COVID-19 AND ITS IMPLICATION ON DENTISTRY

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ABSTRACT

The spread of COVID-19 has posed significant challenges for dentistry all around the globe and is causing a huge financial unsustainability for all healthcare workers. Due to the unique characteristics of dental practices, dental health care providers are at a higher risk of contracting COVID-19. The route of spread can be direct transmission such as cough, sneeze, aerosol producing procedures, inhalation of droplets and through direct contact transmission with symptomatic as well as asymptomatic patients. The potentially affected hospitals and dental practices require strict and efficient infection control protocols. With the evolving situation, due to COVID-19, routine dental cross infection control measures are not enough to safeguard dental care providers and seekers. Hence, these extraordinary times call for extraordinary measures. Modification and enhancement of the existing protocols is required e.g. use of Personal Protective Equipment in all dental practices should be implemented in routine dentistry, adaptation in the sterilization and disinfection techniques is inevitable and it may have to be incorporated permanently in to our daily practices. In this current pandemic, the digital dentistry has emerged as a new trend and it needs to be a part of our curriculum in undergraduate as well as postgraduate courses and it also needs to become part of our routine practices even after this virus ends.

Keywords: COVID-19, Dentistry, Guidelines, Personal protective equipment (PPE), Transmission.

INTRODUCTION

Corona virus disease known as COVID-19, has rapidly become a worldwide emergency. With more than 6 million active cases worldwide and deaths over 400,000 across the globe so far[1]. COVID-19 has become one of the most infectious disease having devastating global effects. At the conclusion of the year 2019, an unidentified disease resembling viral pneumonia broke out in the city of Wuhan, Hubei Province, People's Republic of China. After thorough research, the experts at Centres for Disease Control (CDC) concluded that the pneumonia like disease was caused by the novel coronavirus[2]. The World Health Organization (WHO) officially named the disease as 'COVID-19' and the virus as 'severe acute respiratory syndrome corona virus 2' (SARS-CoV-2) through its taxonomic analysis[3].

The emergence of COVID-19 has imparted significant challenges to every aspect of life ranging from healthcare to economics and finances. It has taken its toll on the world, particularly the third world countries causing a major setback to the economy as well as development. Similarly, the spread of virus has caused dentistry and health care systems to suffer massively leading to setting of new protocols of preventive measures for the management of emergencies and setting of triages.

Possible Transmission Routes of COVID-19

The common transmission routes of COVID-19 include direct transmission (sneeze, coughing and droplet inhalation transmission), through contact transmission (contact with oral, nasal, and eye mucous membranes) and indirect transmission via contact with surfaces and objects used by the infected person e.g. dental instruments, stethoscope etc[4].

Patients who suffered from the novel viral infection showed clinical symptoms of fever, cough, myalgia and the severe acute respiratory syndrome along with other atypical symptoms, such as muscle pain, confusion, headache and sore throat[5]. This novel viral agent showed that it

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Received: 15 Jun 2020; revised received: 11 Jul 2020; accepted: 13 Jul 2000

is more likely to affect older population and mainly males causing severe respiratory disease[6]. However, whether SARS-CoV-2 can be spread through vertical transmission (from mothers to their new-borns) is yet to be confirmed[7].

Different studies have shown that this virus can be transmitted either directly or indirectly through human contact or via salivary spread from symptomatic patients[5-7]. Furthermore asymptomatic patients have also been reported to be the source of transmission of the virus[5-7]. In addition, the incubation period of COVID-19 in asymptomatic patients is 1-14 days, and it was confirmed that patients without symptoms can spread the virus[6-8]. The importance of COVID-19 cannot be overlooked and its rapid spread should be of rising concern for all dental care providers. Due to the unique characteristics of dental settings, the risk of cross infection may be high between dental practitioners and the patients. In order to have comprehensive discussions with their patients about the rapid spread and sources of COVID-19 infections, dental care providers need to have a thorough knowledge and understanding.

Dentists and other healthcare professionals that perform aerosol-generating procedures are directly exposed to the virus and may be unknowingly are at higher risk of spread of infection[8,9]. Due to the typical environment of dental practices, where a large number of aerosols are generated, the standard protocols followed in daily practice are insufficient, putting dentists and the patients at higher risk. Particularly when patients are in the incubation period or asymptomatic, and are unaware that they are infected could be dangerous.

In many literatures, the spread of COVID-19 via aerosol generating procedures has been well reported[4,10]. In the hospitals and dental practices, it is difficult to avoid the generation of aerosols, thus making it an important concern for the healthcare professionals. During dental treatments, use of high speed handpiece and triple syringe produces aerosols which might be comprising of patient's saliva and blood contaminants, and these airborne particles can remain in the air for short time and then settling on surfaces where it can linger for hours to days i.e. steel 24 hours, on paper 24-46 hours and surviving longest on the plastics for up to 72 hours, thus, increasing the risk of spread[10]. Hence, aerosols can be considered as having the potential of spreading COVID-19 regardless of the level of precautions taken in dental settings[8,10].

Another way by which COVID-19 can spread in a dental setting is via frequent contact with patients (both direct and indirect). This includes, but is not limited to, contaminated dental instruments, materials used for patients, surfaces of x-ray machines and interaction with the staff present. Due to the congested environment of most dental settings, close interaction with the patient during discussion can also be a source of spread from infected patient to the dentist and vice versa[10].

According to the recent research, pandemic COVID-19 can stay alive on surfaces like metal, plastics, shelves or glass up to a couple of days[10]. So aerosols produced during the dental procedures from an infected person can contaminate and spread on the dental surfaces, which can be a primary source of viral spread. Regardless of all precautions taken during clinic timings, the touching of surfaces in dental settings can't be avoided and thus is a potential hazard for disease transmission.

Financial Impact on Dentistry

The emergence of this virus has affected every aspect of life from global businesses, stock markets recession, aggressive travel bans around the globe to closure of schools and similarly, has affected the dental industry too. Closure of dental practices and cancellation of worldwide dental conferences will have a huge impact on dental economy. In these uncertain circumstances, dental perceptions and practices need to be modified with the evolving situation. In the past, when such deadly pandemics broke out in the world, there were major economic implications most

important of which was increased poverty rate. A study conducted on the business impact of the 'Spanish flu' reported increase in the poverty rate[11]. Undoubtedly, COVID-19 will affect the future of dentistry. On the matter of patients, two sorts of responses can be expected. For those who prioritize their dental needs will continue with their visits to the dental practices while the others will weigh on their financial circumstances for future dental care and most likely delay their trips to the dental offices until they become financially viable[12].

Like everything else, the medical and dental schools have also been closed causing major revamp of the education systems. Online teaching systems have been developed and enhanced in Pakistan to continue the learning process for the students. The spread of COVID-19 has also posed significant challenges for the staff involved at colleges as well as private practices which have all been closed due to lockdowns. Similar situation has been generated for the dental suppliers since the supply demand chain has been broken.

Recommendations for Dental Practice during COVID-19 Outbreak

The close face to face encounter with the patients and exposure to the blood and saliva makes dentistry a high-risk job. Occupational safety and health administration of United States of America has categorized dentistry as a very high risk profession to COVID-19[13]. A publication of New York Times also placed dentists among the workers with highest risk of COVID-19 exposure, even more than general physicians and surgeons[14]. In dental practice, the infection control protocols are rather well established and standardized but these extraordinary times require measures according to changing situation.

Clinical studies in China have proved that COVID-19 can also be transmitted from individuals whose symptoms haven't appeared but they are carriers of the virus, another study stated the similar conclusion when the residents of a nursing facility were tested in Washington[15,16]. Spread from an asymptomatic carrier of COVID-19 was also detected in China[17]. In the light of these facts, any patient entering the dental clinic regardless of the age, should be considered positive unless proven otherwise[18].

A. Postponement of Elective Procedures and Preventive Measures

Major health organizations like CDC and National Health Services (NHS) have issued their guidelines for dentists regarding COVID-19[19,20]. The most important and prudent opinion that these guidelines state is the postponement of all elective non-urgent dental treatments. In addition, services should be limited to emergency visits only during the pandemic.

The best preventive measure against COVID-19 to date is social distancing and isolation[21]. A dental patient should be discouraged to visit dental health facility and should be handled remotely unless there is an emergency.

Tele-dentistry can be defined as the use of different kind of technologies to provide virtual dental health care services remotely to the patients. The means by which it can be carried out are broadly classified by American Dental Association (ADA) as; live video or synchronous, a live video in which both patient and dentist can interact, health information is recorded and then sent to dentist e.g. clinical photographs, radiographs. Remote Monitoring, record of personal health and related data is transferred to the healthcare provider. Mobile health, healthcare is provided to the patient by means of mobile comm-unications e.g. cell phones[22]. Whatever the means of teledentistry, every patient should be assessed through remote communication to establish the urgency of treatment required and to assess vulnerability or exposure to COVID-19. A triage procedure can be performed by a member of dental clinic for assessment[23]. As a result of this remote consultation and triage, a dentist can provide patient with Advice Analgesia Antibiotic (if needed) as recommended by NHS and Scottish Dental Clinical Effectiveness Programme (SDCEP)[24].

B. Emergency Patient

Dental emergency patients can range from acute dental pain to a suspected oral cancer case. A broad description of dental emergencies is given below based on theguidelines from ADA, NHS and SDCEP which can give us an idea during remote assessment of patient[20,25,26].

1. Prosthodontics

- Correction of denture problems of patients undergoing radiotherapy/ oncology treatment
- Cementation of definitive prosthesis like crowns and bridges only if interim restorations are lost, broken or causing pain

2. Operative Dentistry/Endodontics

- Severe dental pain caused by pulpal exposure which cannot be controlled after self-help advice
- Fractured tooth which may have caused pulpal exposure resulting in severe pain
- Replacement of temporary restorations on endodontic access openings which is a cause of pain to the patient
- Dental caries or faulty restorations which are causing pain. (to be replaced/restored with interim restorations)

3. Oral and Maxillofacial Surgery

- Trauma, which can include facial laceration, bone fracture or tooth avulsion or luxation
- 3rd molar pain or pericoronitis
- Post extraction alveolar osteotis dressings
- Any abnormal tissue which needs biopsy/ oral cancer suspicion
- Removal of sutures which may have been placed after a dental surgery
- Uncontrolled bleeding
- Intra or extra oral swelling causing air-way restriction, trouble in breathing or swallowing

4. Orthodontics

- Adjustment of orthodontic wires /appliances which are causing oral ulceration.

5. Other

- Acute and severe systemic illness which has been caused by a dental condition.
- Any dental condition which can result in aggravated systemic medical condition.

C. Preparing Dental Care Facility For Face To Face Consultation

COVID-19 awareness posters and instructions on prevention should be at display in the waiting area. Tissues, alcohol based hand rubs, soaps at sink and trash cans should be in place. Waiting area should be well ventilated and any material such as magazines, coffee mugs, toys etc. which can harbor virus should be removed. Seating arrangement should be such that there must be distance of 3-6 feet in-between chairs and they should not face each other[20,25].

All the staff of dental health facility should get flu vaccine and anyone with flu symtoms should not report to work[27]. A daily screening log of facility members should be kept which should include daily temperature record, presence of any flu like symptoms and any shortness of breath[28]. Strict hand hygiene measures should be implemented i.e. hand washing on; entering workplace, before and after contacting patients, after touching any contaminated instrument, equipment or surface, after removing any kind personal protective equipment[29].

Facemask should be worn all the time. Scrubs, head Cap, protective goggles, face shield, shoe covers, nitrile or latex gloves and protective disposable gowns should be used. Everyone who enters the facility should be checked with a contactless thermometer for fever, wash/sanitize hands, and wear face mask[25,28].

A questionnaire specifically designed for screening of COVID-19 should be used to decide the order of treatment for the patients. It should be comprised of questions about history of fever in last 14 days, any respiratory problem e.g.

cough, difficulty breathing, any gastrointestinal upset, loss of taste or smell, any flu like symptoms or fatigue, any contact with a COVID-19 confirmed case and any travel history to the area where COVID-19 is spread[25]. If any of the above mentioned asked questions reveal signs and symptoms of active disease, then the patient should be considered at risk of infection and should be referred to a testing center for screening of COVID-19. The questionnaire serves as a filter for the patients who need dental treatment.

Figure-1: Sequence for putting on personal protective equipment[19].

D. Protocols During Treatment

Materials and equipment required should be made ready before start of procedure. Procedure should be performed along with only one staff member with dentist who should be fully trained in infection control measurements. Research has shown that aerosol transmission is the possible cause of the transmission of disease in dental setting, the reason is because majority of the dental procedures cause generation of aerosols[9,10,29]. Aerosol generating procedures should be avoided wherever possible. If aerosol generation procedure is inevitable, then use of high volume suction is advised[20,25].

Mouth rinses with Cyclodextrins combined with Citrox and mouth rinses with oxidizing agents like 1% hydrogen peroxide lower the SARS-CoV-2 viral load and reduce the nasopharyngeal microbiota[28]. It is highly recommended to use rubber dam for restorative procedures, as it can reduce aerosols by 70% in 3 feet diameter during aerosols generating procedures[30]. Research shows that anti-retraction high speed dental hand-piece reduces backflow of bacteria and viruses into tubes on hand-piece and dental

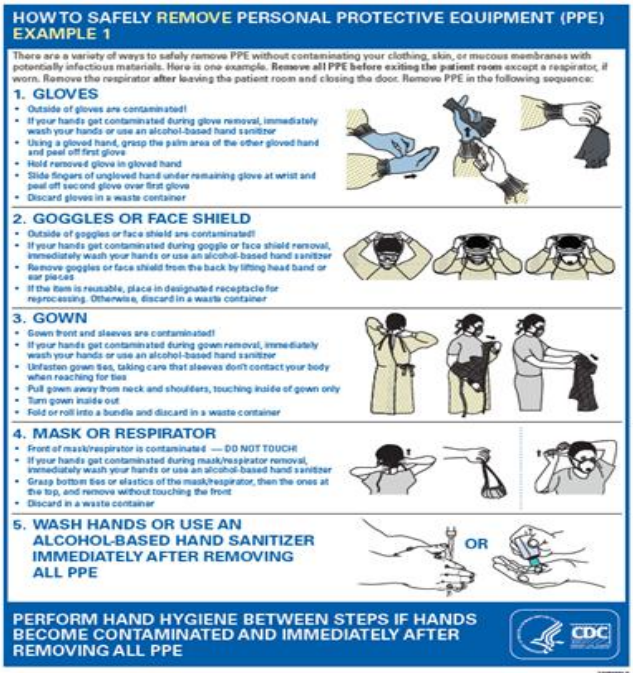

Figure-2: Sequence of removing the personal protective equipment safely; Method-1[19].

unit[31]. Use of such hand-pieces is practical during this outbreak period of COVID-19.

Operatory should be cleaned while wearing all the protective equipment. Reusable instruments should be taken to sterilization area, they should be cleaned, disinfected and sterilized and stored properly. Waste should be considered as infectious waste and should be dealt as such. The operatory room should be disinfected by chlorine-based disinfectant, 70% alcohol or an alternative that should be effective against enveloped viruses. Aerosols clearance is dependent upon ventilation of the room; a single air change can remove 63% of contaminants from air[20].

E. Personal Protection Equipment (PPE)

In the wake of contagious diseases in the modern era, the use of personal protective equipment (PPE) has become inevitable and its importance has grown manifolds. Infection prevention and control requires personal hygiene practices, use of barriers and PPE's and efficient management of waste materials. PPE is of viable importance in protecting not only the health workers but also for the disease active patients who pose a risk to healthy individuals. It is a standard for preventing transmission of communicable diseases and restraining the spread of any epidemic.

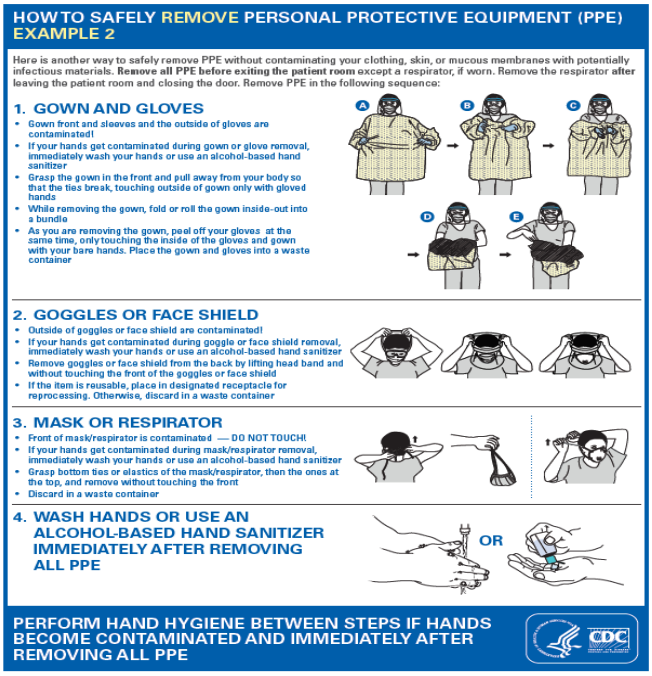

Figure-3: Sequence of removing the personal protective equipment safely; Method-2[19].

The protective equipment can vary for different individuals involved in different practices. It usually comprises of garments and devices placed to protect the health care workers or any other personnel from contracting the infection. It can mainly very between two forms. For standard precautions, gown along with gloves and mask should suffice[32]. For protection from highly contagious infections that are blood-borne and air-borne, the protection should include tyvek suit/coveralls, gowns, gloves, masks, goggles, face shields, head cover/cap, rubber boots and shoe covers[32]. The use of PPE unquestionably reduces, but does not abolish the hazard of skin and clothing from getting contaminated with the pathogens. Never the less, its use is of extreme significance in preventing the spread of contagion. The use of PPE along with other preventive practices like cleaning of hands frequently by washing with soap for 20 sec or hand sanitizers, practicing social distancing and avoiding of touching one's face can significantly reduce the chances of infection.

Since SARS-CoV-2 spreads from person to person through droplet infection, covering the face with face masks is of vital importance in order to avoid the infection[33,34]. As the research is in early stages about the fairly new corona virus, there is some evidence that mask wearing on larger scale may contribute to the control of spread of COVID-19 by reducing the amount of emission of infected respiratory and salivary droplets from persons with subclinical or mild form of disease[35].

According to WHO recommendations, a healthy person needs to wear a mask when taking care of a person with COVID-19 and when suffering from coughing or sneezing[33]. It is also rational to recommend that people in quarantine should wear face masks if they need to leave home for any reason, to prevent potential transmission. WHO also advises the people to properly dispose off the mask when discarded[34]. Masks can be of various types i.e. homemade face masks, surgical masks, N95 (N99, N100) and FFP's (FFP1, FFP2 & FFP3) respirators. While respirators are considered gold standard for preventing of COVID-19, there is evidence that even homemade masks can be considered as last resort and better than no protection when it comes to preventing of droplet infection[36]. Surgical masks on the contrary to belief, are not designed to protect the wearer. They fail to form a seal around the face due to loose fitting and provide one way protection to capture body fluids leaving the person[37]. Hence, they are better suited for patients who have active infection.

Respirators are available in two varieties, with or without valves. Respirators with valves make exhalation easier for the wearer and are more comfortable but they fail to filter the exhaled air and hence put the patients at risk of COVID-19 when used by medical personnel. Hence, respirators without valves are recommended for health care workers.

Most of the countries around the world are currently facing shortage of medical supplies due to low production and high demand. Henceforth, it is preferable to reuse the suits, shields and goggles after implication of thorough disinfection regimen wherever possible. A summary of sequence of putting on and removing the PPE is shown in figures 1-3 for guidance in dental hospitals and practices[19].

CONCLUSION

Due to the unique environment of dental settings and aerosol producing procedures, the risk of cross infection can be high between the dentists and their patients. The standard protocols followed in daily practice are not sufficient to prevent the spread of virus. For dental practices and hospitals all around the globe, strict and efficient infection control measures are urgently required, along with clear and easy guidelines for healthcare workers to work in a safe environment. The limitations that exist due to the nature of dental work, the healthcare workers related to this field are facing serious financial crisis. The unpredictable situation that has been created by the spread of COVID-19 will have dire effects on the economy in the near future. There is a need of serious and urgent measures by the competent authorities to provide support and help to the dental practices, hospitals and healthcare providers.

CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

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