer possibilities in health care research and the need for revised education goals during the COVID-19 pandemic were suggested by Chowdhry *et al*. 2020.[31] Since salivary diagnostics are likely to serve as markers of several diseases, including infections of viral origin, such as COVID-19, it is pertinent that saliva's physiology and its diagnostic aspects should be included in the undergraduate dental curriculum. The dental curriculum should balance skill training of dental procedures and the oral cavity's biological aspects, including saliva. There is a tremendous scope to study saliva in health and diseases.

Conflicts of interest

There are no conflicts of interest.

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