



Dentistry during the COVID-19 Era: Safety Protocols and Considerations

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Authors' contributions

This work was carried out in collaboration among all authors. Author RH designed the study, wrote the protocol and wrote the first draft of the manuscript. Author AA, TAA and LAJ managed the literature search, summarized the protocol and guidelines' and revised the manuscript, Author SAO revised the work and discussed the protocol. All authors read and approved the final manuscript.

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ABSTRACT

Objective: The dental surgery, where healthcare personnel work in close proximity to patients and perform aerosol-generating-procedures, is classified as a high exposure risk environment. Dentists should have thorough knowledge about the correct protective measures during clinical practice to reduce transmission of disease. This narrative review proposes comprehensive evidence-based and content-specific guidelines on infection control and communication strategies to help workers in the dental setting mitigate the risks of COVID-19 until effective vaccines are available and to also enhance cross contamination measures generally.

Methods: A review of pertinent literature was carried out in PubMed and other global sites

including: American Dental Association, Occupational Safety, Health Administration and British Dental Association, NHS England and Faculty of General Dental Practice, to determine and summarize the current recommendations and safety measures specific to the dental setting throughout the world.

Results: Safety measures are needed to control transmission of COVID-19 at the administrative, clinical and environmental levels. Clinic and appointments should be prepared and arranged in a way to maximize social distancing and minimize virus transmission. Preoperative measures should be taken to reduce the chance of viral exposure and transmission. Personal protective measures should be handled properly by clinical and non-clinical staff members. Engineering measures should also be employed, such as economic air purifiers and ventilation systems should also be considered if Coronavirus is proven to be airborne.

Conclusion: This outbreak should serve as a chance for healthcare authorities and providers to invest in precautionary additional cross contamination measures. These should become part of standard practice, as there are other transmissible diseases which place the dental practitioner at risk of infection.

Keywords: COVID-19; pandemic; aerosol; personal protective equipment.

1. INTRODUCTION

The global impact of the fast spreading COVID-19 pandemic is overwhelming and represents the most serious public health threat seen from a respiratory virus since the 1918 H1N1 influenza pandemic. Given the novelty of the disease, no cases of COVID-19 transmission in a dental setting are identified yet. However, given the high transmissibility of the disease and considering that dentists who are working in close proximity to patients and performing aerosol-generating procedures; dentists have been classified by many occupational health bodies worldwide as high exposure risk workers [1]. Face-to-face communication, exposure to saliva and blood, handling of sharp instruments, and the aerosol generating nature of dental operations stresses the need for strict guidelines to regulate the dental body at this time.

No vaccine for COVID-19 has completed clinical trials, while in late February 2020, the WHO said it did not expect a vaccine against COVID-19 to become available in less than 18 months [2]. Although the critical phase of the COVID-19 pandemic is considered in many countries to have passed, dentistry has changed and it may need a long time before we get back to our old ways of dental management which in the meantime necessitates strict adherence to the new normal. It is clear that providing routine dentistry 'as normal' is no longer sustainable and that a change in the delivery of care is needed. There is a need for immediate collaboration and regulation to provide appropriate protocols and evidence based guidelines that can be utilized in

crises like this to help healthcare providers deal better and reduce interruptions to healthcare provision as much as possible.

Dental regulatory bodies worldwide have come to the consensus that during the pandemic, only dental emergency treatments and urgent care is to be provided with implementation of very strict infection control measures [1-13]. This should be continued after the pandemic and dentists should prioritize their role in the control and prevention of infection and transmission of disease since dental practices can easily become a hub for the virus's transmission.

Universities have also developed their own protocol for safety measures in the clinical setting. In the United states and Canada for instance, ADA guidelines have become the gold standard, while in the United Kingdom, the NHS guidelines are followed. The recommendations suggested in this article will represent the summary of the epidemiological modelling that has informed policymaking in the UK, US and China. It is worth mentioning that no single strategy alone can control the outbreak successfully and professional judgement is important especially in cases of epidemics of novel infections with limited empirical and fast changing evidence.

2. METHODS

A review of pertinent literature was carried out in PubMed and other global sites including but not limited to the American Dental Association, Occupational Safety, Health Administration and

British Dental Association, NHS England and Faculty of General Dental Practice, to determine and summarize the current recommendations and safety measures specific to the dental setting throughout the world in a narrative review. Search words such as Coronavirus, COVID-19, decontamination, primary dental practices, dental procedures, pandemic, outbreak, healthcare professionals were used. Available guidance published by leading infection control bodies and health departments was reviewed for the purpose of providing summaries of main highlights to serve as a comprehensive summary and refresher for decontamination protocols that could be of use during the COVID-19 outbreak.

3. DISCUSSION

How does social distancing work in a dental setting?

- **Measures of social distancing in a dental setting: social distancing does exist in dentistry**

Social distancing is one of the most effective measures against the COVID-19. Many options for social distancing do exist in dentistry. Working hours can be extended to limit the number of people in the clinic. Appointments scheduling should be adjusted to maximize social distancing and to reduce the chance of patient-to-patient transmission [3-5].

Walk-ins should be discouraged as mentioned earlier to decrease interpersonal contact between patients and ensure that patients have been screened accordingly. The number of people accompanying the patient to the dental clinic should be restricted to only those people who are necessary such as parents of child patients or carers of patients with disabilities.

Work shifting should be used as a method to minimize the number of employees available at a single time [3-8]. Employees should be advised to avoid public transport during these times and other transport methods encouraged. When more than one patient is present at the same time in the waiting room, they should be instructed to sit at least one meter from one another. Instructions regarding coughing and sneezing etiquette and effective hand hygiene could be hung up as a laminated poster for all patients to see [6,7].

Staff and clinicians should regularly self-monitor and report for COVID-19 symptoms. Any dental

team member who is sick should stay home and should seek testing for COVID-19.

Administrative and secretarial measures

- **Measure to follow pre-appointment taking: Its begins before the patient arrives at the dental clinic**

Effective screening must be the first line of defense to minimize opportunities for virus transmission; hence telephone triaging service is offered to patients to address their concerns and whether it can be successfully managed using pre-visit telephonic triage. A template for screening should be available and tailored to each dental practice to facilitate history taking and ensure no questions are missed. Screening for COVID-19 symptoms and/or any recent contact with confirmed COVID-19 patients and/or recent travel to recent disease epicentres should form a vital part of such templates. Despite its limitations, pre-visit telephonic triage should continue to play an important role in prescreening patients and reducing the number of non-essential dental office visits, at least until community spread of COVID-19 no longer poses a public health threat. A trained member of staff should be responsible for handling the phone calls and referring them on to a dentist to aid in diagnosing and giving treatment advice. The patient screening tool (see Table 1) has a series of questions to identify suspected COVID-19 cases, and where patients answer yes to any of the questions they should be instructed to postpone their appointments for a minimum of 14-26 days if possible. These actions will drastically limit the interpersonal contact and the number of patients sat at once in the waiting room.

Walk-ins should be discouraged and only those with a previously set appointment should come in, to limit the number of patients present at one time and to ascertain that the patient has been screened for possible COVID-19 exposure and for suitability of treatment beforehand. Any Walk-in patient should be instructed by a poster that could be placed on the entrance door of the clinic to call reception before entering or should be allowed to enter only if wearing a mask and the triaging done by a trained staff member (dentist or nurse).

- **Upon patient arrival to the clinic**

All patients should be screened upon arrival to the dental clinic using Patient Screening Tool

(see Table 1) and given a surgical mask and gloves and instructed to take their body temperature via a contact-free forehead thermometer and show it to the receptionist from a distance. As shown in Table 2, the management protocol depends on the answers to these questions and body temperature. Any suspected or confirmed COVID-19 patients' treatment should be postponed if

possible or performed in an airborne infection isolation rooms or negative pressure rooms ideally at a hospital setting [14]. Patients who are fully recovered from COVID-19 can get routine dental treatment as asymptomatic patient [14]. Confirmed recovery is considered if the patient has been asymptomatic for at least 30 days after the last negative laboratory test [14].

Table 1. Patient screening tool

The following questions are suggested to be used as Patient Screening Tool:

- 1) Do you have a fever or have you experienced fever in the last two weeks?
- 2) Do you have coughing, sneezing, or difficulty in breathing or have you experienced any of these in the last two weeks?
- 3) Have you come in contact with someone who was suspected or confirmed to have the SARS-CoV-2 in the last two weeks?
- 4) Have you travelled outside of Jordan in the last two weeks?
- 5) Have you participated in big gatherings in the last two weeks?

Yes to question 1 plus any other question	Case considered Suspected COVID-19 Appointment for routine procedure declined and deferred to a minum of 14-26 days Dentist should call health link to report and advise patient to test immediately
Yes to only question number 1	Appointment for routine procedure declined Patient should be referred for testing immediately after a dental cause for fever is excluded
Yes No to question 1 but Yes to the other questions	Appointment for routine procedure declined Patient should be advised to self-quarantine themselves for at least two weeks before appointment for routine procedures can be given after confirmation that no symptoms has appeared.
No to all questions	Dependent on clinical judgment, appointment for routine can be given if unable to defer until the end of the outbreak, but strict infection control measures should be implemented
In cases of emergency and the patient answering YES to any of the questions	Suspected cases and the dentist should first call health line and report to infection control department for further advise. Patient can be asked to test for COVID before attending an appointment if treatment can wait <24 hours. If urgent treatment is needed it should be performed under very strict implementation of extra protective infection control measures and only minimally invasive procedures taken. It was suggested at the time of SARS pandemic to delay dental treatment of any positive patient for 1 month after recovery (Samaranayake and Peiris 2004) and might deal with COVID-19 positive patient is the same way.

Table 2. Management protocol suggested according to patient response and body temperature

- A patient who has a body temperature > 37.3degrees Celsius and answered yes to any of the questions in the questionnaire (Table 1) will be considered as a suspected COVID-19 case. The dentist should report the case to the infection control department. No routine dental treatment is to be done.

- A patient who has a body temperature > 37.3degrees Celsius and answered No to all the questions in the questionnaire should be referred to a doctor or a COVID-19 clinic for further tests.

- A patient who has a body temperature < 37.3 degrees Celsius and answered yes to one or more of the questions in the questionnaire should be advised to self-quarantine for at least two weeks. An appointment for routine procedures can be given after confirmation that no symptoms have appeared. Patients should also be advised to test for COVID-19.

- A patient who has a body temperature < 37.3 degrees Celsius and answered no to all the questions in the questionnaire can be treated with strict implementation of infection control measures.

The setting of the dental surgery

- **General dental office settings**

The waiting areas should be cleared of adornments, magazines, etc, to facilitate disinfection of surfaces. as it has been shown that the virus can survive on copper for 4 hours, paper for up to 24 hours and on steel and plastic for up to 48 and 72 hours [15]. An alcohol (of high concentration) based disinfectant should be made available in the waiting area for use by patients. It is optional if patients are asked to wear an overshoe cover before entering the premises.

Staff members not involved with the clinical care of the patient (e.g. receptionist) should be instructed to wear a surgical mask and maintain a safe distance from patients at all time. Installing barriers at the reception area or a mark on the floor for patients to not cross could be effective methods. All workers should receive education and training on the outbreak and ways to prevent it. The training should be cyclically given to keep knowledge updated [1,7]. Disposable and single-use instruments should be used whenever possible to reduce the cross-infection and transmission risks.

- **The dental surgery:**

A suggested model for protecting dental healthcare workers during treatment provision involves creating negative pressure isolation rooms designed to contain airborne pathogens by controlling airflow [16-23]. Engineering

controls should be employed to ensure that a proper negative pressure mechanical ventilation system is installed that uses an exhaust fan through which air is released and the isolation room has a lower pressure than other airs to prevent air flowing out. This is equivalent to the "airborne infection isolation room" described by the United States Centers for Disease Control and Prevention [21].

Other measures include installing air filters and increasing ventilation rates, CDC identifies a proper ventilation system as one that provides a minimum of six air changes per hour (ACH) [20,21].

Personal protective equipment (PPE) for the dental workers

Since aerosol and droplet transmission of infection is considered the main route of spread, particularly in dental clinics and hospitals, barrier-protection equipment, including protective eyewear, masks, gloves, caps, face shields, and protective outwear, is strongly recommended for all healthcare givers in the clinic/hospital settings during the epidemic period of COVID-19 [1,24]. Correct use of PPE can help prevent some exposures but should not take the place of other preventive strategies. All types of PPE must be properly fitted and periodically refitted, as applicable (e.g., respirators); consistently and properly worn when required; regularly inspected, maintained, and replaced, as necessary; properly removed, cleaned, and disposed of to avoid contamination of self, others, or the environment [7,10].

The PPE measures suggested for the clinical and the non-clinical staff within the dental setting in contact with patients according to the Occupational Safety and Health Administrations [1] include: N95 filtering face piece respirators, FFP2, or FFP3. Face shields on top of the respirator to prevent bulk contamination, disposable gloves, and un-sleeved plastic aprons, which should be changed between patients and not worn outside the dental surgery [24].

The choice of PPE to cover clothing should be disposable surgical gowns and an apron or a disposable coverall and an apron which should be according to recommendations made of fabric that is tested to be resistance to penetration by blood and body fluids [24]. Waterproof reusable gowns or aprons should be properly disinfected or autoclaved as per provider's instructions. Evidence comparing effectiveness of different types of gowns and coverall is lacking and weak [24]. Head covers should also be used and changed between each patient as per authors recommendations.

Eye protection (goggles or visor) must also be worn if there is a possible risk of splash exposure to the face when providing care (from body fluids, coughing, sneezing) [8,10].

Clinical staff should put on a surgical mask on entering the dental practice while all other PPE items must be put on before entering the dental surgery (operating room) [7,10]. The room should be prepared so that exiting the room is not needed.

Hand hygiene must always be performed in between changing gloves and aprons and after removal of surgical masks and eye protective tools.

It should be noted that regular surgical facemasks usually used in dentistry can be responsible for 80% filtration rate if worn correctly and changed frequently. This is considered a good filtration rate for elective dental procedures for healthy patients. COVID-19 virus measures around 120 nm and the use of surgical respirators can be responsible for 99% filtration rate of all particles up to 600 nm. The moral message behind this is that surgical respirators need to be available as part of the cross-infection control measures to protect dental professionals while serving urgent care for their patients at times of pandemic outbreak [25].

For reception staff that do not work in high risk areas or in physical contact with the patient, we suggest the following PPE measures: [16-19] wearing surgical masks to cover the mouth and nose if facing contact with patient within 2 meters. The mask should not be touched while in place, not hung around the neck, and changed during breaks or when moist. It should be removed using the ties, not re-used and discarded in clinical waste, and hands washed after removal. Plastic aprons and gloves should be used if there is physical contact with the patient.

Finally, PPE should not be worn in non-clinical areas such as the corridors or staff areas. Staff must undergo training in how to put on and take off PPE. Donning and doffing protocols for PPE should be revisited and adhered to strictly as per WHO guidance [24] or available local recommendations.

A summary is provided below:

Non- clinical staff (e.g. reception staff that do not work in high risk areas

**Surgical mask
Use gloves and apron only if you have physical contact with patients
Practice hand hygiene**

Clinical staff or staff in physical contact with patients

**Use surgical mask, gown, apron and gloves for physical contact with patient
Surgical mask, to change if becomes moist and discard open removal
New apron and new gloves and hand hygiene for each separate patient contact and procedure
If risk of splashes, visor/goggles.**

Clinical recommendations

Since dentists were identified as high exposure risk jobs especially due to the aerosol nature of the dental procedures and the close proximity between the dentists and the patient, the consensus that all professional dental bodies have come to is to address dental emergencies only and to avoid aerosol generating procedures [1,6-10].

What is urgent care?

Urgent and emergency oral and dental conditions are those likely to cause deterioration in oral or general health and where timely intervention for relief of oral pain and infection is important to prevent worsening of ill health and reduce complications (Scottish Dental Clinical Effectiveness Programme, 2013) [26].

Urgent dental care problems have been defined previously into three categories: emergency, urgent and routine [10,26].

Dental emergencies include the following conditions, which require treatment in a timely manner proportional to the severity of the condition, these should be treated as minimally invasively as possible and include: [26]

- Trauma including facial/oral laceration and/or dentoalveolar injuries, for example avulsion of a permanent tooth
- Oro-facial swelling that is significant and worsening
- Post-extraction bleeding that the patient is not able to control with local measures
- Dental conditions that have resulted in acute systemic illness or raised temperature as a result of dental infection
- Severe trismus
- Oro-dental conditions that are likely to exacerbate systemic medical conditions such as diabetes (that is lead to acute decompensation of medical conditions such as diabetes)
- Urgent dental problems include the following conditions, which should receive self-help advice and treatment within 24 hours:
 - Dental and soft-tissue infections without a systemic effect
 - Severe dental and facial pain: that is, pain that cannot be controlled by the patient

following self-help advice such as pain of pulpal origin, dry socket, dental abscess

- Fractured teeth or tooth with pulpal exposure
- Denture adjustment on radiation/ oncology patients or when function is impeded
- Replacing temporary filling on endo access openings in patients experiencing pain
- Snipping or adjustment of an orthodontic wire or appliances piercing or ulcerating the oral mucosa
- Routine dental problems include the following conditions for which self-help advice is needed and/or access to an appropriate service within seven days if required:
 - Mild or moderate pain: that is, pain not associated with an urgent care condition and that responds to pain-relief measures
 - Minor dental trauma (concussion, subluxation)
 - Post-extraction bleeding that the patient is able to control using self-help measures
 - Loose or displaced crowns, bridges or veneers not impeding function
 - Fractured or loose-fitting dentures and other appliances not impeding function
 - Fractured posts
 - Fractured, loose or displaced fillings if not associated with severe pain
 - Treatments normally associated with routine dental care
 - Bleeding gums

The judgment of the clinician is vital in identifying patients needs and deciding what appropriate treatment is.

Recommendations specific to dental disciplines

Endodontics

The British Endodontic Society has issues clear guidelines on how endodontic emergencies should be handled; they are summarized below: [9]

Access into pulp chamber

Access through enamel into dentine using a high-speed handpiece while reducing the water flow to reduce aerosol spread. Avoid risk of overheating of the PDL by doing this in short intervals.

Once through enamel move to speed increasing electric handpiece to access through roof of pulp chamber and expose entire pulp chamber. Avoid use of ultrasonic to refine cavity. Ensure that high volume aspiration is used as close to the tooth as practicable. This should be done after rubber dam isolation and disinfection of the field with 5% NaOCl [9].

Pulp extirpation

Once the pulp chamber has been fully opened, irrigate the chamber with NaOCl. Ideally higher concentrations of NaOCl should be employed (3-5%) as there is considerable evidence that higher concentrations of NaOCl are more effective in dissolving pulp tissue (Stojicic et al. 2010) which is desirable in emergency endodontic management.

No attempt should be made to introduce the syringe into the canal orifices or any other instrument such as a probe or k files. Flush the pulp chamber for up to 5 minutes or until no further bleeding or drainage is seen from the chamber [9].

Dressing

In cases where a diagnosis of pulpitis was made, dry the pulp chamber and dress with a steroid containing dressing material (Ledermix or Odontopaste). If the diagnosis was of symptomatic apical periodontitis then dress with non-setting $\text{Ca}(\text{OH})_2$. Place a layer of the dressing material to cover the pulpal floor, then place either a pledget of sterile sponge or cotton wool to cover the canal orifices, ensuring that this is sufficiently compressed to allow for a minimum thickness of dressing material of at least 5 mm.

As there is a possibility that the dressing will be required to last longer than it would under normal circumstances consider the use of a more resistant material such as a core build-up glass ionomer material (e.g. Chemfil Rock, Fuji IX, RivaHV) or IRM. Ensure that the occlusion is not high as this may lead to further symptoms and require adjustment.

Post operative instructions

Patients should be prescribed analgesics, ibuprofen should however be avoided despite WHO recently changed its stance and it now does not recommend avoiding ibuprofen.

Nonetheless, the NHS only recommends taking paracetamol for COVID-19 symptoms despite the lack of strong evidence that ibuprofen could worsen the symptoms. Patients should be warned that the pain might take a few days to subside to manage expectations [9].

Refer to BES for full guidelines

Restorative and Pediatric dentistry

Recommendations in restorative dentistry are focused on avoiding using the high-speed handpiece in cavity preparation, and using chemochemical carries removal if the case allows. Atraumatic restorative techniques should be considered when suitable. This should all be done under rubber dam and after instructing the patient to rinse his mouth for at least one minute pre treatment [14].

Prosthodontics

All non urgent prosthetic treatment should be delayed. Final crown or bridge cementation can be considered if the temporary crown is lost. If prosthodontic treatment is to be undertaken the impression trays should be adjusted and chosen to the right size to avoid the patient gagging and coughing. Consider applying oral mucosa anesthesia to the throat before impression taking.

Incorporate using rubber dams by using the split dam techniques for bridges and sticking to supragingival margins to prevent the rubber dam from interfering. Prosthesis or impressions removed from the patient mouth need to be properly disinfected by a disinfectant having at least intermediate level activity [10,14].

Oral Surgery

Extractions should be performed while the patient is sat upright to avoid working in the breath way of the patient.

Periodontics

Manual scalers are to be used instead of ultrasonic scalers as effectiveness of both in root surface instrumentation has been proved. Surgeries can be avoided and only implemented is urgent in the clinician judgment [4,10].

- **Measures to implement during dental treatment provision**

- **Mouth rinse before dental procedures**

It is believed that preoperative application of mouthrinse decreases microbial count intraorally. Chlorhexidine may not be powerful against COVID-19, which is more susceptible to oxidation by mouthrinses such as 1.5-3.0% hydrogen peroxide or 0.2% povidone for one minute. Preoperative mouthrinse would be most beneficial when rubber dam is not applied [2,7-9].

The recent literature does not provide sufficient evidence relating to the virucidal potential of the above mentioned mouthwashes, [27,28] however Kamp et al. 2020 showed that both oral rinses exhibit a much higher virucidal properties than chlorhexidine [29]. A recent study comparing the in vitro inactivation of SARS CoV-2 with hydrogen peroxide and povidone-iodine (PVP-I) oral antiseptic rinses however favoured PVP-I over hydrogen peroxide as it seemed to inactivate the virus at a lower concentration and a lower contact time [30].

- **Rubber dam isolation**

Working under rubber dam isolation decreases the production of contaminated aerosols and droplets especially when a high speed handpiece or ultrasonic scaler are used. Using the rubber dam can significantly decrease the airborne particles in a 3-foot diameter operational field by 70% [10]. Extra-high volume suction along with regular suction are used along with the rubber dam applied to reduce airborne particles [11]. Four-handed dentistry is useful as well. In cases where rubber dam application is not possible, manual excavation of caries using excavators, chemical dissolution of caries using Carisolv, or periodontal scaling using hand scalers, can reduce airborne particles. After rubber dam isolation it is suggested to scrape the tooth with 5% NaOCl for one minute [12].

- **Anti-retraction handpiece**

Anti-retraction valves within high speed handpieces are important to aspirate debris, fluids and microbes during dental procedures. This reduces the chance of cross infection by microbes that might contaminate air or water tubes within dental units. A study showed that anti-retraction valves within high speed handpieces can expel oral bacteria and HBV and

prevent their backflow in the water tubes or dental units [13]. We strongly advise using anti-retraction based high speed handpieces during the COVID-19 pandemic.

- **Management of medical waste**

Medical waste (including disposable protective equipment after use) should be transported to the temporary storage area of the medical institute promptly. The reusable instruments and items should be pretreated, cleaned, sterilized, and properly stored. The medical and domestic waste generated by the treatment of patients with suspected or confirmed COVID-19 infection are regarded as infectious medical waste. Double-layer medical waste bags and "gooseneck" ligation should be used [1,14-15].

- **Environmental consideration**

There is still uncertainty about the airborne property of the coronavirus. Researchers found that viable virus could be detected in aerosols up to 3 hours post aerosolization (5) [6]. Precautions should be taken including proper air ventilation by keeping windows open, and scheduling appointments with gaps between them to allow the proper ventilation of the surgery between patients. Air purifiers can also be considered and are available on amazon and other online sources. Dental universities should consider placing permanent barriers between cubicles, negative pressure rooms should also be made available within dental surgeries and included in the design of the clinics to make sure we are better prepared in the future for other outbreaks.

- **Disinfection of the clinic setting**

Medical institutions should use strict disinfection measures in both the clinic setting and public areas including elevators. Public areas and appliances should be frequently cleaned and disinfected, including door handles, chairs, and desks. Disposable cleaning items should preferably be used such; reusable cleaning items should be cleaned with a chlorine-based detergent [25]. Disinfectants such as 70% isopropyl alcohol or 0.1% sodium hypochlorite have been suggested to be the most effective against coronavirus [31].

- **Disinfection of dental unit waterlines**

A series of regulations should be complied with when it comes to water use in dental settings to

eliminate sources of infection through water systems. No single available method up to date can offer complete elimination of biofilm build-up from dental chair waterlines; hence, a combination of measures should be employed. Manufacturers protocols should be adhered to and checked regarding daily cleaning protocols [32].

For self-contained water bottles only distilled or RO water should be used, and the bottles should be rinsed at the end of the day with purified water and left to air-dry overnight. These systems provide lower biofilm build-ups if waterlines are consistently disinfected. For other systems that use potable water, the main water supply should be separate from dental units waterline through an air gap and the quality of the water should be consistency monitored through a competent person [32]. Nevertheless, dental units waterline should be flushed for two minutes the least at the beginning and end of each working day, and for a minimum of 30 seconds between patients to reduce risk of cross contamination [32]. Disinfection of the waterlines should comply with manufactures instructions as many agents including sodium hypochlorite are suggested to reduce microbial load and remove biofilms.

4. CONCLUSION AND FUTURE CONSIDERATIONS

Little remains known about this novel virus and with the limited knowledge available in the current literature one thing is certain, dental practice is likely to change forever. The concept of taking further precautions in addition to the routine ones normally adopted should be applied to dentistry and not only to medicine. As mentioned earlier no single strategy on its own can control the outbreak successfully and professional judgement is of vital importance at this stage, however we hope that by devising such guidelines we will be ensuring the safety of the workforce and protecting the public and dental professionals alike.

Private dental clinics and teaching clinics within universities should stick to public health authorities in their countries in terms of regulations to follow regarding COVID-19 and keep updating their knowledge as this pandemic is quickly changing and more literature will keep surfacing.

This unprecedented period provokes the innovation of new protocols and strategies. Our

professional family members should support one another, minimize patient contact, reduce aerosol-generating procedures and apply the best PPE tools possible. We also need to elevate our immunity levels, care about our own mental and psychological health so that we can provide care for the public.

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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