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COVID-19 and Its Effect on Dentistry

Amil Sharma[1*], Rupali Balpande[2], Arpit Shrivastava[3], Gayatri Deshmukh[2], Pritee Bargaje[2] and Sharmishtha Sharma[4]

[1]Department of Endodontics, Maharana Pratap College of Dentistry and Research Center, Gwalior, Madhya Pradesh, India.
[2]Department of Endodontics, V. Y. W. S. Dental College and Hospital, Amravati, Maharashtra, India.
[3]Department of Orthodontics, Maharana Pratap College of Dentistry and Research Center, Gwalior, Madhya Pradesh, India.
[4]Modern Dental College Indore, Gwalior, Madhya Pradesh, India.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

COVID-19 or normally known as a coronavirus disease has already been in a pandemic situation which almost grabs many countries in the world. Its outbreak is still at large and even grasping medical professionals too.COVID-19 is a disease caused by SARS-CoV-2 that can trigger what doctors call a respiratory tract infection. It can affect the upper respiratory tract (sinuses, nose, and throat) or lower respiratory tract (windpipe and lungs). It spreads the same way other coronaviruses do, mainly through person-to-person contact. Infections range from mild to deadly. Although the mortality rate of this virus is low, it is especially potent against people with underlying systemic conditions. The practice of dentistry involves the use of rotary dental and surgical instruments, such as Handpieces or ultrasonic Scalars and air-water syringes. These instruments

**Corresponding author: E-mail: amilsharma1989@gmail.com;*

create a visible spray that can contain particle droplets of water, saliva, blood, microorganisms, and other debris. Dental health care professionals are at higher risk due to their close working field to the patient's oral cavity. The outbreak of COVID-19 has affected all businesses including general dental practices, which are suffering huge financial losses as they have been advised to give only emergency dental care because dentistry is a profession where the doctor as well as the dental staff works in close range of patients mouth. These recommendations should be appreciated as a positive step but they have caused serious financial implications for dental practices. It can be concluded that current dental practice globally is limited to the provision of emergency treatments only. So this article briefly discussed Covid-19 and a precautionary measurement needs to be taken by dental professionals

Keywords: Covid-19; dental professionals; personal protection equipment.

1. INTRODUCTION

Coronavirus disease 2019 (COVID-19) is an infectious disease caused by Severe Acute Respiratory Syndrome Corona Virus 2 (SARS-CoV-2). It was first identified in December 2019 and has resulted in an ongoing pandemic. The public health emergency was declared by the world health organization on 30th January 2020. On January 30, 2020, the first Covid-19 patient reported in India [1].

There are pieces of evidence that this novel coronavirus is very similar to coronavirus species which is found in bats and pangolins, confirming the zoonotic nature of this new cross-species viral-mediated disease. As the published genome sequence of this novel coronavirus has a close resemblance with other beta-corona viruses such as SARS-CoV and MERS-CoV, the Coronavirus Study Group of the International Committee on Taxonomy of Viruses has given it the scientific name SARS-CoV-2, even though it is popularly called the COVID-19 virus [2]. Dental professionals appear, indeed, at high risk of contagion due to the exposure to saliva, blood, and aerosol/droplet production during the majority of dental procedures SARS-CoV-2 transmission during dental procedures can therefore happen through inhalation of aerosol/droplets from infected individuals or direct contact with mucous membranes, oral fluids, and contaminated instruments and surfaces [3]. Although the mortality rate of this virus is low, it is especially potent against people with underlying systemic conditions The outbreak of COVID-19 has affected all businesses including general dental practices, which are suffering huge financial losses as they have been advised to provide only emergency dental care because dentistry is a profession where the doctor, as well as the dental staff, works in close range of patients mouth. These recommendations should be appreciated as a positive step but they have caused serious financial implications for dental practices. It can be concluded that current dental practice globally is limited to the provision of emergency treatments only [4,5].

2. NATIONAL HEALTH COMMISSION OF CHINA GUIDELINES AMID COVID-19 OUTBREAK

The National Health Commission of China (NHCC) added COVID-19 to group B of infectious diseases along with other diseases like SARS and influenza in January 2020 Post this step, dental treatment in many cities of China is restricted to emergency care only and that too with strict infection control measures and routine dental treatments are suspended till the situation of COVID-19 pandemic
resolves [4].

3. AMERICAN DENTAL ASSOCIATION GUIDELINES AMID COVID-19 OUTBREAK

The American Dental Association (ADA) has recommended on March 16, 2020, to all its registered dentists to postpone any elective treatment for the next 3 weeks. However, it is also recommended by ADA in the same press release to provide emergency dental care to the patients to reduce the burden on emergency departments in the hospital Emergency dental treatment is usually defined as care provided to control bleeding, infection, and severe pain. Treatments such as routine oral examinations or radiographs, cleaning, preventive, and aesthetic procedures, restorations, and removal of teeth without the pain, and regular orthodontics do not constitute an emergency. It should be mentioned here that all dental specialty organizations in the

United States (U.S.) including the American Association of Pediatric Dentistry, American Academy of Periodontology,16 American College of Prosthodontics, American Association of Orthodontists, American Association of Oral and Maxillofacial Surgeons, American Academy of Oral and Maxillofacial Radiology, American Association of Public Health Dentistry, American Academy of Oral and Maxillofacial Pathology, and American Association of Endodontists have also followed the guidelines of ADA and have recommended postponing all regular dental procedures[4].

4. NATIONAL HEALTH SERVICE, UNITED KINGDOM GUIDELINES AMID COVID-19 OUTBREAK

The guidelines of National Health Service, England published on March 5, 2020 state that in a primary dental care setting, regular treatments should be deferred and only emergency treatments should be provided to the patient. The office of the Chief Dental Officer (CDO) in Scotland has recommended stopping all aerosol-generating procedures (AGPs) in Scotland to curb the spread of COVID-19. The CDO of Wales has also suggested that routine dentistry is no longer practical, whereas, Health and Social Care Board of Northern Ireland has also recommended control of AGPs to control COVID-19 spread [4].

5. ROUTES OF TRANSMISSION

SARS-CoV-2 infections typically spread through respiratory droplets or by contact. Therefore, coughing or sneezing by an infected person can render SARS-CoV-2airborne, potentially infecting individuals in close contact (within a radius of approximately 6 ft). This led to the recent recommendation of social distancing to minimize community spread of the disease. Another important route of transmission is droplets of SARS-CoV-2 land on inanimate objects located nearby an infected individual and are subsequently touched by other individuals. Thus, the disinfection of objects and handwashing are essential for halting the spread of this disease. These recommendations strengthened considering that person touches their face on an average of 23 times per hour, with 44% of these occurrences involving the mucous membranes of the mouth and/nose. Also, studies have shown the presence of SARS-CoV-2 in both saliva and feces of the affected patients. It is known that

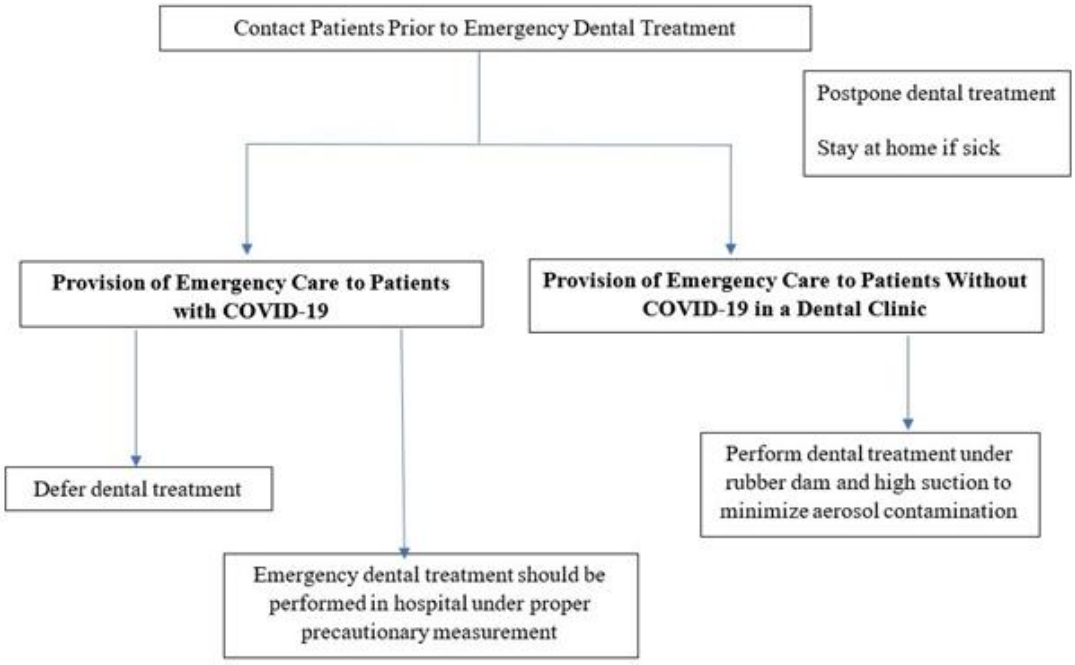

Fig. 1. CDC Guideline for Dental Care During COVID-19 [1]

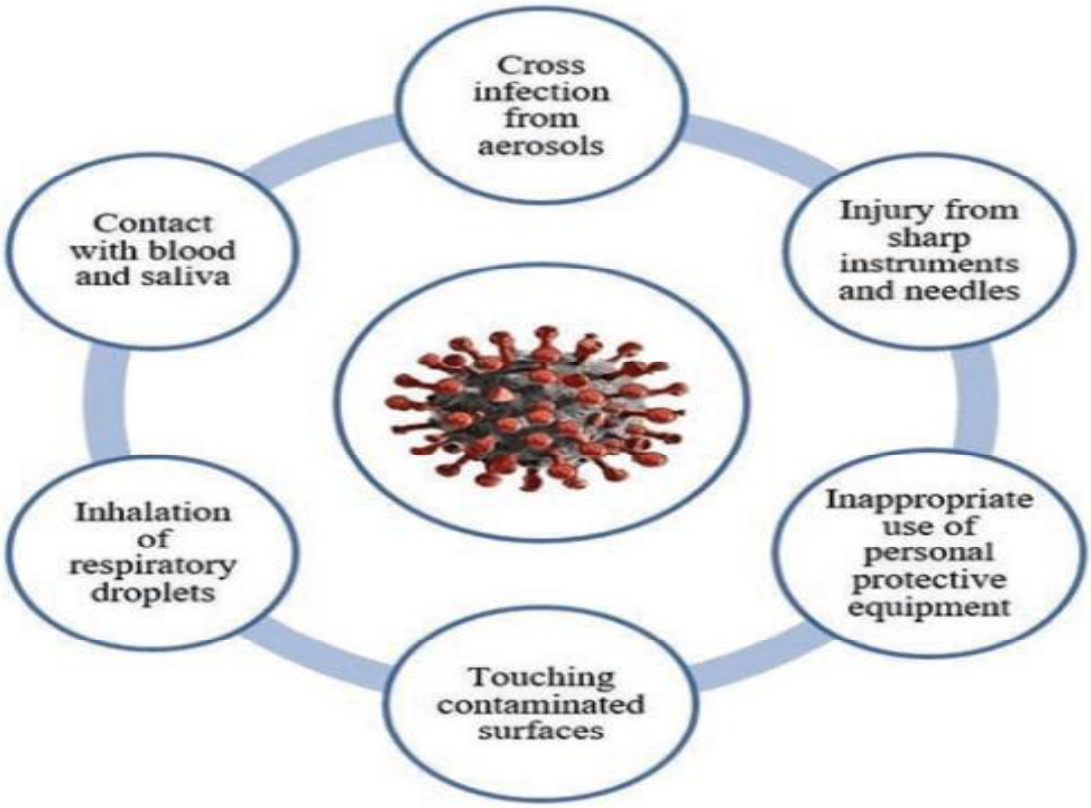

Fig. 2. SOME common modes of possible transmission of COVID-19 in a dental practice. COVID-19, corona virus disease 2019

SARS-CoV-2 can bind to human angiotensin-converting enzyme 2 receptors, which are highly concentrated in salivary glands; this may be a possible explanation for the presence of SARS-CoV-2 in secrete saliva. Therefore, there is a potential for transmission of COVID-19 via aerosol, fomites, or the fecal-oral route that may contribute to nosocomial spread in the dental office setting [2].

Dental practitioners risk should not be underestimated. Dentists routinely perform several aerosol-generating procedures due to the use of different tools, like a dental high-speed turbine, spray handpiece, or piezoelectric scalar. These instruments largely increase the aerosol produced in the work environment, thus exposing both clinician and patient to the risk of infection. [6] During dental procedures, inhalation of aerosols produced by instruments on patients with COVID-19 can determine a high infection risk [7].

6. DENTAL AEROSOL AND SPLATTER

Aerosols can be defined as particles less than 50 micrometers in diameter. Particles of this size are small enough to stay airborne for an extended period before they settle on environmental surfaces or enter the respiratory tract. The smaller particles of an aerosol (0.5 to10 μm in diameter) have the potential to penetrate and lodge in the smaller passages of the lungs and are thought to carry the greatest potential for transmitting infections [8].

Splatter can be defined as airborne particles larger than 50 μm in diameter. These particles behave in a ballistic manner. This means that these particles or droplets are ejected forcibly from the operating site and arc in a trajectory similar to that of a bullet until they contact a surface fall to the floor. These particles are too large to become suspended in the air and are airborne only briefly [8].

Fig. 3. The visible aerosol cloud produced by an ultrasonic scalar using a flow of 17 milliliters per minute of coolant water

Fig. 4. PPE kit recommended incovid-19

7. INFECTION CONTROL PRECAUTIONS

7.1 PPE

Recommended PPE for contact with critically ill patients with confirmed or suspected 2019-nCoV infection includes a fluid-resistant gown, gloves, eye protection, full-face shield, and fit-tested N95 respirators. Hair covers or hoods should also be worn. Longer sleeved gloves are preferred (if available) to prevent exposure of the wrist with glove slippage. Alternately, vertical tape strips can be used to help keep gloves secured to the gown. Circumferential taping of gloves to the gown, such as the user when wearing chemical PPE, is not necessary makes gown and glove removal more challenging. Eye protection should include

protection from side exposure with side shields or goggles. Full face shields can provide both eye protection and avoid facial and respiratory contamination. Some disposable shoe covers may increase the risk of self-contamination during the removal of protective clothing. Shoes worn should be impermeable fluids and able to be decontaminated. Staff should wear operating room scrub suits or full coveralls under the PPE. Coveralls with an integrated hood may simplify the underlayer worn in conjunction with PPE, however, the choice of product should be assessed for ease of removal to avoid contamination during removal. Hand hygiene must be performed after removing PPE, and in the event of inadvertent contamination of the hands by touching dirty surfaces during PPE removal [8].

7.2 Face Shields

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7.3 Hand Hygiene

Hand hygiene is a critical measure of reducing sars-CoV-2 transmission. It is crucial to perform thorough hand washing when coming into contact with patients and no disinfected surfaces or equipment, and it is recommended to avoid touching eyes, mouth, and nose without having hands carefully washed. In particular, a protocol involving 5 hand wash (2 before and3 after treatment) was proposed to reinforce professional compliance [3].

7.4 Povidone-Iodine Gargle/Mouthwash

PVP-I 7% gargle/mouthwash showed rapid bactericidal activity and virucidal efficacy in vitro at a concentration of 0.23%PVP-I and may provide a protective oropharyngeal hygiene measure for individuals at high risk of exposure to oral and respiratory pathogens [9].

7.5 Dental Clinic Disinfection

Dental Treatment of asymptomatic Covid-19 patients with the high-speed handpiece and ultrasonic produce aerosol in the dental clinic and routine standard procedure cannot protect dental health professionals fromCovid-19. Heat tolerated critical and semi-critical instruments should be sterilized with a heat sterilization procedure. Heat sensitive instruments can be sterilized with a chemical disinfectant [1]. Aerosol contamination can also be prevented by using EOVA [10].

Fig. 5. Recommended Face Shield in Covid 19

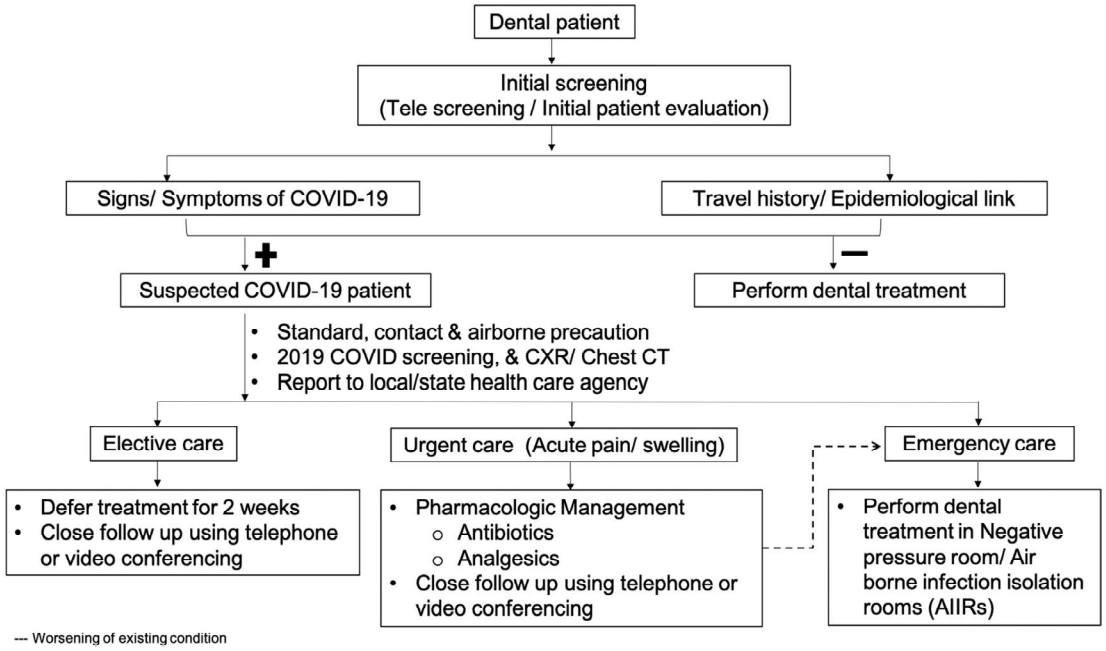

Fig. 6. An overview of patient screening for COVID-19 and dental management

8. DISCUSSION

The rampant spread of SARS-CoV-2 worldwide increases the likelihood that dental health care professionals will treat this subset of the patient population.

Universal precautions are crucial to minimizing the spread of this virus and its associated disease. As presented in this review, further precautions are necessary that include careful prescreening of patients and additional measures if the treatment of patients with confirmed COVID-19 is deemed necessary. may be called upon for the assessment and management of odontogenic pain, swelling, and dental alveolar trauma is suspected or known COVID-19 patients. It is worth noting that case presentations can be dynamic, and there is a good chance that dental practices might treat some of the patients with asymptomatic COVID-19 infections since the incubation period can range from 0 to 24 days and most patients only develop mild symptoms. Thus, every patient should be considered as potentially infected by this virus, and all dental practices need to review their infection control policies, engineering controls, and supplies. Health care providers must keep themselves up-to-date about this evolving disease and provide adequate training to their staff to promote many levels of screening and preventive measures, allowing dental care to be provided while mitigating the spread of this novel infection [2].

Every patient who appears healthy should nevertheless be considered at an unknown risk of being contagious, as one of the dangerous aspects of COVID-19 is the presence of the virus despite the absence of clinical manifestations.

Our role as dental practitioners is also then to thoroughly evaluate each patient in terms of current health status and/or contacts with potentially infected people to avoid cross-infection [3]. A growing number of bacterial infections are becoming harder, and sometimes impossible, to treat as antibiotics become less effective, and vaccination against respiratory viruses either does not exist or has incomplete coverage. When there is an emerging infectious disease outbreak, practicing appropriate hygiene is recommended for both healthcare workers and individuals to limit the spread of infection by breaking the transmission. Oral hygiene could further improve the success rate of hygiene measures, especially against respiratory pathogens [11]. Remote management should always precede the face-to-face treatments in order to avoid useless direct contacts that might only increase the risk of infection for both patients and clinicians [12]. Unfortunately, the

Table 1. Recommendations for dental emergency management during COVID-19 outbreak

Diagnosis	Primary Management	Secondary management
Symptomatic Irreversible pulpitis/Symptomatic Apical Periodontitis	**Pain Management** 1st line: Ibuprofen 600mg+ Acetaminophen 325-500mg	Full Pulpotomy
Acute Apical Abscess	**Intra oral swelling** Incision and Drainage Augmentin 500g b.i.d × 5 days / Clindamycin 300mg q.i.d × 5 days Ibuprofen 500mg + Acetaminophen 325-500mg Consideration for supplementation with long acting local anesthesia **Extra oral swelling:** Augmentin 500g b.i.d × 5 days / Clindamycin 300mg q.i.d × 5 days Ibuprofen 500mg + Acetaminophen 325-500mg	Call oral and Maxillofacial Surgery for further instructions for a possible referral
Avulsion/Luxation	If tooth is replanted, follow pain management protocol. Pain management depend on age 1st line: Ibuprofen 500mg + Acetaminophen 325-500mg	If tooth is not replanted, replant and follow IADT guidelines as best as possible.
Tooth fracture resulting in pain	**Pain Management** Ibuprofen 600mg+ Acetaminophen 325-500mg	Vital pulp therapy
Trauma involving facial bones , potentially compromising the patient's airway	Refer to Oral and Maxillofacial Surgery	
Cellulites or a diffuse soft tissue bacterial infection with intra oral or extra oral swelling that can	Refer to Oral and Maxillofacial Surgery	

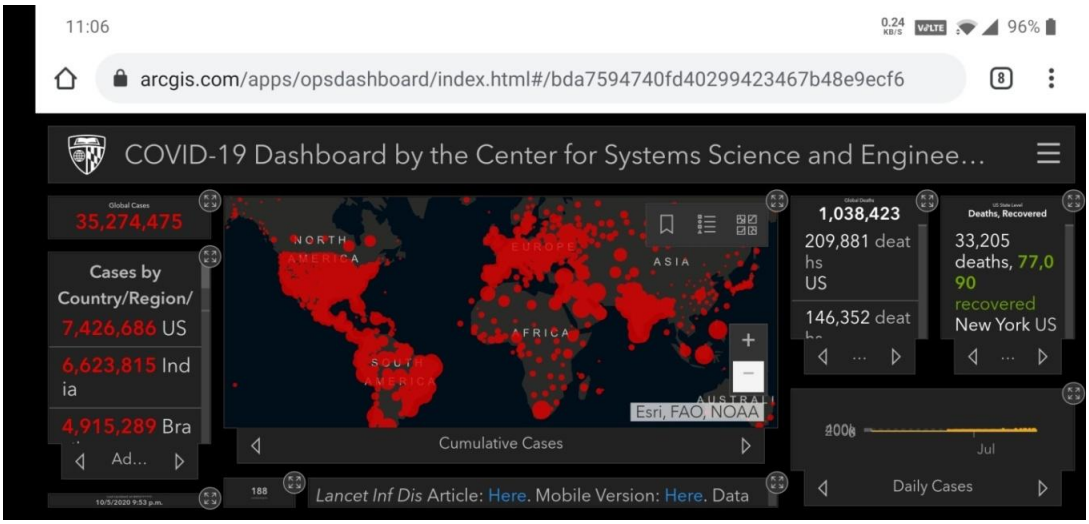

Fig. 7. A screenshot of an interactive map of the global cases of COVID-19 by the Center for Systems Science and Engineering atJohns Hopkins University

This dashboard is continually updatedand can be accessed at https://coronavirus.jhu.edu/map.html. Site accessed 5th October 2020

positive pressure airflow environment of the operating room can create risk of viral spread when managing a patient infected with 2019-nCoV. Hospitals should consult with their biomedical engineers to see if any operating rooms can be converted to negative pressure environments with airflow changes [13].While this is the situation of developed countries, no policy has been put forward by the governments of underdeveloped countries regarding the recovery of financial losses gained by dental practices due to the COVID-19 pandemic. It is recommended that the developed countries should continue the support of Clinical Practitioners through financial means whereas, the underdeveloped countries should come forward with a policy to help their registered Clinical Practitioners morally and financially in this critical time [14]. The current situation has opened the doors for an avenue which was less explored in the past. Teledentistry can help in the deliverance of all essential components of dental education.

Teledentistry can also be used in daily practice where it can be beneficial as it would save consultation time for both dentist and patient. In addition, it can be used to triage patients in this critical time of COVID-19 pandemic, before receiving them for emergency dental care in educational institutions, hospitals, and private clinics through teledentistry tools [15].

Many Countries are doing drug vaccination trials for covid 19 and many of them are in their 3rd phase of human trials of the vaccine. Countries like the USA working on vaccine Moderna, Oxford university also working for a vaccine, however in recent trials they stopped it due to some complications occurred in subjects, Russia is also in their 3rd phase of human trials of 2nd vaccine after 1st vaccine developed some complications in recipients. India is also in the 3rd phase of their human trials, they are working on covaxin, ZyCoVD, Oxford-Astra Zeneca [16].

9. CONCLUSION

In the current situation in which the whole world is facing this crisis, dental professionals are at higher risk, due to the ACE receptor which is present in human saliva. A dentist should undergo only for emergency procedures and avoiding unnecessary procedure which generates aerosols. A dentist should be very careful before examining a patient and should a proper medical history and travel history of the patient. After the dental treatment if the patient develops Covid-19 symptoms then dental health care professionals should isolate themselves for 48 hours and seek medical professional help.PPE's should not be reused again once a patient treatment. The Clinic/ Operator should be sterilized every day by chemical sterilization methods. Wear eye protection in addition to their facemask to ensure the eyes, nose, and mouth are all protected from exposure to respiratory secretions during patient care encounters,

including those where splashes and sprays are not anticipated. Use an N95 respirator or a respirator that offers an equivalent or higher level of protection during aerosol-generating procedures. We did not have drugs to fight the coronavirus in February 2020. We were only treating the complications caused by its hypoxia. Hence most patients became severely infected.

Now we have 2 important medicines FAVIPIRAVIR & REMDESIVIR. By using these two medicines we can prevent patients from becoming severely infected and therefore cure them BEFORE THEY GO TO HYPOXIA. This knowledge we have in September 2020. Not in February 2020.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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