



CHALLENGES FACED BY DENTISTS AND PRAGMATIC APPROACHES TO PROVIDE SAFE DENTAL CARE DURING COVID SCENARIO – A NARRATIVE REVIEW

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ABSTRACT

Corona Virus Disease or Covid 19 as it is commonly known, stemming from the SARS Cov-2 virus infection, has now developed into a full-blown pandemic generating health concerns worldwide. Various countries have indulged in great efforts to protect people from this deadly virus. This SARS virus seems to offer extreme challenge to health professionals especially in dental field. This necessitates following of stringent safety protocols during performing dental procedures thereby avoiding contact with the virus. A literature review was done searching through the databases online such as, Pubmed, Scopus and using following MESH terms dentist, Covid 19. The challenges encountered by dentists and protocols followed while managing the patients in dental clinics in current Covid scenario forms the crux of this narrative review.

KEYWORDS: Covid 19; Challenges; Dental Health Care Personnel; Management; Infection control protocols.

INTRODUCTION

The world is grappling with an invisible deadly enemy COVID 19, which was first identified at Wuhan city in the Hubei Province of China in the month of December 2019 and WHO proclaimed it as a pandemic on 30th January 2020¹. As the pandemic progresses in different phases, it not only redefines the life of people but also poses an unprecedented challenge to health sector especially in the field of dentistry². Dental practitioners who are unable to keep a safe distance from the patient during treatment are more vulnerable to infection by SARS CoV-2³. Dental council guidelines and various government measures taken to abate infection have indirectly imposed financial burden among dentists⁴. This article will address several challenges faced by dentists and precautionary measures to provide safe care to patients.

MATERIALS AND METHODS

The search strategy used to extract information pertaining to challenges faced by dentists and the stringent protocols to be adhered in Covid 19 situations have been collected using online data sources like PubMed, Scopus, Google Scholar using following MESH search terms Covid 19, dentist, management and protocol. The evidences obtained were mostly reviews and cross-sectional surveys concerning the topic. The peer reviewed publications were considered for this review. The protocols for practice management in dental clinics were obtained from Centre of Disease Control (CDC), World Health Organization (WHO), dental associations nationwide and from bodies regulating healthcare.

SARS CoV-2

WHO has given the moniker “Covid – 19” to this lethal disease, it being an acronym of Corona Virus Disease and the year of identification being 2019. The name “Corona” (Crown in Latin) is attributed to its crown like appearance with a spherical shape and glycoprotein spikes on the envelope. The International Virus Taxonomy Committee, based on the phylogenetic and taxonomic analysis proposed to name the new Corona virus as SARS CoV- 2 because its nucleotide sequence shows similarity of 80% with SARS CoV (Severe Acute Respiratory Syndrome Corona Virus) and 50% with MERS CoV (Middle East Respiratory Syndrome Corona Virus).

The Corona viruses belong to the family of Coronaviridae, sub genus sarbecovirus with the order of Nidovirales and four sub families include, alpha, beta, gamma and delta corona virus. SARS CoV – 2 is a type of beta corona virus of the B lineage which are responsible for rapid spread, severity of disease and fatalities. The severity of omicron variant is yet to be fully studied.

SARS CoV-2 consists of an envelope with spike protein, lipid layer, and ssRNA. It enters the host cell by binding its S protein with host ACE-2 which is not only present in the respiratory and salivary gland epithelium but also expressed in the tongue at an elevated level, thereby enhancing the chance of infection by SARS CoV-2 in dentistry⁵.

CHALLENGES IN DENTAL PRACTICE:

Risk of transmission

Dentists who work in close proximity to patients can be the first line of contact of the disease and have the possibility of inhaling infected aerosolized particles during routine procedures. This leads to bidirectional transmission which can be from patient to clinician or clinician to patient or patient to patient⁶.

The routes of transmission are as follows⁷:

- Transmission by direct contact
- Transmission by indirect contact
- Airborne transmission

Transmission by direct contact

Respiratory droplets produced during breathing, talking, sneezing, coughing and aerosols generated during dental procedures and accidental exposure of perforated gloves to blood and blood containing materials can directly infect the dentists. In addition to it, saliva being the primary reservoir emits virus even from the breath of asymptomatic patients.⁸ Dentists who are destined to work in the salivary environment are at high risk of COVID infection.

Transmission by indirect contact

Personal belongings, objects in contact with the patients and contaminated surfaces in close proximity during treatment serves as a viable medium of indirect transmission when it is exposed to nasal, oral or conjunctival mucosa.

Airborne transmission

- Aerosols transmitting viruses are differentiated based on particle size.
- Spatter (>50 um) being the larger particle fall and contaminate the surfaces.
- Droplets (< 50 um) remain suspended in the air until they evaporate
- Droplet nuclei (<10 um) contain infectious particle and may contaminate the air and inanimate surroundings in a range of 3 ft and may remain airborne for 30 min - 2 hrs. If inhaled, it can penetrate deep into the respiratory system⁹.

Infection control challenges

Dental healthcare personnel (DHCP) should update the recommended infection control measures to safeguard themselves and their patients. Larger dental organizations having dental operatories that are clustered in open spaces need to set up physical barriers. In addition to unavailability of Personal Protective Equipment (PPE), they encounter problems like excessive sweating, suffocation, breathlessness, pressure marks on the skin though it serves as a protective armor. It also restricts comfort, movement, breathing, vision, communication and also elevates the risk for heat stress and dehydration¹⁰.

It still remains a practical challenge to follow strict disinfection protocols after every procedure, rubber dam isolation, cough/sneeze etiquette, and the usage of high efficiency particulate

arrestor (HEPA) filters that are both expensive and require periodic replacement of the filters.

Challenges in the treatment of oral lesions

COVID 19 infected patients present with atypical oral manifestations such as mucormycosis, aphthous stomatitis, herpetiform lesions, vasculitis, mucositis, drug eruption, necrotizing periodontal disease, angina bullosa-like, atypical Sweet syndrome, and Melkerson-Rosenthal syndrome¹¹ which become troublesome for the dentists to diagnose and provide authentic treatment. Research is still under progress to evaluate whether the underlying etiology is closely associated with virus or due to other comorbidities. Current management aims to alleviate pain and stimulate healing as the underlying cause is not known.

Economic challenges

A further concern of dental professionals has been the economic impact. The suspension of dental practice during lockdown left many dentists, dental assistants and hygienists unemployed. The financial impact was not reduced even after the relaxation of lockdown. Refurbishment of dental settings, limited inflow of patients, changes in clinical routines and purchase of required protective gear were worrisome for all the dental practitioners¹². Hence they were impelled to hike the charges to balance the cost accrued in running a dental practice but dissidence of patients to pay for expenditure of safety precautions further burdened the dentists. Most dentists were hesitant to restart their dental practice due to the fear of cross infection and additional investments.

Management of economic crisis

As many middle and low income countries are not facilitated with dental insurance, access to digital solutions and innovative measures are needed to regain the revenues which had been plummeted during Covid times. Website with information on dental services should be created for every dental office. If websites already exist, new functionalities must be updated. This will attract new patients in addition to references and campaigns.

Though online dental consultations would help to increase the income even if dental offices are closed, dental procedures can be performed only in the dental office. Staffs should be trained to intimate patients via social platform about the resumption of dental office activity, treatment schedule, appointment reminder and consequences of neglecting the treatment.

Mobile dental services, upgradation with newer techniques, tie up with schools, colleges, companies etc. are some of the innovative measures to recover the income with strict infection control measures.

Psychological stress

The panic caused by the contagion, drastic rise in infection control measures, inadequate space in waiting room for social distancing, self and family health concerns, general cynical outlook, shortage in availability of personal protective

equipment (PPE), combined with financial problems has created a dilemma among the oral healthcare community, whether to keep practicing by overcoming the burdens or to stay idle till the world gets back to normal¹³. Patients and even healthcare personnel, who develop symptoms that are related to flu, may become stressful, fearing Covid infection, leading to psychiatric disorders.

In 2020, Khanager SB et al found post traumatic stress disorder (PTSD) to be more prevalent among DHCP during COVID-19. The rejection and stigma endured concomitantly in dental practice, hinders reviving from their emotional challenges¹⁴.

Management of stress

Dental curriculum should include stress management and coping mechanism to overcome the psychological problems due to occupational stress. A study on coping mechanism of dentists by Shiva Pouradeli et al¹⁵ revealed the following coping strategies

- Family Support
- Positive Thinking
- Adequate food intake which is always overlooked
- Exercise
- Watching television
- Peer Support
- Gardening, Reading, Cooking
- Sports
- Meditation
- Religious or Spiritual Approach

Maladaptive coping such as consuming alcohol, smoking, gluttony affect the health of DHCP in the long term.

INCOGNIZANCE

The incognizance towards infection control procedures in the wake of Covid 19 among the dental practitioners are reported in the following online cross-sectional questionnaire studies. Kumar M et al., 2021 observed that the overall mean knowledge, practice scores, awareness and application of the safety protocols and guidelines were not satisfactory¹⁶. The study results of Sudeep C.Bhagvandas et al., 2020 showed that 98.5% were familiar with the term PPE but only 42.7% knew the primary components of PPE and 31% were incognizant about proper sequence of donning and doffing the PPE¹⁷. Boreak N et al., 2020 remarked that 25% of dental practitioners lacked the knowledge to use rubber dam though they have it in their clinics¹⁸. Dental practice without adequate knowledge on safety measures serves as a hunting ground to SARS CoV 2.

HANDLING INCOGNIZANCE

Internet

Though Internet is loaded with plethora of information, upgrade knowledge from authentic sources, engage in online learning portals accredited by trusted organizations

Join professional organization

Joining professional organization provides contact and network with experienced professionals. The conference organized by these professional organization not only helps to learn via seminars, books or lectures but also imbibe their experiences to improvise one self.

Subscription to peer reviewed journals

Peer reviewed journals help us to implement evidence based dental practice thereby planning treatment based on the literature data which enhances the success rate of treatment.

Join continuing dental education programs

Choose the program based on the patient needs and demands of a particular locality. The program in which the mentors provide continuous support for a period of time would be an added advantage to make betterment in the treatment plan.

ETHICAL DILEMMA

Guidelines from regulatory authorities have opined that aerosolized and elective dental procedures to be deferred and emergency procedures to be performed under strict infection control environment. In such a scenario with uncertainty of Covid 19, avoiding or delaying any healthcare intervention raise an ethical issue. The dentists are in ethical dilemma to choose between patient preferences and public health concerns¹⁹.

Management of ethical dilemma

ADA Formulated the following five code of ethics to provide safe care to the patients^{20,21}.

- Patient autonomy
- Non maleficence
- Beneficence
- Justice
- Veracity

If there is conflict in anyone of the above, it is known as ethical dilemma

Patient autonomy

It is the duty of dentists to inform the patient about the risk of transmission during the procedures and also explain about the benefits of alternative treatment (extraction instead of restoration). Patient has the right to decide about the proposed treatment.

Non maleficence

Upgradation of knowledge from authentic sources, installation of essential infection control equipments, knowing one’s own limitations and making referrals are essential to safeguard the patient from harm.

Beneficence

ADA advises dentist to administer US Food and Drug administration authorized point of service testing before treatment. Protection of dental healthcare personnel further protects the family members of patients, dentist and staff members thereby making social contribution to the public at large.

Justice

The principle of justice (“fairness”) states that “the dentist has a duty to treat people fairly.” In fulfilling that duty, “dentists should actively seek allies throughout society on specific activities that will help improve access to care for all.” Dentists cannot deny treatment based on patient’s socio-demographic and economic status.

Veracity

From an ethical perspective, the dentist should avoid overbilling, fee differentiation and charge the fee with respect to the principle of Veracity (“truthfulness”) and notify patients about the hiked charges. The dentist should discuss with the patients and having them sign the written notice acknowledging that they have read and understood the fee offers helpful service.

PREVENTIVE MEASURES TO PROVIDE SAFE CARE

Dental practitioners should constantly upgrade the latest Standard Operating Procedures (SOPs) and infection control guidelines given by Centre for Disease Control (CDC) and World Health Organization (WHO) in order to take managerial and clinical decisions to provide safe care.

The “Pandemic-5 Framework for COVID-19 Control in Dental Practice” proposed by Benzian H in 2021 is the most recent, consolidated and simplified model of (Occupational Safety and Health Administration) OSHA’s “Hierarchy of Controls” and CDC’s “Standard and Transmission-based Precautions”²². (Fig 1)

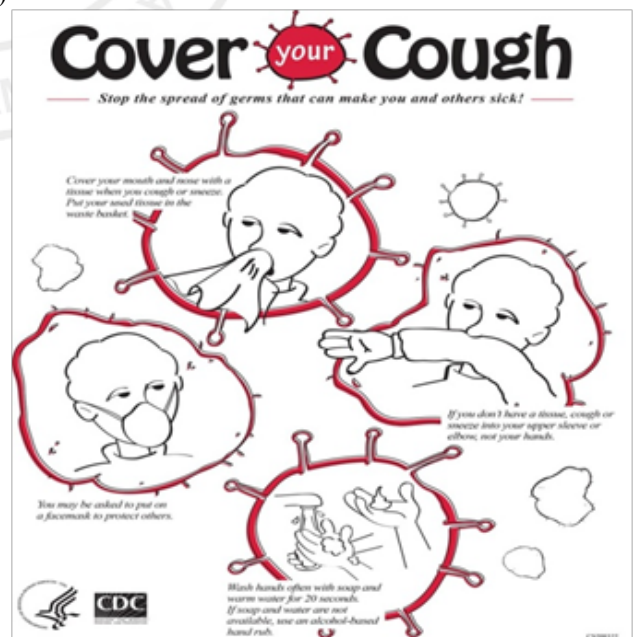
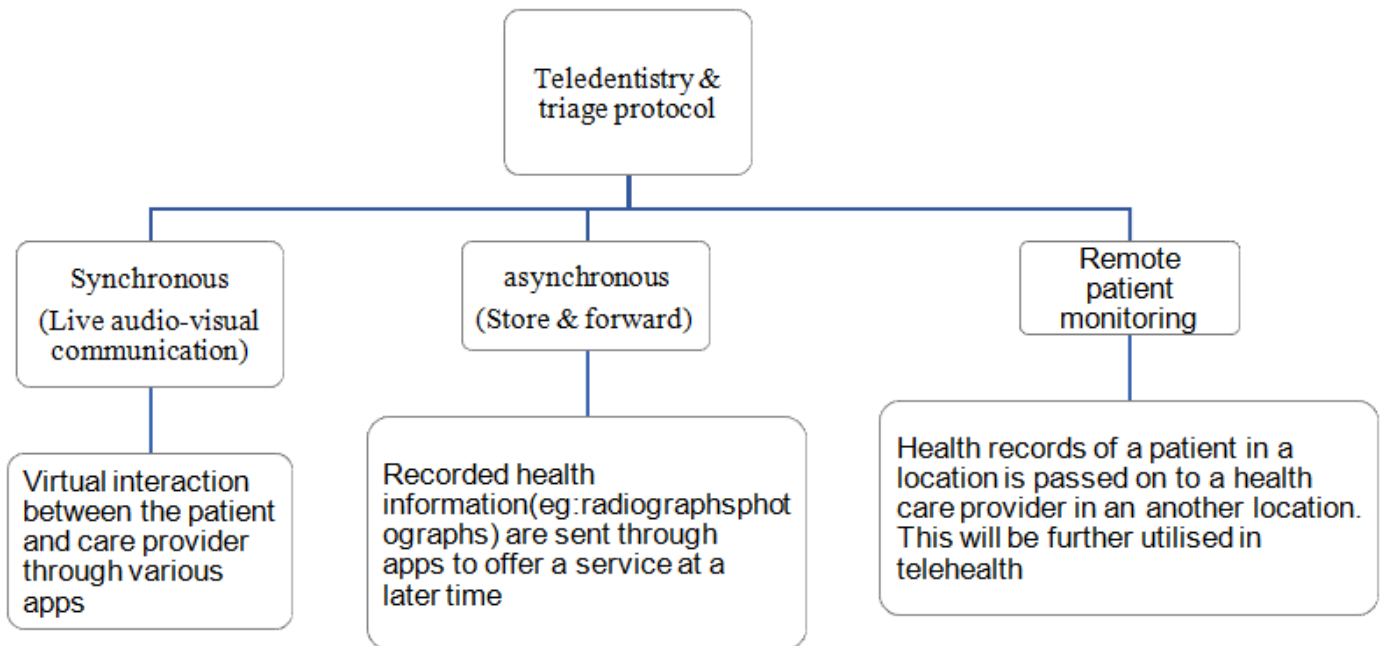


Fig 1: “Pandemic-5 framework for COVID-19 control in dental practice”.²²

PLANNING AND PROTOCOLS

DHCP should attend virtual training programs and self educate them. A judicious planning is necessary to implement the following protocols listed under ‘Guidelines for Dental Professionals in Covid-19 Pandemic Situation’ issued by ‘Ministry of Health & Family Welfare, Government of India’²³.



PATIENT HANDLING PROTOCOL	PATIENT DISCHARGE PROTOCOL	PATIENT TURN AROUND & DISINFECTION PROTOCOL	PROTOCOL FOR HEALTH CARE WORKERS ON REACHING HOME
<ul style="list-style-type: none"> • Select appropriate PPE • Use rubberdam • Practice four handed technique and non aerosolized procedures. • [Text] 	<ul style="list-style-type: none"> • The assistant will remove the patient drape and escort them out of the clinic after performing hand hygiene and provide details on review • The procedures and prescription is recorded only after doffing the PPE. 	<ul style="list-style-type: none"> • Disinfect the dental chair along with auxiliary parts within 3 feet of distance using 1% NaOCl • 3 in 1 syringe, water outlets, handpiece, water pipelines, etc. must be flushed for 30-40 sec with disinfectants. 	<ul style="list-style-type: none"> • Remove shoes, take bath, wash the clothes separately • Disinfect the used items in dental office like mobile, wrist watch, handbags etc..

PATIENT SCREENING

COVID-19 RAPID TESTING AT THE DENTAL OFFICE

Screening the patients, dentists and assistants with rapid tests offers another control mechanism. According to CDC reporting guidelines, dental offices with Clinical Laboratory Improvement Amendments (CLIA) certificate can perform Point of Care (POC) tests and report the results to state or local public health department.

TYPES OF RAPID TESTS

- Direct test: It detects antigens from nasopharyngeal secretions.
- The nasopharyngeal swab is mixed with lysis buffer and serves as the sample
- The sample is placed on the strip/card.
- Viral antigens are detected based on the degree of fluorescence.

- Indirect test: It detects antibodies present in the serum.
- Blood sample collected from the finger tip is placed on the kit.
- A buffer is added on to the test kit.
- Test result will be visible within 10-30 minutes.

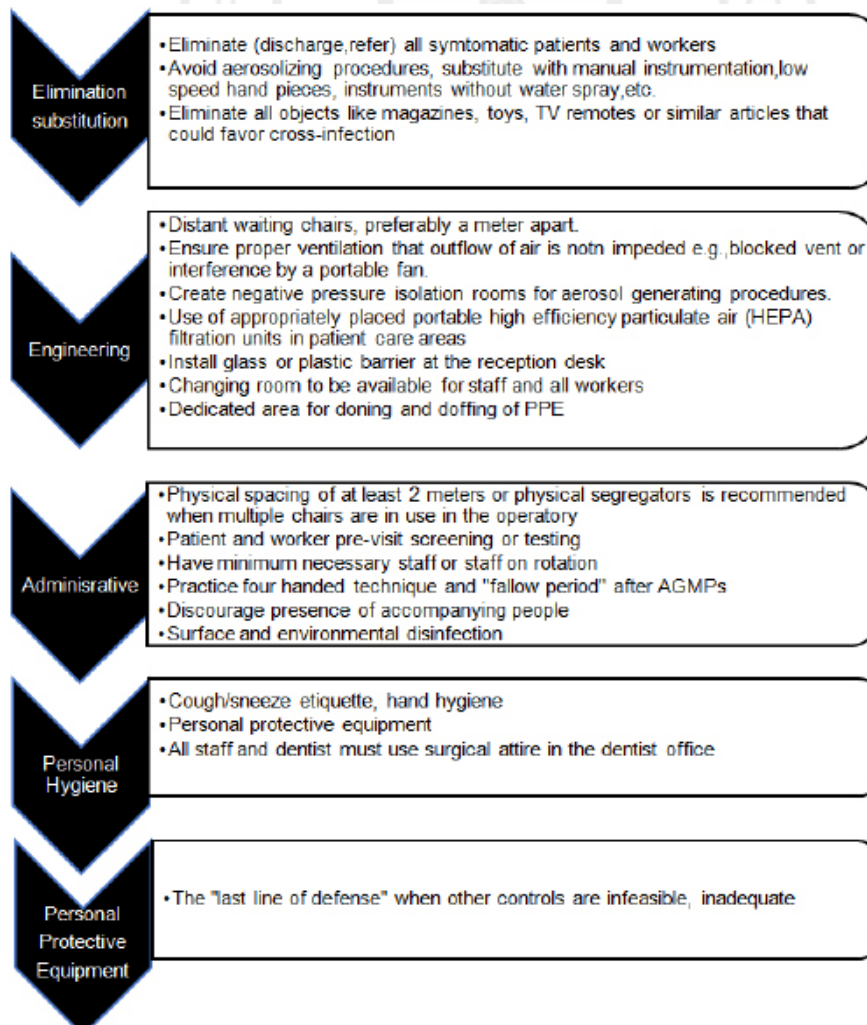
PREPARING FACILITIES

The dental team should prepare the operatory as per 'OSHA Guidance on Preparing Workplaces for COVID-19' to alleviate the possible transmission of Covid 19 in the dental office set up.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

PPE is a protective gear which defends the skin and mucous membrane from the infectious microbes. DHCP should be trained to wear appropriate PPE with proper donning and doffing protocol.

OSHA'S HIERARCHY OF CONTROLS²⁵



WHO RECOMMENDATIONS FOR PPE INCLUDE THE FOLLOWING :²⁶

- Respiratory protection - masks
- Protection of eyes - goggles and face shield
- Protection of body - impermeable, medical gowns with full sleeves, coveralls and shoe covers
- Protection of hand - sterile surgical gloves covering till gown cuffs. (Nitrile gloves are preferred over latex)
- Respiratory protection - (Table 1)

DONNING AND DOFFING PPE

Donning & Doffing is advised to be performed in a dedicated area. Remove all jewellery, check equipment conformity and to avoid potential dehydration issues, make sure to drink sufficient water before donning the PPE. Adjustments to PPE are not advised during the procedure.²⁸

The gown should be removed by touching the internal surface and avoid shaking to prevent the release of particulate contaminants. (Fig 3)

INFECTION CONTROL:³⁰

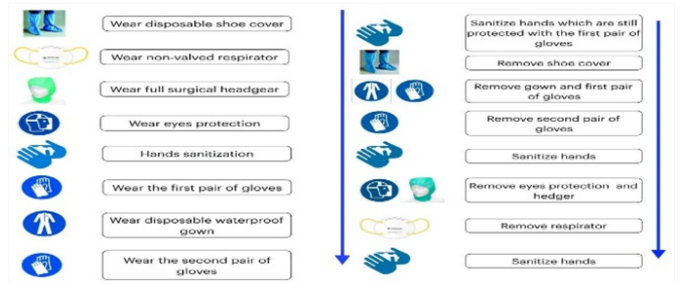
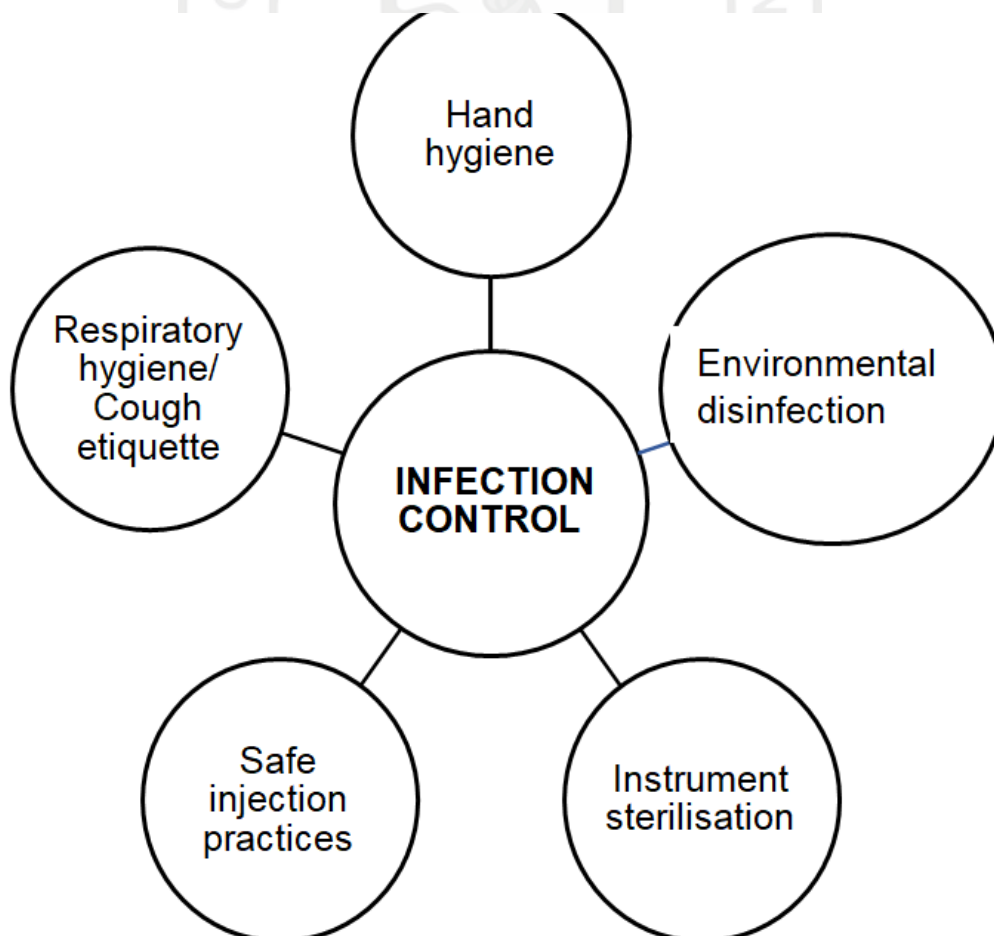


Figure 3: ‘Effective sequence of wearing & removing PPE’.³

DISPOSAL OF PPE

Fold the infected external surface of PPE facing inside and dispose it in a biohazard symbolized yellow colored medical waste bags and tie it with “gooseneck” ligation. Discard in the routine method of disposing highly infectious wastes.²⁹ Reusable gowns should be washed for 30 minutes at 60 °C or for 10 minutes at 80-90 °C.

HAND HYGIENE

The dentists and patients should perform efficient hand hygiene before and after procedure for at least 60 s, employing a 60% to 85% hydro alcoholic solution.

WHO 5 moments of Hand hygiene:31

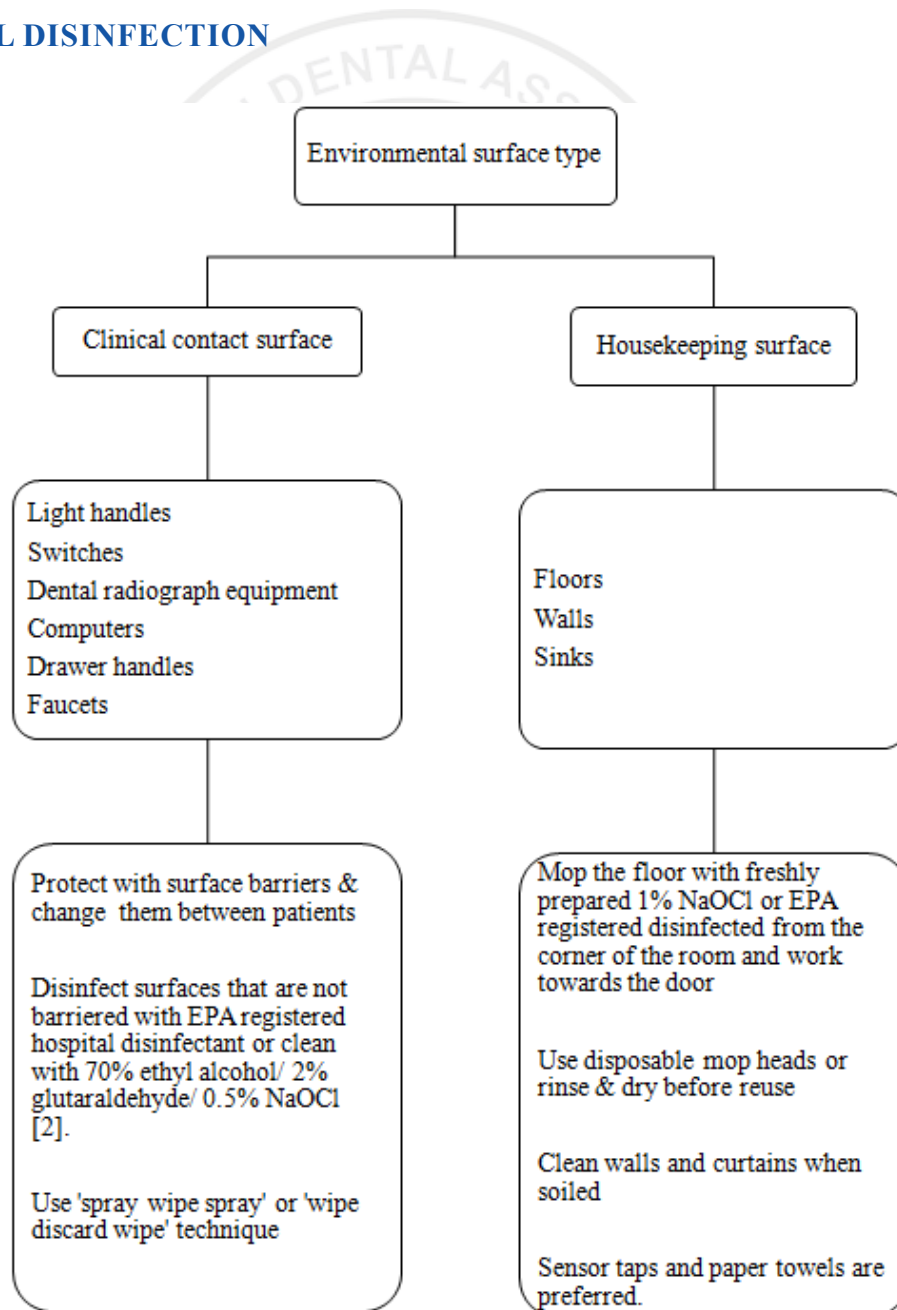
- Prior to touching a patient
- Prior to aseptic procedure
- After exposure to body fluids
- After touching a patient
- After touching patient surroundings

STEPS OF HANDWASHING



Figure 2: Steps of hand washing ³¹

ENVIRONMENTAL DISINFECTION



INSTRUMENT STERILIZATION

Disposable dental instruments are safer alternatives to reusable instruments during Covid-19. They are cost and time efficient as they bypass the need of decontamination and sterilisation thereby reducing the risk of cross infection. Reusable instruments should be sterilized by the approved methods of CDC and ADA.

- Steam under pressure (autoclaving):
- –Gravity displacement.
- –Pre-vacuum.
- Dry heat.
- Unsaturated chemical vapor.
- Liquid chemical sterilants for semi critical and heat sensitive critical items.

Sterilisation efficacy should be monitored periodically by mechanical, chemical and biological indicators. Manufacture's guidelines have to be followed for cleaning, drying, packing and storage of the instruments. Automated Cleaning with ultrasonic cleaner, instrument washer and washer-disinfector are preferable to manual cleaning. In order to avoid contact during sterilisation, following non-contact disinfection systems have been developed.³²

- Ozone
- Air ionizer
- Photocatalytic oxidation
- Hydrogen peroxide-based systems
- Formaldehyde steam
- Vaporized Peracetic acid

DISINFECTION OF DENTAL UNIT WATERLINES (DUWL)

DUWL should be flushed for 2 minutes initially and for 20 – 30 seconds in between the procedures with Environmental Protection Agency (EPA) standard water (≤ 500 CFU/ml).³⁰ Autoclavable anti-retraction valve fitted in the handpiece will prevent aspiration of debris, microbes into the dental tubes. Disposable microbial point of use filters dispenses microbe free water during the procedure.

RESPIRATORY HYGIENE / COUGH ETIQUETTE

- This plan of action is aimed not only at patients and their attendants but also to DHCP with suspected symptoms.
- Patient should be provided with tissues, masks in the dental office.
- Patients are advised to discard used tissues in automated receptacles.
- Mount automatic dispensing sanitizer/handwash to perform hand hygiene.
- Post the following visual alert at the outpatient areas.

SAFE INJECTION PRACTICES

- Pierce the rubber septum on a vial after disinfecting with alcohol

- When repeated doses are needed for the same patient, fresh syringe and needle should be used.
- Prefer single-dose vials and discard the remaining.
- If possible, multidose vials can be allocated to a single patient
- Confine the injection procedures to centralized medication area when multidose vials are to be utilized for many patients in order to prevent accidental contamination in the dental operatory.
- Contaminated sharp items are considered as infectious wastes.
- Hood the needles with one-handed scoop technique or a mechanical device.
- Dispose sharp items in puncture-proof containers

PROCEDURES AND AEROSOL CONTROL

- Aerosol Generating Procedures (AGPs) which release airborne particles $<5\mu\text{m}$ include:
- Ultrasonic scaler (including piezo)
- High speed air/electric rotor ($>60,000$ rpm)
- Piezo surgical handpiece
- Air polishers
- 3 in 1 syringe

PREPROCEDURAL RINSE

WHO advocates rinsing with 1% hydrogen peroxide or 0.2% povidone iodine for 20 seconds before examination and dental procedure to decrease the salivary viral load.³³

HIGH VOLUME SUCTION/ EVACUATION

High-Efficiency Particulate Air (HEPA) filter filters 99.97% of $0.3\mu\text{m}$ aerosols.³⁴ NASA invented higher standard HEPA filter which can be used without pauses between one patient and the next if inserted in sanitization devices. Double suction completely drains the fluid from oral cavity.³⁵

RUBBER DAM

Cochran M A et al.,1989 stated that rubber dam mitigates the contamination of microbes at the primary source by 90%-98%.³⁶ A 2003 'CDC guidance on infection control in dental care settings' concludes that rubber dam reduces spattering of aerosol and blood.

FALLOW TIME

Fallow time is the waiting period prior to the entry of next patient following AGPs which allows in the settling of aerosols. The Scottish Dental Clinical Effectiveness Programme (SDCEP) postulated the following algorithm.

CONCLUSION

Though the end of COVID pandemic is uncertain, it would leave a lasting impact on our clinical practice. With the ever-changing scenario clinicians have to adjust with the times. As we all progress towards normalcy, dentists should recommence their practice with thorough knowledge of Covid 19, associated

risks, preventive measures and overcome the challenges to treat the patients who depend upon our service. As medical personnel, we should lead from the front, following the necessary protocols and provide patients a safe and secure environment.

CONFLICT OF INTEREST

No conflict of interest.

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