

**A Practical Manual**

**COVID 19**

**AND DENTAL**

**PRACTICE**

**GDC Taskforce**



**DEPARTMENT OF ORAL & MAXILLOFACIAL SURGERY**  
**Government Dental College & Hospital, Nagpur**

*The purpose of this task force is to provide relevant information and guidelines on **COVID-19** outbreak for dental practioners and dental institutions.*

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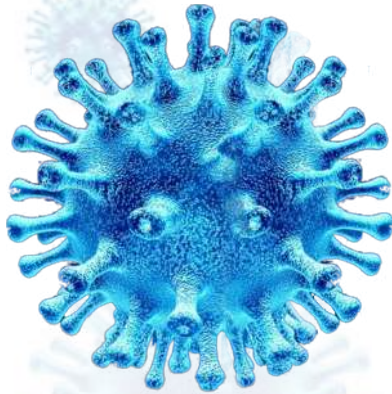
*The interim recommendations for dental practioners and auxiliaries are made in the light of this **COVID-19** pandemic which has grasped majority of the world.*

## NOTICE

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*Published by-*  
**Department of Oral & Maxillofacial Surgery, Government Dental  
College & Hospital, Nagpur**





*Dedicated to.....*

*“All the Frontiers”  
in this fight against  
COVID-19*

*A Practical Manual*  
***COVID-19 And Dental Practice***  
*GDC Task Force*

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# Preface

*We are facing a global health crisis unlike any the world has seen in many decades. The coronavirus disease (COVID-19), which has been characterised as a pandemic by the World Health Organization, is attacking societies at their core. The COVID-19 outbreak affects all segments of the population and is particularly detrimental to members of those social groups in the most vulnerable situations.*

*Once in the human body, this coronavirus is abundantly present in nasopharyngeal and salivary secretions of affected patients, and its spread is predominantly thought to be respiratory droplet/contact in nature. Dental professionals, may encounter patients with suspected or confirmed SARS-CoV-2 infection and will have to act diligently not only to provide care but at the same time prevent nosocomial spread of infection. We have done awareness about the implications this virus will have on dental practice in about 1000 dentists across Central India.*

*The main aim of coming up with this practical manual is to help my fellow dental professionals to fight this global pandemic and have a safe and sound dental practice.*

*All the incorporations have been authenticated by giving necessary references at the end of each chapter and appropriate source of information has been acknowledged.*

*Myself on the behalf of all the contributors would like to dedicate this practical manual to every health care worker who has been contributing immensely in the fight against this deadly disease. Let us all fight together against this menace of Coronavirus.*

**Dr. Abhay N. Datarkar**

*Editor in chief*

*Professor & Head of Department*

*Department of Oral & Maxillofacial Surgery*

*Government Dental College & Hospital,*

*Nagpur*



## Foreward

*During this **COVID -19** pandemic, dentistry is sidelined as medical professionals are taking care of the heavy burden of patients all around the globe but as famous english prose says ” **Face is the index of mind**”, likewise oral cavity is the main entrance of any systemic diseases.*

*Dental surgeons who come in contact with human saliva, aerosols during procedures are at the highest risk for the spread of this **COVID -19** infection and they have to be more careful while dealing with the patients during this corona pandemic period.*

*Department of **OMFS, GDCH Nagpur** headed by **Dr Abhay N Datarkar** is publishing interim E- guidelines for the dental practitioners and dental institutions.*

*I congratulate the team for their efforts and hope that this practical manual will help the dental personnel to do safe practice in the field of dentistry.*

*Thanking you,*

***Prof (Dr) S.P. Dange***

*Joint Director (Dental)*

*Directorate of Medical Education & Research*

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# From the desk of Dean

## *Birds Eye View*

*Novel Corona-virus (COVID-19) is a deadly protein molecule devastating the human kind and has brought down the life to a standstill. Its effect is determined by the interaction among the agent, the host and the environment. It is better prevented than treated for all in general and paediatric, geriatric and medically compromised in particular. Home quarantine is the best possible way of preventing it which involves social distancing as a first step. Avoiding to touch the T-zone of face involving the eyes, nose and mouth coupled with frequent hand-washing by soap or alcohol-based sanitizer is advocated for self-protection.*

*The proven fact that the spread of COVID-19 is also air-borne has made it mandatory for the dental fraternity to follow a systematic protocol in clinical practice. Proper history of travel and exposure, thermal scanning, symptoms of sour throat, dry-cough and difficulty in breathing makes you suspect an individual with COVID-19. It is imperative to consider only emergency and essential dental procedures to be carried out under strict aseptic measures, not only for suspects but also for routine patients. These measures include the use of sodium hypochlorite spray or fumigation and protective barriers like surgical gloves, triple layer masks, N-95 masks, head caps, eye ware and face shield topped up with HIV-kits or PPE-kits.*

*For symptomatic patients of COVID-19, no dental treatment but referral for medical management is must. Consumption of drugs like hydroxychloroquine and azithromycin is the domain of medical speciality, it is better to leave it for them.*

*In such an uncertain scenario, after the nutshell of Do's and Don'ts recommendations of subject experts from GDCH, Nagpur, adapted by Maharashtra State Dental Council, Task Force GDC initiated by the department of Oral and Maxillofacial Surgery has come out with a **"Practical Manual on COVID-19 and Dental Practice"** and I am sure it will go a long way in the management of dental practice in COVID-19 stricken period.*

**Dr. Mangesh Phadnaik**  
Dean, GDCH, Nagpur

## From the pen of President MSDC....

*COVID-19 and Dentistry are very closely related with each other as the dental professionals are directly working in the oral cavity.*

*Due to lockdown most of the dental operatories are closed today to prevent the spread of this virus causing undue apprehension among dental health professionals leading to impaired functionality of such operatory.*

*Although Ministry of Health & Family Welfare has issued comprehensive guidance to prevent occurrence of Hospital Acquired Infection (HAI) in health facilities, the practice of universal precautions might still be lacking in many dental professionals due to improper knowledge. Purpose of this practical manual is to provide guidance on action to be taken on prevention of Covid-19 in dental practice. This document intended as Taskforce GDC will be very much useful for all the dental practitioners and institutions to manage infection free practice.*

*I congratulate entire team of Government Dental College for such a wonderful publication which will go a long way in the practice of dentistry.*

*Wishing very good luck*

*Regards*

***Dr Narendra Kale***

*President*

*Maharashtra State Dental  
Council, Mumbai*



## Words of wisdom from our mentor

*The management of **COVID-19** is one of the most important part in clinical practice for all the branches of Medicine & Dentistry. All health professionals have now commitment towards "**Containment of this viral pandemic and prevention of its spread in community**" by following guidelines in the interest of self and society. Dental professionals are equally vulnerable to this infection which has emerged in past four months.*

*The Government of India as a commitment for healthy India framed task force on 8<sup>th</sup> February under the guidance of Honourable Union health minister with vigilant and knowledgeable professionals. I am proud to say that GDC&H Nagpur under the guidance of **Dr. Abhay Datarkar (Professor & HOD, Dept of Maxillofacial Surgery)** and his team have also framed **Task Force GDC**. Five academic activities are held to educate the dental professionals. The knowledge & courage are the important arms of these guidelines. I am sure these guidelines from Task Force GDC sails us through the fight against Corona "Know Corona... Go Corona"*

**Dr Vinay Hazare**

Consultant Oral Pathologist

Ex Dean GDCH Nagpur

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# INTRODUCTION & BACKGROUND OF COVID 19 INFECTION

- I. **Introduction**
- II. **What is coronavirus??**
- III. **What is SARS CoV-2/COVID-19??**
  - a) **Origin of SARS CoV-2**
  - b) **Characteristics of SARS CoV-2**
  - c) **Transmission routes of SARS CoV-2**

## I. Introduction :

The 2019 novel coronavirus (2019-nCoV) is rapidly spreading from its origin in Wuhan City of Hubei Province of China to the rest of the world [1]. On 11 February 2020, the World Health Organization (WHO) announced a new name for the epidemic disease caused by 2019-nCoV: coronavirus disease (COVID-19).

Regarding the virus itself, the International Committee on Taxonomy of Viruses has renamed the previously provisionally named 2019-nCoV as severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) [2].

COVID 19 has become a major global health concern. On 30 January 2020, the WHO declared the COVID-19 outbreak as the sixth public health emergency of international concern, following H1N1 (2009), polio (2014), Ebola in West Africa (2014), Zika (2016) and Ebola in the Democratic Republic of Congo (2019). Therefore, health workers, governments and the public need to co-operate globally to prevent its spread [3].

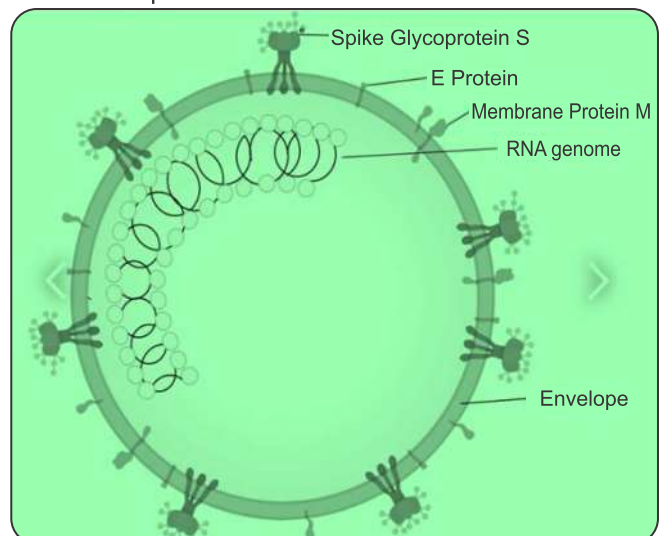
## II. What is a coronavirus? :

Coronaviruses (CoVs) are a large family of viruses that cause illness ranging from the common cold to more severe diseases such as Middle East Respiratory Syndrome (MERS-CoV) and Severe Acute Respiratory Syndrome (SARS-CoV). A novel coronavirus (nCoV) is a new strain that has not been previously identified in humans [4].

Coronaviruses are zoonotic, meaning they are transmitted between animals and people. Detailed investigations found that SARS-CoV was transmitted from civet cats to humans and MERS-CoV from dromedary camels to humans [4].

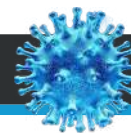
Coronaviruses are large ranging from 60 nm to 140 nm in diameter [5], enveloped, positive-stranded RNA viruses. They have the largest genome among all RNA viruses. The genome is packed inside a helical capsid formed by the nucleocapsid protein and further surrounded by an envelope. Associated with the viral envelope are at least three structural proteins: the

membrane protein and the envelope protein are involved in virus assembly, whereas the spike protein (**S-protein**) mediates virus entry into host cells. Among the structural proteins, the spike forms large protrusions from the virus surface, giving corona viruses the appearance of having crowns (hence their name; *corona* in Latin means crown). In addition to mediating virus entry, the spike is a critical determinant of viral host range and tissue tropism and a major inducer of host immune responses.



**Fig 1. Structure of SARS –CoV virus(Ref- Wikipedia)**

Coronaviruses cause widespread respiratory, gastrointestinal and central nervous system diseases in humans and other animals, threatening human health and causing economic loss from mild upper to lower respiratory tract infections [4]. Rarely, certain coronaviruses that usually affect only certain animal species can generate new strains that can cross over to human hosts and then be transmitted between humans. Since humans had not been exposed to such viruses before and cannot be protected by either existing vaccines or natural immunity, these mutations can rapidly lead to disease outbreaks and, eventually, pandemics.



This was the case with the previous outbreaks of SARS and MERS [4].

The first such instance was in 2002–2003 when a new coronavirus of the  $\beta$  genera and with origin in bats crossed over to humans via the intermediary host of palm civet cats in the Guangdong province of China. This virus, designated as severe acute respiratory syndrome coronavirus affected 8422 people mostly in China and Hong Kong and caused 916 deaths (mortality rate 11%) before being contained [6]. Almost a decade later in 2012, the Middle East respiratory syndrome coronavirus (MERS-CoV), also of bat origin, emerged in Saudi Arabia with dromedary camels as the intermediate host and affected 2494 people and caused 858 deaths (fatality rate 34%) [7].

### III. What is the SARS-CoV-2 / COVID-19 ??:

The SARS-CoV-2 is a novel strain of coronavirus that was first detected in the city of Wuhan, in the province of Hubei, in the People's Republic of China – a city with a population of 11 million. The outbreak started as a pneumonia of unknown causal agent at the end of December 2019.

#### a) Origin of SARS-CoV-2:

The initial source of SARS-CoV-2 is still unknown, although the first cases were linked to the Huanan seafood market in Wuhan city. Besides seafood, it is reported on social media that some wild animals including birds, snakes, marmots and bats were sold at the Huanan seafood market. It has been reported that environmental samples obtained from the marketplace have come back positive for the novel CoV, but the specific animal has not been identified [8].

More recently, several studies have suggested that bats may be the potential natural host of SARS-CoV-2 [9]. The whole genome-wide nucleotide sequence of SARS-CoV-2 is 96% identical to a bat CoV.

Importantly, SARS-CoV-2 has been isolated from pangolins and it was found that the isolated pangolin CoV genomes have ~85.5–92.4% similarity to SARS-CoV-2, suggesting that pangolin may be a potential intermediate host for SARS-CoV-2. However, whether SARS-CoV-2 is transmitted directly from bats or by an intermediate host requires further confirmation. Learning from the role of camels in MERS and civets in SARS, hunting for the source of SARS-CoV-2 will help determine zoonotic transmission patterns and stem the ongoing outbreak [10].

Phylogenetics analyses undertaken with available full genome sequences suggest that bats appear to be the reservoir of COVID-19 virus, but the intermediate host(s) has not yet been identified. (World Health Organization, 2020)

#### b) Characteristics of SARS CoV- 2:

SARS-CoV-2 belongs to the broad family of viruses known as coronaviruses. It is a positive-sense single-

stranded RNA (+ssRNA) virus, with a single linear RNA segment. Other coronaviruses are capable of causing illnesses ranging from the common cold to more severe diseases such as Middle East respiratory syndrome (MERS). It is the seventh known coronavirus to infect people, after 229E, NL63, OC43, HKU1, MERS-CoV, and the original SARS-CoV [11].

The virus seems to have mutated already after its original transmission from the animal host or reservoir to humans, leading to at least two different strains. Population genetic analysis of 103 SARS-CoV-2 genomes indicated that these viruses evolved into two major types (designated L and S). Although the L type is more prevalent than the S type, the S type was found to be the ancestral version. (Xiaolu Tang, 2020)

While both types play a part in the current outbreak, the higher prevalence of the L-type suggests that it is more aggressive. However, it is important to keep in mind that viruses mutate all the time and that not all mutations are indicative of increased disease severity or transmission rates. In fact, differences between the two types of the novel coronavirus are so small that researchers are reluctant to even classify them as separate strains.

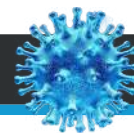
#### c) Transmission route of SARS-CoV-2:

The SARS CoV-2 can be transmitted between humans via respiratory droplets. Notably, the respiratory tract is probably not the only route of transmission. Close contact is also a source of transmission of SARS-CoV-2. For example, SARS-CoV-2 can be transmitted through direct or indirect contact with mucous membranes in the eyes, mouth or nose [12].

There is also a possibility of aerosol transmission in a relatively closed environment with continuous exposure to high concentrations of aerosol. Moreover, it has been reported that COVID-19 patients have some gastrointestinal symptoms, including diarrhoea, nausea and vomiting [13].

A recent study showed that the enteric symptoms of COVID-19 pneumonia are associated with invaded ACE2-expressing enterocytes, suggesting that the digestive tract is a potential route of SARS-CoV-2 infection besides the respiratory tract [14].

The outbreak of COVID-19 has become a clinical threat to the general population and healthcare Professionals worldwide. The spread of coronavirus (COVID-19) has posed significant challenges for dentistry and medicine. The role of dental professionals in preventing the transmission of COVID-19 is critically important. There were publications reporting dental professionals to be at high risk of COVID-19 infection due to the close face-to-face contact [15]. Studies suggesting COVID-19 may be airborne through aerosols formed during medical procedures or indirectly through saliva have been published [16]. Dental professionals feel a moral duty to reduce routine care and treat only emergency cases for fear of spreading COVID-19 among their patients and



beyond. So we have to aggressively implement infection control measures to prevent the spread of SARS- CoV-2 via human-to-human transmission.

## REFERENCES :

1. Wang C, Horby PW, Hayden FG, Gao GF. A novel coronavirus outbreak of global health concern. *Lancet*. 2020. [https://doi.org/10.1016/S0140-6736\(20\)30185-9](https://doi.org/10.1016/S0140-6736(20)30185-9).
2. Gorbalenya AE, Baker SC, Baric RS, de Groot RJ, Drosten C, Gulyaeva AA, et al. Severe acute respiratory syndrome-related coronavirus: the species and its viruses—a statement of the Coronavirus Study Group. *bioRxiv* 2020 Feb 11. doi: 10.1101/2020.02.07.937862
3. Yoo JH. The fight against the 2019-nCoV outbreak: an arduous march has just begun. *J Korean Med Sci* 2020;35:e56. doi: 10.3346/jkms.2020.35.e56 .
4. Coronavirus SARS-CoV-2 / COVID-19 pandemic: Information and Guidelines for Pharmacists and the Pharmacy Workforce(Internet)
5. Richman DD, Whitley RJ, Hayden FG. *Clinical Virology*, 4th ed. Washington: ASM Press; 2016.,
6. Chan-Yeung M, Xu RH. SARS: epidemiology. *Respirology*.2003;8:S9–14
7. Middle East Respiratory Syndrome Coronavirus. Available at : [https : // www. who.int /emergencies /mers-cov /en/](https://www.who.int/emergencies/mers-cov/en/). Accessed 16Feb 2020.
8. Gralinski LE, Menachery VD. Return of the coronavirus:2019nCoV. *Viruses*. 2020;12 pii: E135
9. Zhou P, Yang XL, Wang XG, Hu B, Zhang L, Zhang W. A pneumonia outbreak associated with a new coronavirus of probable bat origin. *Nature*. 2020;579:270–273
10. Lam TT-Y, Shum MH-H, Zhu H-C, Tong Y-G, Ni X-B, Liao Y-S, et al. Identifying SARS-CoV-2 related coronaviruses in Malayan pangolins. *nature* 2020 Mar 26. doi:10.1038/s41586-020-2169-0
11. Zhu N, Zhang D, Wang W, Li X, Yang B, Song J, et al. (February 2020). "A Novel Coronavirus from Patients with Pneumonia in China, 2019". *The New England Journal of Medicine*. 382 (8): 727-733. doi:10.1056/NEJMoa2001017. PMC 7092803. PMID 31978945
12. Lu CW, Liu XF, Jia ZF. 2019-nCoV transmission through the ocular surface must not be ignored. *Lancet*. 2020;395:e39
13. Wang D, Hu B, Hu C, Zhu F, Liu X, Zhang J. Clinical characteristics of 138 hospitalized patients with 2019 novel coronavirus-infected pneumonia in Wuhan, China. *JAMA*. 2020 Feb 7
14. Zhang H, Kang Z, Gong H, Xu D, Wang J, Li Z. The digestive system is a potential route of 2019-nCov infection: a bioinformatics analysis based on single-cell transcriptomes. *bioRxiv*. 2020 Jan 31
15. Peng X, Xu X, Li Y, Cheng L, Zhou X, Ren B. Transmission routes of 2019-nCoV and controls in dental practice. *Int J Oral Sci* 2020; **12**: 9.
16. Wax R S, Christian M D. Practical recommendations for critical care and anaesthesiology teams caring for novel coronavirus (2019-nCoV) patients. *Can J Anaesth* 2020; DOI: 10.1007/s12630-020-01591-x.



# EPIDEMIOLOGY & CLINICAL FEATURES OF COVID 19

- I. *Introduction and Definitions*
- II. *Epidemiology*
- III. *Clinical Features*
- IV. *Radiological Features*
- V. *Testing and Laboratory Findings*
- VI. *Treatment*
- VII. *Prevention measure*

## I. Introduction & definitions

The epidemic of 2019 novel coronavirus, also known as COVID-19 or **severe acute respiratory syndrome coronavirus 2(SARS-CoV-2)**, previously referred to as 2019-nCoV has expanded from Wuhan district of China to increasing number of countries around the globe[1].

- a) The term **Epidemic** is “rapid regional spread of an infectious disease to a large number of people in a community at a particular time”.
- b) The term **Pandemic** defined by World Health Organisation as “worldwide spread of a new disease”

The rapid spread of coronavirus from Wuhan to globally atleast 124 countries has left us to ponder over its epidemiology and its clinical course.

- c) **Confirmed case** - A person with laboratory confirmation of COVID-19 infection, irrespective of clinical signs and symptoms.
- d) **Contact** - A contact is a person who experienced any one of the following exposures during the 2 days before and the 14 days after the onset of symptoms of a probable or confirmed case:
  1. Face-to-face contact with a probable or confirmed case within 1 meter and for more than 15 minutes;
  2. Direct physical contact with a probable or confirmed case;
  3. Direct care for a patient with probable or confirmed COVID-19 disease without using proper personal protective equipment; OR
  4. Other situations as indicated by local risk assessments.
- e) **Probable case**
  - A. A suspect case for whom testing for the COVID-19 virus is inconclusive. OR
  - B. A suspect case for whom testing could not be performed for any reason

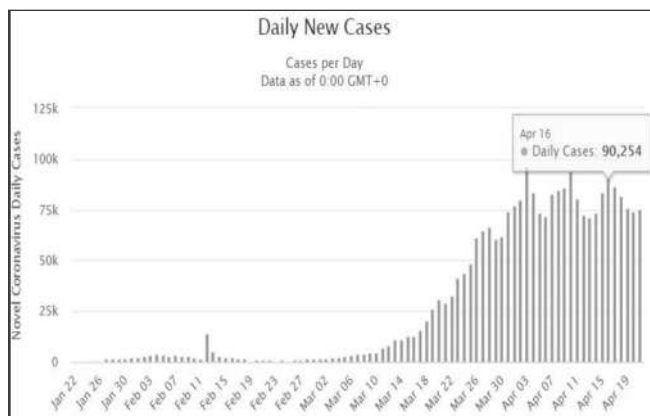
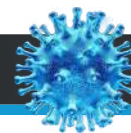
## f) Suspect case

- A. A patient with acute respiratory illness (fever and at least one sign/symptom of respiratory disease, e.g., cough, shortness of breath), AND a history of travel to or residence in a location reporting community transmission of COVID-19 disease during the 14 days prior to symptom onset; OR
- B. A patient with any acute respiratory illness AND having been in contact with a confirmed or probable COVID-19 case in the last 14 days prior to symptom onset; OR
- C. A patient with severe acute respiratory illness (fever and at least one sign/symptom of respiratory disease, e.g., cough, shortness of breath; AND requiring hospitalization) AND in the absence of an alternative diagnosis that fully explains the clinical presentation.

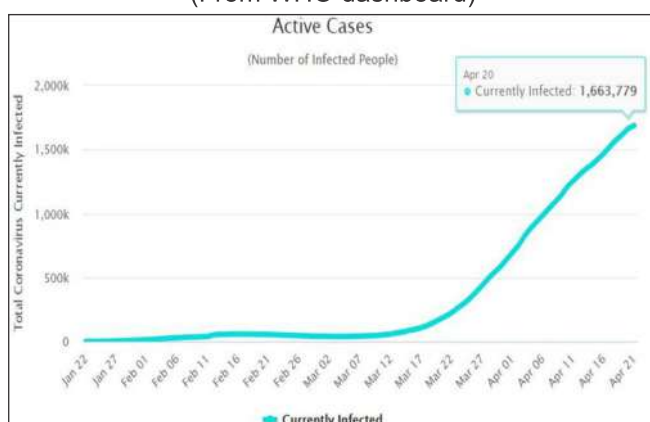
## II. Epidemiology

The epidemiology of any disease is defined by the full spectrum of the disease (ranging from asymptomatic to mild and moderate-severe cases), rate and method of transmission from one individual to another and risk factors involved.

- a) **Geographic distribution - Globally**, as of 10:00am CEST, 23 April 2020, there have been **2,544,792 confirmed cases** of COVID-19 (Graph 1 and 2), including **175,694 deaths**, reported to WHO (Graph 4 and 5). All the continents are affected except for Antarctica. In the list of most affected countries, India is on 17 position as on 24 April 2020. The total active cases in India are 16,689 as seen in Graph 6. Maharashtra has the maximum number of positive cases 5652 in India. The total 4342 patients are cured and 686 deaths. Maximum cases are from Mumbai, but Nagpur is also in red zone with 76 positive cases.

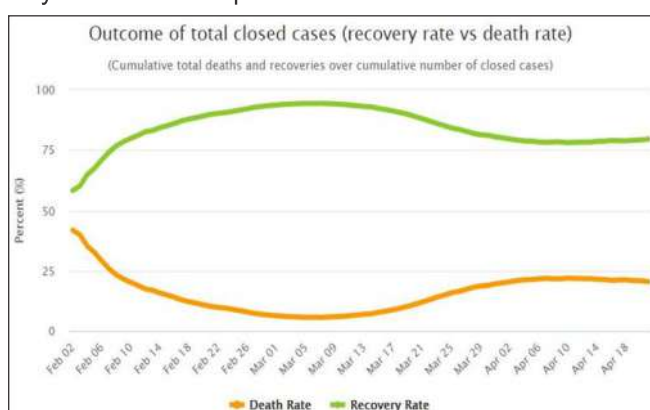


**Graph 1:** Graph showing daily new cases in the world. (From WHO dashboard)



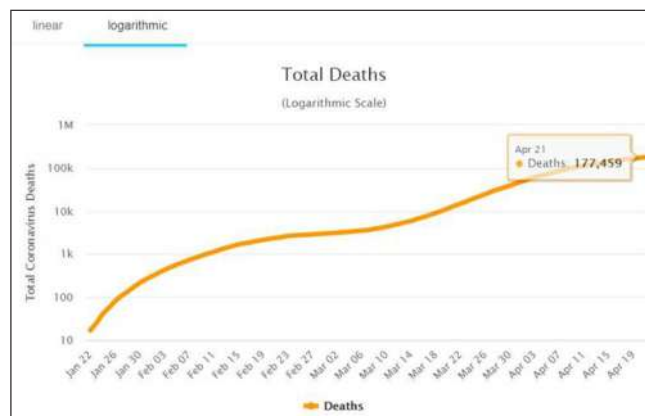
**Graph 2:** Graph showing active cases in world. (From WHO dashboard)

By removing deaths and recoveries from the total number of cases, we get the active or “currently infected cases” i.e. the cases that still awaits outcome. An exponential growth rate of a 16% increase in cases per day is shown in Graph 2.



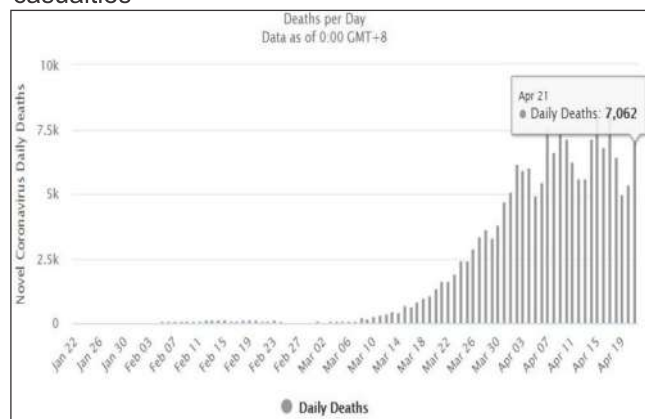
**Graph 3:** Graph depicting the global outcome of the disease in terms of the recovery rate and death rate.

The death rate for confirmed cases is between 2% & 8%, and the death rate for overall cases between 0.2% and 1.6%." according to the Chinese study in Wuhan. The recovery rate is overall improving from 17% to nearly 20% after following preventive measures as reported by various studies from China.



**Graph 4:** Graph showing total cumulative deaths reported globally due to covid-19.

The US, China, Italy and Spain are some of the worst affected countries in terms of cases and number of casualties



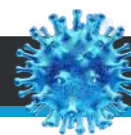
**Graph 5:** Graph illustrating number of deaths per day reported globally due to covid -19.



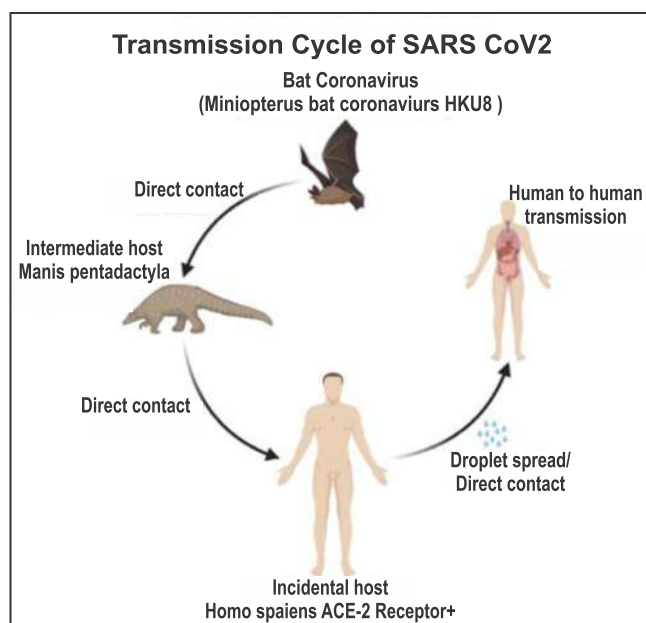
**Graph 6:** Graph showing daily total cases in India on 23th April 2020 ( FromMyGov from Government of India #IndiaFightsCorona COVID-19)

2019-nCoV (SARS-CoV-2) belongs to the betaCoVs category. It has round or elliptic and often pleomorphic form, and a diameter of approximately 60–140 nm. Like other CoVs, it is sensitive to ultraviolet rays and heat. Furthermore, these viruses can be effectively inactivated by lipid solvents including ether (75%), ethanol, chlorine-containing disinfectant, peroxyacetic acid and chloroform except for chlorhexidine.

**b) Transmission** – Person to person through respiratory droplets of cough, sneeze and talks by directly infecting the mucus membrane or by directly touching the mouth, nose and face after touching an infected surface. This virus has also been detected in blood and stools. Most load of the



virus is detected in naso/oropharyngeal secretions and sputum during the first week of transmission of infection.



**Fig1: Transmission Cycle of SARS CoV 2.**

- c) **The mode of transmission** of this virus has been reported in household contacts, health care workers not wearing Personalised Protective Equipments (PPE) and in closed settings like social or work gatherings. Extensive SARS-CoV-2 contamination of environmental surfaces in hospital rooms of patients with COVID-19 has been described. In a study from Singapore, viral RNA was detected on nearly all surfaces tested (handles, light switches, bed and handrails, interior doors and windows, toilet bowl, sink basin) in the airborne infection isolation room of a patient with symptomatic mild COVID-19 prior to routine cleaning.

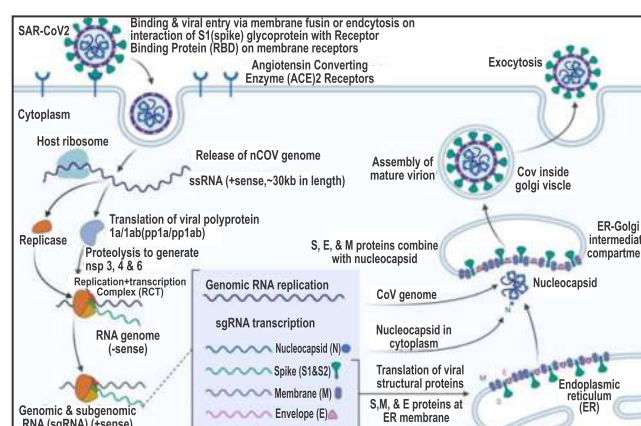
**Table 1: Definition of the categories for transmission pattern**

Category number	Category name	Definition
1	No cases	Countries/territories/areas with no cases
2	Sporadic cases	Countries/territories/areas with one or more cases, imported or locally detected
3	Clusters of cases	Countries/territories/areas experiencing cases, clustered in time, geographic location and/or by common exposures
4	Community transmission	Countries/area/territories experiencing larger outbreaks of local transmission defined through an assessment of factors including, but not limited to: <ul style="list-style-type: none"> <li>Large numbers of cases not linkable to transmission chains</li> <li>Large numbers of cases from sentinel lab surveillance</li> <li>Multiple unrelated clusters in several areas of the country/territory/area</li> </ul>

- d) **Period of infectivity** – According to a modelling study in China [2], the covid-19 has a mean serial interval of 5.8 days between the onset of symptoms. The infectiousness started 2.3 days prior to symptom onset, peaked 0.7 days before symptom

onset, and declined within seven days. Thus suggesting that patient is most infectious at the earlier stages of infection. Transmission of SARS-CoV-2 has also been reported from asymptomatic cases or individuals within incubation period [3]. Thus, exposure can occur one to three days prior to development of symptoms.

Based on data from the first cases in Wuhan and investigations conducted by the China CDC and local CDCs, the incubation time could be generally within 3 to 7 days and up to 2 weeks as the longest time from infection to symptoms was 12.5 days (95% CI, 9.2 to 18). This data also showed that this novel epidemic doubled about every seven days, whereas the basic reproduction number ( $R_0$  -  $R$  naught) is 2.2. In other words, on average, each patient transmits the infection to an additional 2.2 individuals. Of note, estimations of the  $R_0$  of the SARS-CoV epidemic in 2002-2003 were approximately 3. Fig 2 shows the replication of virus.



**Fig 2: Covid 19, Corona Replication [4].**

The duration of viral shedding or the duration a person remains infected is also variable according to the severity of the illness. According to one study [5] of 21 patients with mild illness, 90 percent had repeated negative viral RNA tests on nasopharyngeal swabs by 10 days after the onset of symptoms. Another study [6] with mild to moderate illness, the median duration of viral RNA shedding from naso- or oropharyngeal specimens was 24 days

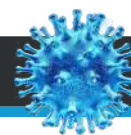
### III. Clinical features

The spectrum of this disease ranges from

SPECTRUM	CLINICAL PRESENTATION
Mild	No pneumonia
Moderate-severe	Dyspnea, hypoxia, >50% involvement of lung on imaging within 24 to 48 hours
Critical	Respiratory failure, shock, multiorgan dysfunction

The first case of COVID-19 in India was reported on 30<sup>th</sup> January 2020 in Kerala by a student who had returned from Wuhan. On 4 March, 22 new cases came to light,





including those of an Italian tourist group with 14 infected members.

#### a) RISK FACTORS

Older people with other medical co-morbidities like diabetes mellitus, hypertension, asthma, chronic obstructive pulmonary disease and other cardiovascular conditions are more prone to develop severe form of disease.

#### b) SYMPTOMS

It is a self-limiting respiratory illness typical of a viral pneumonia.

Common Symptoms	Less common symptoms	Rare symptoms
Fever	Myalgia/Arthralgia	Nausea, vomiting
Cough	Headache	Nasal congestion
Fatigue	Sore throat	Diarrhoea
Shortness of breath	Chills	Palpitations and chest tightness

The symptoms are usually mild initially (81%) and develop gradually depending on the host and viral organism. Few patients do not even develop any symptoms (asymptomatic cases). Interestingly the patients also report **anosmia, hyposmia, ageusia and dysgeusia**. Severe disease accounts for 14% includes florid pneumonia that may progress to **Acute Respiratory Distress Syndrome (ARDS)** along with **cardiogenic or distributive shock**.

Although respiratory symptoms predominate, severe cardiovascular sequelae may occur with COVID-19. The SARS-CoV-2 virus potentially binds to angiotensin converting enzyme-2 (ACE-2) which is highly expressed by the alveolar epithelial cells in the lung. The invasion of these cells by SARS-CoV-2 is thought to provoke respiratory symptoms. Using the same receptor, it gains entry to cardiomyocytes and subsequently cause local inflammation causing cardio-vascular destruction and leads to hypoxia and Disseminated Intravascular Coagulation (DIC)[7].

#### IV. Radiological features

a) **Chest Plain X-ray** shows findings that of atypical pneumonia. According to published literature, of patients with COVID-19 requiring hospitalization, 69% had an abnormal chest radiograph at the initial time of admission, and 80% had radiographic abnormalities sometime during hospitalization[8]. Findings are most extensive about 10-12 days after symptom onset.

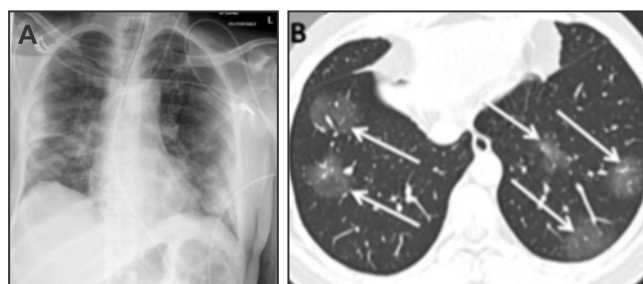
- Airspace opacities called consolidations involving bilateral, laterally, lower lobes.
- Bronchovascular thickenings

b) **Chest CT Scan** reveals—Fig. 3

- Ground-glass opacities and areas of consolidation

laterally

- Airway abnormalities like airway wall thickening, bronchiectasis.
- Linear or round opacities with “Reverse halo sign” and “crazy-paving pattern”



**Fig. 3: A.** Chest X ray showing frontal view of lung depicting ill defined radiopacities involving bilateral lateral borders of the lower lobes of lung. **B.** An Axial CT scan of lung without contrast showing bilateral ground-glass opacities in lower lobes with rounded morphology (arrows).

#### V. Testing and laboratory findings

15 labs across India led by the National Institute of Virology (NIV), Pune, are testing for the virus, with more labs being trained. India became the fifth country to successfully obtain a pure sample of the virus after China, Japan, Thailand and the US.

Centre for Cellular and Molecular Biology has been working on genome sequencing of COVID 19.

**The Real Time Polymerase Chain Reaction (RT-PCR)** of respiratory secretions obtained by bronchoalveolar lavage, endotracheal aspirate, nasopharyngeal or oropharyngeal swab is the definitive test for SARS-CoV-2.

**Ministry of Health & Family Welfare, Government of India**

**Help us to help you**

**NOVEL CORONAVIRUS (COVID-19)**

**COVID-19 testing - when and how?**

**All individuals need not be tested, because**

Disease is primarily reported in individuals with travel history to the affected countries or close contacts of positive cases

**WHOM TO TEST**

**ALL symptomatic people who**

- Have history of international travel in last 14 days
- Are hospitalized patients with Severe Acute Respiratory Illness (SARI) or Influenza Like Illness (ILI) or severe pneumonia.
- Had come in contact of confirmed cases
- Are healthcare workers

**Asymptomatic direct and high-risk contacts of confirmed cases should be tested once between day 5 and day 14 of coming in his/her contact. Direct and high-risk contact include:**

- Those living in same household with a confirmed case
- Healthcare workers who examined a confirmed case without adequate protection as per WHO recommendations

**List of labs (Govt. & Private) can be accessed at: [icmr.nic.in](http://icmr.nic.in)**

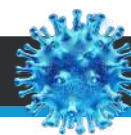
**For further information:**

Call the State helpline numbers or Ministry of Health and Family Welfare, Government of India's 24x7 helpline numbers

**1075 (Toll Free) | 011-23978046**

Email to: [ncov2019@gov.in](mailto:ncov2019@gov.in), [ncov2019@gmail.com](mailto:ncov2019@gmail.com)

[mohfw.gov.in](http://mohfw.gov.in) | [@MoHFWIndia](https://twitter.com/MoHFWIndia) | [MoHFW India](https://www.facebook.com/MoHFWIndia)



**Table 2: Specimens to be collected from the symptomatic patients and contacts.**

	Test	Type of sample	Timing
Patient	NAAT	Lower respiratory tract -sputum -spirate -lavage  Upper respiratory tract - nasopharyngeal and - oropharyngeal swabs - nasopharyngeal wash/nasopharyngeal aspirate  Consider stools, whole blood urine and if diseased, material from autopsy.	Collect on presentation. Possibly repeated sampling to monitor clearance. Further research needed to determine effectiveness and reliability of repeated sampling.
Patient	Serology	Serum for serological testing once validated and available	Paired samples are necessary for confirmation with the initial sample collected in the first week of illness and the second ideally collected 2-4 weeks later (optimal timing for convalescent sample needs to be established)
Contact in health-care centre associated outbreaks or other settings where contact have symptoms, or where symptomatic contacts have had high-intensity contact with a COVID-19 case	NAAT	Nasopharyngeal and oropharyngeal swabs	Within incubation period of last documented contact
	Serology	Serum for serological testing once validated and available	Baseline serum taken as early as possible within incubation period of contact and convalescent serum taken 2-4 weeks after last contact (optimal timing for convalescent sample needs to be established)

NAAT - Nucleic acid amplification tests

The most common ancillary laboratory findings are –

- Lymphopenia
- Increased Prothrombin Time
- Raised Lactate Dehydrogenase
- Mild elevation of inflammatory markers like CRP and ESR

## VI. Treatment

Most (80%) patients recover without needing any special treatment. Currently, there is no FDA-approved therapy to prevent or treat COVID-19. Individuals or combination of **anti-malaria (Chloroquine)**, **anti-Swine flu (Remdesivir)** and **anti-HIV drugs (Lopinavir/Ritonavir)** are under assessment.

On 23 March, the National Task Force for COVID19 constituted by Indian Council of Medical Research recommended the use of **hydroxychloroquine** for

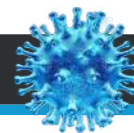
treatment of COVID19 for high-risk cases.

The focus remains to attain innovation and increased production of low cost, compact and portable and multi patient ventilators. Pune-based Serum Institute of India is expected to apply for clinical trials of certain strains from Drug Controller General of India. Efforts are being made to replicating viral vector and developing **DNA plasmid vaccine**. Animal trials have already begun. In Delhi, a 49-year-old man who was on ventilator support became first patient in the country, who recovered through **Plasma therapy**.

## VII. PREVENTION MEASURES

A cluster-containment strategy is mainly being adopted, similar to how India contained previous epidemics, as well as "breaking the chain of transmission".

- **Social Distancing** – maintaining a distance of 1 meter (3 feet) between two individuals at all times.
- Regularly and thoroughly cleaning hands with



alcohol based hand rub and washing with soap and water.

- Avoid touching face, nose or eyes as hands may be contaminated from touching any contaminated surface.
- **Respiratory hygiene** – Covering mouth and nose with a cloth/tissue or bend elbow while coughing and sneezing. Dispose the used tissue immediately into a covered dustbin operated by foot.
- **Home quarantine and self-isolation**
- Keep up-to-date information using official government portals.

## REFERENCES

1. Report of the WHO-China Joint Mission on Coronavirus Disease 2019 (COVID-19) [Pdf] - World Health Organization, Feb. 28, 2020
2. He X, Lau EH, Wu P, Deng X, Wang J, Hao X, Lau YC, Wong JY, Guan Y, Tan X, Mo X. Temporal dynamics in viral shedding and transmissibility of COVID-19. *Nature Medicine*. 2020 Apr 15:1-4.
3. Wei WE, Li Z, Chiew CJ, Yong SE, Toh MP, Lee VJ. Presymptomatic Transmission of SARS-CoV-2—Singapore, January 23–March 16, 2020. *Morbidity and Mortality Weekly Report*. 2020 Apr 10;69(14):411.
4. Cascella M, Rajnik M, Cuomo A, Dulebohn SC, Di Napoli R. Features, evaluation and treatment coronavirus (COVID-19). *InStatPearls* [Internet] 2020 Mar 8. StatPearls Publishing.
5. Liu Y, Yan LM, Wan L, Xiang TX, Le A, Liu JM, Peiris M, Poon LL, Zhang W. Viral dynamics in mild and severe cases of COVID-19. *The Lancet Infectious Diseases*. 2020 Mar 19.
6. Xiao AT, Tong YX, Zhang S. Profile of RT-PCR for SARS-CoV-2: a preliminary study from 56 COVID-19 patients. *Clinical Infectious Diseases*. 2020 Apr 19.
7. Ong SW, Tan YK, Chia PY, Lee TH, Ng OT, Wong MS, Marimuthu K. Air, surface environmental, and personal protective equipment contamination by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) from a symptomatic patient. *Jama*. 2020 Mar 4.
8. Wong HYF, Lam HYS, Fong AH, Leung ST, Chin TW, Lo CSY, Lui MM, Lee JCY, Chiu KW, Chung T, Lee EYP, Wan EYF, Hung FNI, Lam TPW, Kuo M, Ng MY. Frequency and Distribution of Chest Radiographic Findings in COVID-19 Positive Patients. (2019) *Radiology*.



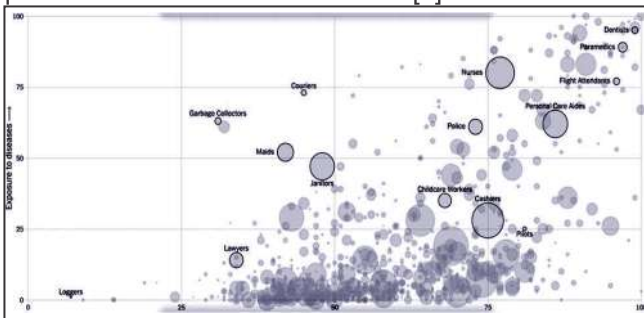
# IMPLICATIONS OF COVID 19 PANDEMIC ON DENTAL PRACTICE – A GLOBAL SCENARIO

- I. Introduction
- II. General implications on Global Dental practice
- III. Psychosocial implications on Dentistry
- IV. Socio-Economic Implications on Dentistry
- V. Educational Implications
- VI. Post Pandemic Future implications

## I. Introduction :

The coronavirus infection started in Asia and rapidly spread across the globe. According to the **World Health Organization (WHO)** [1], this is the first pandemic caused by a coronavirus. Globally, 1 773 084 confirmed cases and 111 652 deaths have been reported by dated 13 April so far.

The spread of the novel coronavirus (COVID-19) has posed significant challenges for dentistry and medicine, and dental and medical schools, in all affected countries. The New York Times (NYT) reminded the world that dentistry had the most risk of exposure among all other professions in relation to COVID-19[2].



**Fig.1: Taken from the NYT article: The Workers Who Face the Greatest Coronavirus Risk**

In the absence of any therapeutic treatment modalities and unavailability of vaccine for COVID-19, the sole management is based on containment measures and symptomatic treatment. The role of dental professionals in preventing the transmission of COVID-19 is critically important. Since the viral load is very high in saliva and its transmission is mainly through inhalation or direct mucous contact with saliva droplets. It becomes paramount for dental professionals to remember that the virus can survive on hands, objects or surfaces that were exposed to infected saliva. Dentistry is very familiar with the principles of Universal Precautions and prevention

of cross contamination. Hence, could play a pivotal role in the successful containment of this infectious pandemic situation. In China and South Korea, the severe application of these containment interventions has drastically reduced the number of new cases.

## II. General implications of COVID -19 on global dental practice

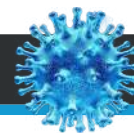
While each country had a different approach, all closed down routine dental care in a similar way to China. **The UK National Health Service's (NHS's)** [3] initial view was that dentists and their teams should continue to provide routine care for asymptomatic patients with no close contact history and to discourage symptomatic patients for any dental procedure. Meanwhile, many general dental practitioners (GDPs) felt a moral duty to reduce routine care for fear of spreading the COVID-19 among their patients and beyond.

According to Dental Tribune, **in Spain, dental clinics are considered an essential service.** Therefore, 40000 dentists are obliged to keep their practices open even though they are allowed to do only emergency procedures.

According to a poll conducted by **American Dental Association (ADA)** [4] on dental practice status in United states of America, majority (76%) of dental clinics are closed for routine practice but seeing emergency patients only. 19% of the clinics are reported closed and not seeing any patients while 5% reported they are keeping the clinics open for all but their patient volume is significantly lower than usual. Many regions of the world closed down routine dental care to all.

There was an early report of one case of COVID-19 infection in **Germany** with transmission through contact with an asymptomatic patient [5].

Therefore, it is crucial for dentists to refine preventive



strategies to avoid the COVID-19 infection by focusing on patient placement, hand hygiene and all personal protective equipment (PPE). The **Chinese model of dentistry**[6] is worth mentioning. The pre-check triages established in clinics and hospitals to record the temperature of every staff and patient. Pre-operative antimicrobial mouthrinse provided to every patient to reduce the bacterial load. Use of rubber dam and high volume suctions during a dental emergency procedure. Separate entry gates for patient and the dentist along with the use of PPE.



**Figure 2: Model of a Dental set-up during Coronavirus infection outbreak. Yellow: Triage and waiting area. Orange: Dental clinic. Red: Isolation clinic. Green: Resting area for Staff only.**

The triage staff in yellow area wears work clothes, disposable surgical mask and cap. In Orange area, PPE is provided including disposable N 95 masks, gloves, gowns, cap, shoe covers and goggles or face shield. The area is disinfected regularly. The Red Isolation area is designed for the suspected COVID-19 patients, or recovering (< 1 month after discharge from hospital) or a close contact person who needs emergency dental treatment. Separate entry and exit gate for such patients. The staff also enters from a separate gate in the isolation area and this area is disinfected as soon as the patient leaves. Green is the resting room for staff and it is recommended to use by turn. The staff should wear surgical mask and gloves at all times in the dental set-up except for while eating.

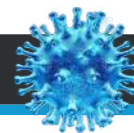
In order to limit infection, The School and Hospital of Stomatology, Wuhan University has shared its

experience and suggestions[6] -

- Consistent disinfection of your waiting area and front-desk counter space throughout open hours.
- Remove waiting area amenities that involve high-touch (e.g. coffee and tea service, magazines and reading materials)
- Additional space between chairs.
- Six handed dentistry
- Make alcoholic disinfectants and masks available to patients in waiting rooms.
- The entire air conditioning system must be sanitized very frequently.
- Handpieces must be equipped with anti-reflux devices to avoid contaminations, improving the risk of cross-infections.
- Use of Rubber dams and saliva ejectors with high volume can reduce the production of droplets and aerosols.
- Preoperative antimicrobial mouth rinse could reduce the number of microbes in the oral cavity.
- Extraoral dental radiographies, such as panoramic radiography and cone beam CT, are appropriate alternatives during the outbreak of COVID-19.
- Absorbable suture is preferred.
- Appointing the patient with procedure involving generation of aerosols at the end of the day.

#### EFFECTIVE INFECTION CONTROL PROTOCOLS WORLDWIDE:

- Suspend all patient care by undergraduate and postgraduate students on 16 March 2020.
- Non-clinical teaching rapidly being moved to online platforms.
- Establish pre-check triages to measure and record the temperature of every staff and patient as a routine procedure.
- The WHO recommends the use of a particulate respirator at least as protective as a US National Institute for Occupational Safety and Health (NIOSH)-certified N95, European Union (EU) standard FFP2, or equivalent, when performing aerosol-generating procedures such as dental drilling. The COVID-19 measures around 120 nm (0.12  $\mu\text{m}$ ) and aerosol particle sizes range from 3-100 nm. The use of a FFP3 respirator offers a filtration rate of 99% of all particles measuring up to 0.6  $\mu\text{m}$ [7].



## 5) On 1st April, the ADA [5] also published an Interim Guidance for Management of Emergency and Urgent Dental Care–

### Dental emergencies :

" Should be attended by the seniormost professional following all necessary recommended precautions."

- Uncontrolled bleeding
- Cellulitis or a diffuse soft-tissue bacterial infection with intra-oral or extra-oral swelling that potentially compromises the patient's airway
- Trauma involving facial bones, potentially compromising the patient's airway

### Dental urgencies :

"Should be addressed based on the signs and symptoms. Non surgical treatment preferred over surgical management of such cases."

- Severe dental pain from pulpal inflammation
- Pericoronitis or third-molar pain
- Surgical post-operative osteitis, dry socket dressing changes
- Abscess, or localized bacterial infection resulting in localized pain and swelling
- Tooth fracture resulting in pain or causing soft tissue trauma
- Dental trauma with avulsion/luxation
- Dental treatment required prior to critical medical procedures
- Final crown/bridge cementation if the temporary restoration is lost, broken or causing gingival irritation
- Biopsy of abnormal tissue

### Non-urgent dental treatments that can be postponed

- Initial or periodic oral examinations and recall visits, including routine radiographs
  - Routine dental cleaning and preventive therapies
  - Orthodontic procedures other than those to address acute issues (e.g. pain, infection, trauma) or other issues critically necessary to prevent harm to the patient
  - Extraction of asymptomatic teeth
  - Restorative dentistry including treatment of asymptomatic carious lesions
  - Aesthetic dental procedure
- 6) Reschedule routine non-emergency appointments.

## III. Psychosocial implications

Healthcare workers are particularly vulnerable to emotional distress during this pandemic, given their higher risk of exposure to the virus, risk of infecting the family and loved ones, shortages of PPEs and longer working hours at the frontline. Keeping away from the routine practice for a longer duration also plays a role for anxiety among the dental professionals. Longer self-isolation and home quarantine proved to have adverse outcomes like stress, depression, anxiety, irritability, insomnia, fear, confusion, anger, frustration, boredom and stigma[9]. Education and training regarding the psychosocial issues should be provided to all health care professionals.

## IV. Socio-economic implications

With loss of jobs, reduction in working hours, postponement of the elective procedures, the dentistry is facing an economic backlash during the coronavirus pandemic. The patients are being screened over phone and only emergency procedures are being conducted. Despite of being available 24/7, the private dental practitioners are losing their daily income during this pandemic. Addition and modification of infrastructure pertaining to this pandemic adds to the burden on pocket. Authors suggest searching for additional source of income for those dependent exclusively on the dental practice.

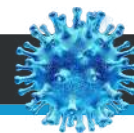
## V. Educational implications

With coronavirus pandemic and a global lockdown, dental educational system has also suffered a brunt. The national and international conferences and meetings have been postponed indefinitely. Though many educational universities and centers are moving towards the online video conferencing and webinars worldwide, it won't be an exaggeration to comment that education system has been faced a period of prolonged interruption especially with hold at research related activities, postponement of exams and admissions of new students and doctors globally.

## VI. Post-pandemic future

1. **Teledentistry** [10] – the strategy of "forward triage" i.e. the sorting of patients before they arrive in the emergency department (ED). It is a 21st-century approach to forward triage that allows patients to be efficiently screened, is both patient-centered and conducive to self-quarantine, and it protects patients, clinicians, and the community from exposure. It can allow physicians and patients to





communicate 24/7, using smart phones or webcam-enabled computers.

2. **Healthcare Revolution** – Though Covid-19 has exposed major weaknesses in the United States' federalist system of public health governance[11], the CDC has already started working on revolutionising the entire healthcare system by promoting research and technology[12].
3. **Innovations in care delivery**[13] – high volume suction in order to minimize the aerosol spread.
4. **Changing the approach** from Reactive to Pro-active[14]. Since we did not anticipate the profound impact of covid-19 because of wide transmission by asymptomatic carriers. There is rise of intensive care facilities by 200%, shortage of PPE worldwide, other non-respiratory wards and hospitals are being converted to coronavirus units. The situation has been reactive rather than pro-active. We need to be better prepared for such unfortunate circumstances in future with better facilities and education in a pro-active manner. Only then, we can prevent mass destruction in future.
5. **Artificial Intelligence system** – will reduce human-to-human close contact and interaction and will be helpful in various advanced diagnostic aids. It could help in assisting the doctors in treating patients and reducing the contact of number of personal with any infectious patient.

## REFERENCES

1. World Health Organization. Coronavirus disease 2019 (COVID-19): situation report, 84. [https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200410-sitrep-84-covid-19.pdf?sfvrsn=ca96eb84\\_2](https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200410-sitrep-84-covid-19.pdf?sfvrsn=ca96eb84_2)
2. Gamio, L. The Workers Who Face the Greatest Coronavirus Risk. The New York Times (New York) 2020 March 15. Available online: <https://www.nytimes.com/interactive/2020/03/15/business/economy/coronavirus-worker-risk.html>
3. Coulthard, P. Dentistry and coronavirus (COVID-19) - moral decision-making. Br Dent J 228, 503–505 (2020). <https://doi.org/10.1038/s41415-020-1482-1>
4. <https://www.ada.org/en/publications/ada-news/2020-archive/april/hpi-poll-examines-impact-of-covid-19-on-dental-practices>
5. Rothe C, Schunk M, Sothmann P et al. Transmission of 2019-nCoV Infection from an Asymptomatic Contact in Germany. N Engl J Med 2020; 382: 970-971.
6. Meng L, Hua F, Bian Z. Coronavirus disease 2019 (COVID-19): emerging and future challenges for dental and oral medicine. Journal of Dental Research. 2020 Mar 12:0022034520914246.
7. Health and Safety Executive. Evaluating the protection afforded by surgical masks against influenza bioaerosols: Gross protection of surgical masks compared to filtering facepiece respirators. 2008. Available at <https://www.hse.gov.uk/research/rrpdf/rr619.pdf>
8. [https://www.ada.org/~media/CPS/Files/COVID/ADA\\_Int\\_Guidance\\_Mgmt\\_Emerg-Urg\\_Dental\\_COVID19.pdf](https://www.ada.org/~media/CPS/Files/COVID/ADA_Int_Guidance_Mgmt_Emerg-Urg_Dental_COVID19.pdf)
9. Brooks SK, Webster RK, Smith LE, Woodland L, Wessely S, Greenberg N, Rubin GJ. The psychological impact of quarantine and how to reduce it: rapid review of the evidence. The Lancet. 2020 Feb 26.
10. Hollander JE, Carr BG. Virtually perfect? Telemedicine for covid-19. New England Journal of Medicine. 2020 Mar 11.
11. Haffajee RL, Mello MM. Thinking Globally, Acting Locally—The US Response to Covid-19. New England Journal of Medicine. 2020 Apr 2.
12. Keesara S, Jonas A, Schulman K. Covid-19 and Health Care's Digital Revolution. New England Journal of Medicine. 2020 Apr 2.
13. Mehrotra A, Ray K, Brockmeyer DM, Barnett ML, Bender JA. Rapidly Converting to "Virtual Practices": Outpatient Care in the Era of Covid-19. NEJM Catalyst Innovations in Care Delivery. 2020 Apr 1;1(2).
14. Berjano P, Prewitt E. Covid-19 Message from Milan: Be Ahead of the Curve. You Cannot Wait. NEJM Catalyst Innovations in Care Delivery. 2020 Apr 7;1(2).

# ARMAMENTARIUM FOR REDUCTION OF TRANSMISSION OF COVID-19 IN DENTAL OPERATORY

## INTRODUCTION

### ARMAMENTARIUM:

- |   |  |
|---|--|
| <ul style="list-style-type: none"> <li>I. Automatic sanitizer dispensers</li> <li>II. Non-contact Infrared thermal devices</li> <li>III. N- 99 (PAPR'S) Face masks</li> <li>IV. Triple protection gowns and face shields.</li> <li>V. HEPA filters</li> </ul> | <ul style="list-style-type: none"> <li>VI. Plasma air sterilizers</li> <li>VII. Arbat safet box for trauma care</li> <li>VIII. Fogger machines</li> <li>IX. Personal protective equipment</li> <li>X. Hazmatsuit</li> <li>XI. Teledentistry</li> </ul> |
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## I. Introduction:

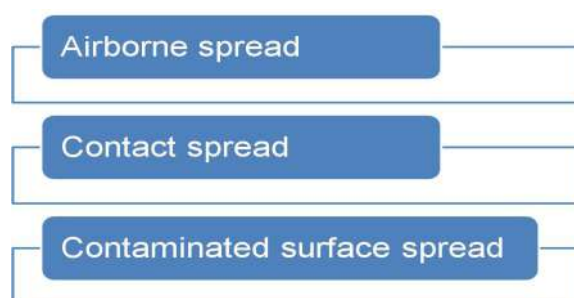
Corona virus disease (Covid -19) clinically manifests as the severe acute respiratory syndrome coronavirus 2 (SARS-COV-2) [1]. The pandemic of novel corona virus disease is having an overshadowing impact on all our lives. We dentists are at higher risk as we deal with oral cavity problems and saliva is best medium for dwelling of Covid-19 viruses[1-3]. The route of transmission is through droplets and most of our procedures generate a huge amount of aerosols.[1]

To date, most of the researchers revealed that 1-14 days is called as incubation period in which patient does not exhibits any clinical signs and symptoms[1-4]. However, To KK W et al revealed that the patients in incubation period can spread disease most effectively through droplets. Furthermore, his (To KK W et al) study concluded reporting that the virus persists actively in saliva of these asymptomatic subjects during incubation period[5].

Dental patients and professionals are at high risk to expose covid -19 infections, because of Dental procedures using drills or ultrasonic devices cause aerosol release, thus, most often exposure to saliva (droplets, aerosols), blood, working position with patients, face to face communication can spread disease and also contaminates the dental clinical environment[1-6]. we have 99% risk to come in contact and spread as super spreader. covid -19 is creating immense psychosocial disturbances ,so every doctor should develop the skills needed to cope with the ongoing crisis.

Researchers suggests about three modes of transmission of COVID-19 infection already discussed in previous chapters in detail. [6]

The routes of transmission of covid -19 in dental practice



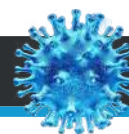
As there might be many asymptomatic carriers and we are not enough equipped to handle or diagnose impending respiratory infections and medical conditions and there is no availability of easy testing modalities which gives surety for safety one should follow all preventive measures in reducing the transmission of covid -19 as we know that **“prevention is always better than cure”** .. However, although we are following routine precautionary measures to reduce the transmission Covid-19 infections; there are some other armamentarium required for prevention of transmission of Covid-19 infection and those are the following. [1-6].

## I. Automatic hand sanitizer dispensers [7]:

Routinely, manually operated hand sanitizers were dispensed in dental clinical premises. In this type, the risk of contaminated surfaces that are frequently contacted in healthcare settings is a potential source of coronavirus transmission. Therefore, electrical operated with sensor attached Automatic Hand Sanitizer Dispensers is more advantageous in reducing the transmission of covid-19 infection.



**Fig :1 Automatic sanitizer dispenser** (courtesy : Internet)



## II. Non contact infra red thermal device [1-8]



**Fig :2 Non contact Infrared thermal device**  
(Courtesy : Internet)

Patient reporting to dental clinics may or may not exhibit the classic clinical features of Covid -19 infections, in both conditions the use of non- contact infrared thermometer helps to record the body temperature with maintaining a distance of 3 to 15 cm away from patient. The advantages of non-contact infrared thermometer are, most comfortable to patient and operator, in comparison with conventional thermometer, it does not come in contact with patient body, most commonly used in mass screening (2).

## III. N99 –(FFp3) face mask with (papr's) powered air purifying respirators [1,3,7,9]:

Generally the face mask used in routine practice is made up of three different protective layers. Innermost is absorbent layer, middle is filter layer and outermost is repeller or reflector layer. Innermost layer absorb wearer's nasal moisture contaminants and middle layer is made up of melt-blown material that acts as a filter, and the outer layer is made up of material that repels liquid.

Mask certification authority is not formed in India; hence, it is very difficult to retain its standards of manufacturing. However, in 1972, 3M introduced the first, single-use N95 mask, for industrial coal and oil workers. The outer layer was modified by using very thin layers of fibers by air-blasting melted polymer. They then added an electrostatic charge to the material in order to block very small particles.



**Fig :3 N -99 (FFP3) face mask** (courtesy :Internet)

N95 masks are also called as a respiratory mask and N99 is recent modified version of it. The filter N99 mask made up of millions of microfibers of polypropylene layered on top of each other that have been permanently electrostatically charged. The electrical charge is necessary to retain its ability to filter microorganisms or microparticles.

N95 means that this mask can filter off at least 95% of particles which are  $> 0.3$  Microns, while N99 means it can filter off 99% of these particles. The  $0.3\mu\text{m}$  cut off is used for measuring filtration efficacy because that is the most penetrating size into the lungs. The coronavirus is between  $0.06\text{--}0.14$  microns in diameter or  $60\text{--}140\text{nm}$ . Counterintuitively, viruses of this size are easier to filter than those that are  $>0.3$  microns, because these sized particles follow a Brownian motion (random zig zag) and therefore trap more easily into filters. N99, N100, FFP2, and FFP3 masks all filter the corona virus effectively.[3]

## Valve versus Non-valve N95, N99 Respirators

The valve N95 mask respiratory are not suitable for patients suffering with COVID-19 as during exhalation they will allow the virus to pass out easily and can potentially infect neighbouring people.

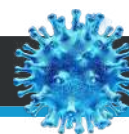
## IV. Triple protection gowns and face shields[2,3,6,8]:



**Fig : 4 Gowns and face shields** (courtesy : Internet )

Gowns are identified as the second-most-used piece of PPE, following gloves, in the healthcare setting. The Food and Drug Administration (FDA) defines isolation gowns as: “a gown intended to protect healthcare patients and personnel from the transfer of microorganisms, body fluids, and particulate material”. It is also specified that the isolation gown covers the torso and clothing, and poses a physical barrier to the transfer of microorganisms and other materials. Isolation gowns were made of 100% cotton or 50/50 cotton/polyester. The fabric used in manufacturing these gown mainly based on single use gown (Disposable) or multiple time use gown (re-usable).





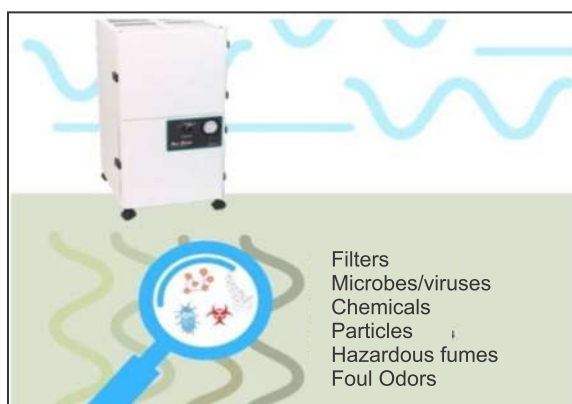
In disposable type, gowns are made of nonwoven materials which provide protection from liquid penetration. Whereas, Reusable isolation gowns are typically made of 100% cotton, 100% polyester, or polyester/cotton blends. These fabrics are tightly woven plain weave fabrics that are chemically finished and may be pressed through rollers to enhance the liquid barrier properties.

Woven and nonwoven are the two most commonly used fabric construction techniques for isolation gowns. Knitting technology is used generally for most of the reusable gown cuffs. The random orientation of the fibers in the nonwoven fabrics successfully reduces liquid transmission by (a) providing filtering media (b) reducing the capillary formation.

Triple layered protection gowns and head caps are recommended to prevent fomite based transmission. This is mandatory for the clinicians who perform aerosol generating procedures on patients with suspected or confirmed covid-19 cases and are advised to wear full face shields or visors not just eye protection. These protections should also be used whenever patient condition is unknown. Proper donning and doffing of PPE should be followed to prevent transmission of novel corona virus.

Most recent used triple layered gown is made of most commonly used nonwoven fabrics for isolation gowns are spunbond and spunbond/meltblown/spunbond technologies. Innermost layer is absorbent layer which absorbs body liquids of wearer's and middle layer is filter layer, which resistant to liquids and outmost layer is shiny, short fiber layer treated with anti-bacterial and resistant to liquids. However, both outer and middle layers are non-resistant to alcohol based liquids, may wet the gowns.

## V. HEPA filters [5,6,8]:



**Fig :5 HEPA filters** (courtesy : Internet)

High-efficiency particulate air (HEPA), also known as high-efficiency particulate absorbing and high-efficiency

particulate arrestance, is an efficiency standard of air filter. Filters meeting the HEPA standard must satisfy certain levels of efficiency. Common standards require that a HEPA air filter must remove—from the air that passes through—at least 99.95% (European Standard) or 99.97% (ASME, U.S. DOE) of particles whose diameter is equal to 0.3  $\mu\text{m}$ ; with the filtration efficiency increasing for particle diameters both less than and greater than 0.3  $\mu\text{m}$ .

HEPA filters are composed of a mat of randomly arranged fibres. The fibers are typically composed of fiberglass and possess diameters between 0.5 and 2.0 micrometers. Key factors affecting its functions are fiber diameter, filter thickness, and face velocity. The air space between HEPA filter fibers is typically much greater than 0.3  $\mu\text{m}$ .

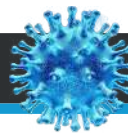
The common assumption that a HEPA filter acts like a sieve where particles smaller than the largest opening can pass through is incorrect and impractical. Unlike membrane filters at this pore size, where particles as wide as the largest opening or distance between fibers can not pass in between them at all, HEPA filters are designed to target much smaller pollutants and particles. The virus that causes covid-19 is approximately 0.125 microns in diameter. It falls squarely within the particle size range that HEPA filters capture with extraordinary efficiency: 0.01 microns and above. So in dental environments where there are more aerosol generating procedures are done, the droplets become aerosolised particles and this lie in a very fine mist in the air for a longer period. So these HEPA filters works best.

## VI. Arbat safety box for trauma care[12]



**Fig : 6 Arbat safety box** (courtesy : Internet)

Dr Sameer Arbat from Nagpur, India recently designed a safety box for performing difficult bronchoscopy procedures in suspected or confirmed COVID-19 patients. This is the first of its kind in the world, developed specifically for performing bronchoscopy in infected patients. The prototype developed by Dr Sameer was scrutinised by doctors from Italy, USA and India and its innovation has already gathered



international recognition.

Considering the difficulties that Italy is facing with the increased number of COVID-19 cases, the Italian Society of Pulmonologists broadcasted Dr Sameer Arbat's invention at an international webinar. Dr. Stefano Gasparini, one of the pioneers of bronchoscopy in the world and Ex- President of WCBIP, was chairing this broadcast and highlighted the importance of this invention and has named it the "Arbat Safety Box".

This box mainly helps in prevention of aerosol transmission from patient to doctors and other health care workers during surgical procedures. And this box can be easily disinfected and reusable.

## VII. Plasma Air Sterilizers[6,7,9,13]::



**Fig :7 Plasma air sterilizer** (courtesy : Internet )

One possibility for curbing the spread of airborne pathogens is a non-thermal plasma reactor. Plasma is the fourth state of matter, a gas composed of electrically charged ions and electrons rather than neutral atoms and molecules. Non-thermal means the plasma isn't formed at high temperatures University of Michigan, has developed a non-thermal plasma reactor that leaves airborne pathogens unable to infect host organisms, including people. The plasma oxidizes the viruses, which disables their mechanism for entering cells.

This means that the plasma didn't destroy the virus but rather altered its ability to infect. Plasma air sterilisers can be used and continuously run for air disinfection in an environment with human activity. So these can be used in office rooms and waiting rooms.

## VIII. Fogger Machine [10,13]



**Fig :8 Fogger machine** (courtesy : Internet )

A fog machine, fog generator, or smoke machine is a device that emits a dense vapour that appears similar to fog or smoke. This artificial fog is most commonly used in professional entertainment applications, but smaller, more affordable fog machines are becoming common for personal use.

Fog machines can also be found in use for a variety of industrial, training, and some military applications. Typically, fog is created by vaporizing proprietary water and glycol-based or glycerin-based fluids or through the atomization of mineral oil. This fluid (often referred to colloquially as fog juice) vaporizes or atomizes inside the fog machine. Upon exiting the fog machine and mixing with cooler outside air the vapour condenses, resulting in a thick visible fog.

Fogger machine with sodium hypochlorite can be used efficiently in sterilising the oftenly contacting surfaces like dental chairs, door hangers, tables, cloths. These can be repeated 2 to 3 times a day in clinic to minimise the transmission of covid -19 virus in a dental clinic.

## IX . Personal Protective Equipment:

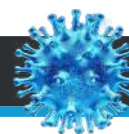
BASIC KIT 45GSM	MEDIUM KIT 70GSM	ADVANCED KIT FOR ICU 180GSM
		
WHO SHOULD USE		
All Housekeeping Staff Canteen Workers Administrative Staff Pharmacy Staff All Visitors	All OPD Staff Pathology Staff Radiology Staff Ambulance Staff Mortuary Staff OT Staff Patient's Attendants	Doctors in ICU Intensivists ICU Nursing Staff Housekeeping Staff Inside ICU All who are in Direct Contact with Positive Cases.

**Fig : 9 Personal protective equipment** (courtesy : Internet )

It is mandatory to use personal protective equipment in health care system to prevent transmission of covid -19. There are various PPE designs according to the level of protection needed.

## X. Hazmat suit:

Apart from current respiratory protocol for the aim of facial surgeons there is a level 2 hazmatsuit free from atmospheric air breathing to get protection from virus. This can be especially useful for the surgeons who deals with aerosol generating procedures and emergency dental treatment for COVID positive patients.



**Fig :10 Hazmatsuit** (courtesy : Internet )

### **XI. Teledentistry[11,13,15] :**

To some, teledentistry means searching the Web for information that might help a patient. To others, it is partaking of online continuing education courses. In reality, these two activities are actually Web surfing and distance learning. Teledentistry, on the other hand, is a combination of telecommunications and dentistry, involving the exchange of clinical information and images over remote distances for dental consultation and treatment planning.

The term “Teledentistry” was first used in 1997, when Cook defined it as “... the practice of using video-conferencing technologies to diagnose and provide advice about treatment over a distance.”

The initial concept of teledentistry developed as part of the blueprint for dental informatics, which was drafted at a 1989 conference funded by the Westinghouse Electronics Systems Group in Baltimore. Focus was on a discussion of how to apply dental informatics in dental practice to directly affect the delivery of oral healthcare.

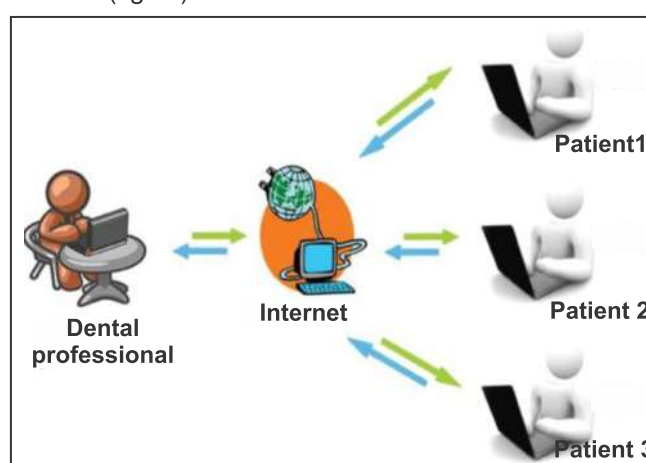
The birth of teledentistry as a subspecialist field of telemedicine can be linked to 1994 and a military project of the United States Army (U.S. Army's Total Dental Access Project), aiming to improve patient care, dental education, and effectuation of the communication between dentists and dental laboratories. This military project demonstrated that teledentistry reduced total patient care costs, extending dental care to distant and rural areas and offering complete information required for deeper analyses.

As technology has advanced, new opportunities for teledentistry have been created. Technologies currently available are beginning to change the dynamics of dental care delivery. Teledentistry will offer new opportunities to improve the level of patient care and reshape current business models.

Teledentistry will have to be put to optimal use in this

covid scenario. This will decrease the footfall in the dental practice and enable the dentists to decide when an operative intervention is necessary. Patients should be encouraged to seek online and telephonic consultation .We should exert our professional discretion and elective procedures at all costs to protect our community, our patients and ourselves.

Tele consultation through teledentistry can take place in either of the following ways – “Real-Time Consultation” and “Store-and Forward Method”. Real-Time Consultation involves a video conference in which dental professionals and their patients, at different locations, may see, hear, and communicate with one another (fig.11).



**Fig :11 Real time consultation**

Store-and-Forward Method involves the exchange of clinical information and static images collected and stored by the dental practitioner, who forwards them for consultation and treatment planning. The patient is not present during the consultation”(Fig.11).

Dentists can share patient information, radiographs, graphical representations of periodontal and hard tissues, therapies applied, lab results, tests, remarks, photographs, and other information transportable through multiple providers. This data sharing can be of extreme importance for patients, especially those in need of specialist consultation.



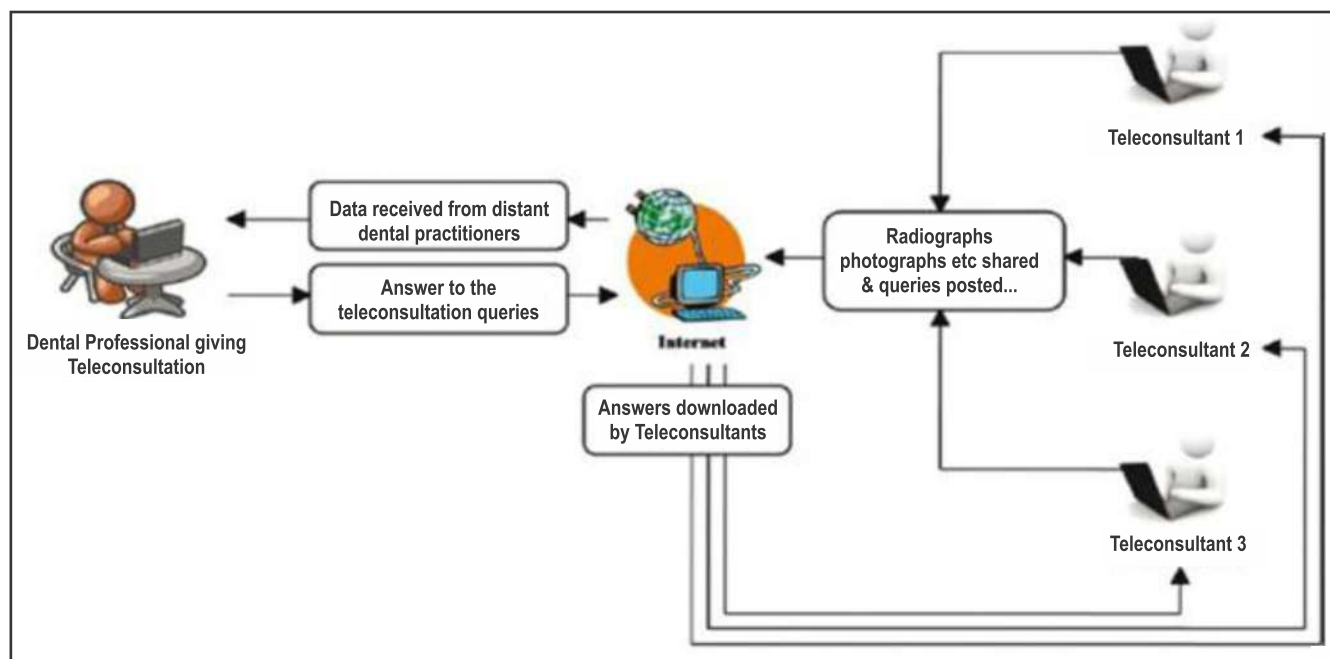
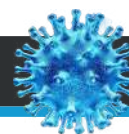


Fig :12 Store and forward method

#### References :

1. Wang, C., Horby, P. W., Hayden, F. G. & Gao, G. F. A novel coronavirus outbreak of global health concern. *Lancet* 395, 470–473 (2020).
2. Huang, C. et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *Lancet* 395, 497–506 (2020).
3. Chen, N. et al. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. *Lancet* 395, 507–513 (2020).
4. Chan, J. F.-W. et al. A familial cluster of pneumonia associated with the 2019 novel coronavirus indicating person-to-person transmission: a study of a family cluster. *Lancet* 395, 514–523 (2020).
5. To, K. K.-W. et al. Consistent detection of 2019 novel coronavirus in saliva. *Clin. Infect. Diseases* <https://doi.org/10.1093/cid/ciaa149> (2020).
6. Rutala WA, Weber DJ. A review of single-use and reusable gowns and drapes in healthcare. *Infection Control and Hospital Epidemiology*. 2001; 22(4):248–257.
7. Pissiotis CA, Komborozos V, Papoutsis C, Skrekas G. Factors that influence the effectiveness of surgical gowns in the operating theatre. *Eur J Surg*. 1997; 163:597–604.
8. Meyer KK, Beck WC. Gown-glove interface: A possible solution to the danger zone. *Infection Control and Hospital Epidemiology*. 1995 Aug; 16(8):488–490.
9. Li, X., Zai, J., Wang, X. & Li, Y. Potential of large 'first generation' human-to-human transmission of 2019-nCoV. *Journal of Medical Virology* (2020).
10. Wang, D. et al. Clinical characteristics of 138 hospitalized patients with 2019 novel coronavirus-infected pneumonia in Wuhan, China. *Jama* (2020).
11. Li, Q. et al. Early transmission dynamics in Wuhan, China, of novel coronavirus-infected pneumonia. *New England Journal of Medicine* (2020).
12. Zhu, N. et al. A novel coronavirus from patients with pneumonia in China, 2019. *New England Journal of Medicine* (2020).
13. Varughese S, Teschke K, Bauer M, Chow Y, van Netten C, Kennedy SM. Effects of theatrical smokes and fogs on respiratory health in the entertainment industry. *American Journal of Industrial Medicine*. 2005 May;47(5):411-8.
14. Clark GT. Teledentistry: What is it Now, and What Will it be Tomorrow? *J Calif Dent Assoc*. 2000;28:121–7.
15. Dasgupta A, Deb S. Telemedicine: A New Horizon in Public Health in India. *Indian J Community Med*. 2008;33:3–8

# GUIDELINES FOR THE FUNCTIONING OF DENTAL SETUP IN COVID 19

## I. Introduction

## II. Clinical Design

- a) Waiting area
- b) Operating area
- c) Changing area

## III. Patient Records

- a) Demographics data
- b) Covid-19 history

## IV. Covid-19 Consent

- a) Reason for COVID-19 consent

## V. Algorithm for clinical decision making

## VI. Patient declipline

## VII. Waiting area protocol

### I. Introduction:

As Covid-19 has altered the life style all over the globe even we as dental surgeons have to alter our protocols for protection of our patients, to prevent spread of COVID-19 and protect ourselves.

“Social Distancing is Key”

The dental professional is particularly at risk if one is working on an infected patient or an asymptomatic carrier because of close contact with the patient and the risk of blood, saliva and droplet exposure.[1] In Italy, there were 7 dental professionals who died of COVID-19 during the pandemic.

Even general population has started to develop a dilemma to visit dental clinics as they fear of acquiring infection. There are certain measures which we can apply in our clinical setup to provide better care and fulfil the need of hour.

1. Reduced number of staff at all times . The members can follow a rotation posting to avoid unnecessary exposure.
2. No intraoral xrays. Prefer panoramic view (OPG) if at all required.
3. Wear mask and gloves at all times in the clinic or department except for eating.
4. Minimum use of cell phones during the working hours. Use plastic sheets to cover as cell phone is the most common device to harbour fomites and contaminants.
5. All surfaces of dental chair to be disinfected with appropriate disinfectant ( 70% alcohol/ 0.5% hydrogen peroxide/ 0.1% sodium hypochlorite) after OPD of every patient.
6. Use of high volume suction near the OPD chair for suctioning of saliva directly from patient's mouth

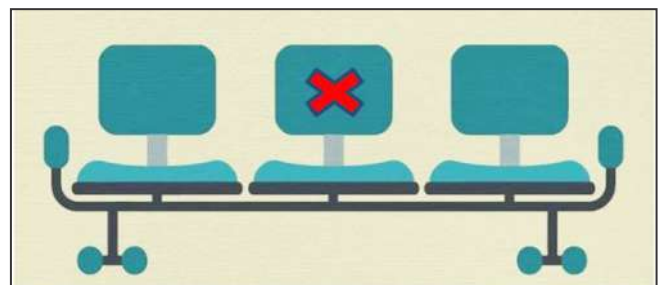
instead of allowing patient to spit in the spittoon or basin of dental chair.

7. Patients to be positioned on the dental chairs in such a way so that they are at a distance from operator's face.

We will be providing guidelines regarding these measures in the following part of chapter.

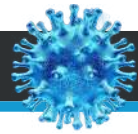
### II. Clinical Design:

#### a) Waiting Area



**Fig.1 Markings on Chairs in waiting area to maintain Social Distancing**

- 1) Patient waiting area to be spacious and arrangements of chairs to be made following the norms of Social Distancing.
- 2) Fomite bearing articles like magazines to be removed from waiting area.
- 3) Only patient to be allowed in waiting area.
- 4) Commonly touched surfaces like door knobs, reception tables, chair handles to be sprayed regularly by auxiliary staff with sodium hypochlorite.
- 5) An arrangement of hand hygiene practice (Sensor based Sanitizer dispenser) to be kept at entry of waiting area.
- 6) 1 staff with Infrared Thermal Scanner at the entry of waiting area for thermal scanning.



- 7) Covid-19 awareness signage provided by MOHFW of India to be printed and pasted in waiting area.[2]
- 8) Pens, record books and appointment books to be kept in a closed formalin chamber to keep it free from any contaminants.



Fig 2. Signage provided by MOHFW of India



Fig 3. Signage provided by MOHFW of India

#### b) Operating Area

- 1) Operating area should be spacious with windows/vents for air circulation.
- 2) Only equipment\material to be used at that point of time to be kept outside.
- 3) Keep all extra equipment in storage area.
- 4) Cover all fomite bearing surfaces like x-ray viewer, computers, pulseoxymeters, micromotor, scaling unit with plastic sheets.
- 5) Remove all text books, models from operatory.[3]
- 6) All the bins with respective biomedical color coding to be filled with diluted sodium hypochlorite.
- 7) 3 staff to be present in operatory with complete

PPE(6 hand dentistry) [4]

- 8) 2 staff to perform procedure and one to act as runner and to help maintain disinfection protocol

#### c) Changing Area

- 1) Changing area to change from personal clothing to Surgical Scrubs.
- 2) Doffing area where PPE and Surgical Gown can be removed and immersed in disinfectant solution or disposed of as per recommendation.
- 3) Provision of hand hygiene to be present in doffing area.

#### III. Patient Records:

##### a) Demographic Data

Social Distancing ,testing and contact tracing is the crux to control Covid-19 pandemic.

So as health care providers its our duty to help the government of India in contact tracing so maintaining record of every person visiting to our health care facility is our responsibility

Following is the proforma for patient records to be maintained

Name of Patient : .....  
 Age/Gender: .....  
 Address : .....  
 Contact Number : .....  
 Date and Time : .....  
 Doctor on Duty : .....  
 Clinic Staffs on Duty : .....

##### b) Covid-19 History

With the emergence of COVID-19 virus, many uncertainties remain for dental fraternity about carrying out dental practice and preventing transmission of COVID19 from because of their health care facility.[5]

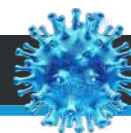
##### Covid-19 History Proforma

Name of patient : .....  
 Age/Sex : .....  
 Name of Doctor : .....

**1. Have you or any of your family member have traveled to any of these locations in last 1 month?**

- Foreign Travel : .....
- Domestic Travel : .....





- Social Gathering : .....
- 2. Have you had contact with anyone with confirmed COVID-19 in the last 1 month?**  
Yes/No
- 3. Have you or anyone in your family had any of these symptoms in the last 1 month?**
  - 1) Fever
  - 2) Difficulty breathing
  - 3) Cough, Sneezing
- 4. Any other necessary information**

#### IV. Covid-19 Consent:

As the Indian Penal Code put Doctor-Patient relation under Consumer Protection Act for us being health care providers we have to protect ourselves from virus as well as medico-legal issues. Although informed consent about any procedure is still mandatory an additional covid19 consent to be procured and kept in records

##### a) Reason for COVID19 Consent:

- 1) Patient may acquire infection while travelling to and fro from the dental clinic
- 2) Patient can hide travel history/history of exposure to positive case hence a written consent instills a sense of seriousness about situation.
- 3) Even after all the precautionary measures by the health care staff as we are facing a global pandemic and virus being droplet borne there can be a transmission from dental setup and patient has to be preinformed about the risk.

Hence we provide a template that how COVID19 consent should be and similar consent form to be made available in every dental operatory.

#### Department Of OMFS, GDCH Nagpur Covid-19 Consent

Date- / / Time-

I..... (name of patient) aged.....and resident of .....have been explained this consent in language I understand.....(Language Name) and I have come to Department of OMFS, GDCH, Nagpur for treatment of my illness with my own will and I declare that I understand the additional risks and limitations due to unusual situation secondary to Corona Virus-19 disease.

I understand WHO has declared COVID-19 as global

pandemic and I know the risk of spread of infection and hospital staff are taking all measures in action to prevent transmission.

I understand that I or any of my companion can get corona virus infection while travelling to and from home to hospitals and hospital staff are taking all measures to minimize visits and providing telemedicine support.

I am fully aware that even after all preventive measures during my visit to hospital, Indoor stay at hospital or during treatment I can get covid19 infection and I cannot hold any doctor, worker or hospital liable for this.

I was given a COVID19 questionere and I have disclosed all the information to best of my knowledge and no details have been left undisclosed. I am also liable to legal actions if I have not shared any information allegedly.

I agree to the fact that due to unusual situation secondary to pandemic only life saving measures/essential elective treatment will be provided and alternative therapy can be used. I will agree with the advise given by the department.

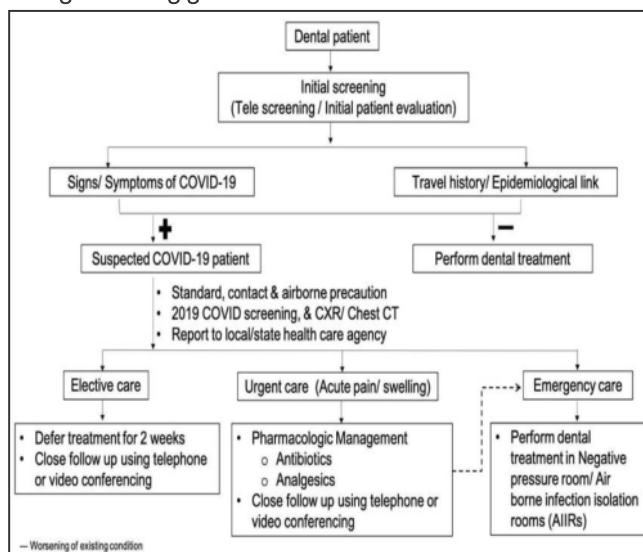
I have completely understood the information in this consent and I agree to cooperate with the hospital staff for same and I am above 18 years, in sound mind and without any fear, threat or false misconception.

**Patients**                      **Relative**  
**Signature.....**              **Signature.....**

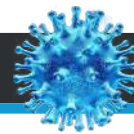
**Fig 4. Template of consent to be signed by patient and relatives**

#### V. Algorithm for Clinical Decision Making :

Decision making in the clinical practice can be done using following guidelines.



**Fig 5. Algorithm for Clinical Decision Making**



## VI. Patient Discipline:

### ***“Patient Discipline is as important as Health Care Professional Discipline”***

Patient needs to follow certain guidelines to procure utmost care with complete safety. Following are the guidelines which every health care professional should make sure that every patient reporting to his facility is following.

- 1) All patients should visit dental clinic only after telecommunication with the doctor.
- 2) Only patient to visit the clinic unless age, physical/mental morbidity demands so.
- 3) Every patient and relative to wear mask while visiting Clinic **“No mask, No entry”**
- 4) Every patient to perform hand hygiene measures before entering the clinic.
- 5) Patient to follow all post operative instructions strictly
- 6) Recall and follow-up will be done only through telemedicine.
- 7) **STRICT EXECUTION OF SOCIAL DISTANCING NORMS.**

## VII. Waiting Area Protocol :

- 1) Appointment based practice
- 2) Use teledentistry in initial screening on "any virtual online platform"
- 3) In between two appointments 15-20 mins time for preparation
- 4) Ask patients to wait in their cars before they report to dental operatory

## References:-

- 1) ADA Interim Guidance for Minimizing Risk of COVID-19 Transmission
- 2) Covid-19 Guidelines Ministry of Health and Family Welfare of India.
- 3) AO CMF International Task Force Recommendations on Best Practices for Maxillofacial Procedures during COVID-19 Pandemic
- 4) S. Lei et al., Clinical characteristics and outcomes of patients undergoing surgeries during the incubation period of COVID-19 infection, E Clinical Medicine (2020), <https://doi.org/10.1016/j.eclinm.2020.100331>
- 5) ISOI Guidelines for Dental Practitioners During COVID-19 Pandemic
- 6) Link from AIIMS for Covid Prevention, Precautions, Handling and Treatment Must for every medical practitioner \* [https://youtu.be/BTLGGV3\\_XnI](https://youtu.be/BTLGGV3_XnI)
- 7) LIFE AFTER COVID-19 FOR DENTAL PROFESSIONALS AND THEIR PATIENTS (Indian Perspective)

# GUIDELINES FOR PREPARATION OF DENTAL OPERATORY

- I. Introduction
- II. Cleaning Procedure
- III. Preparation of Operatory
- IV. Preparation of Dental chair and Instruments
- V. Biomedical Waste Management

## I. Introduction

Dental operatory is also a surgical operatory and utmost infection control has always been necessary for a safe and successful dental practice. Covid-19 is a highly contagious disease and such difficult times calls for stringent steps beyond our universal protocol. Dental operatory has high saliva contamination hence a very target oriented disinfection and sterilization protocol is required to protect the our selves, patients and the community. In this chapter we outline the guidelines for preparation of dental operatory as well as postoperative disinfection and waste management.

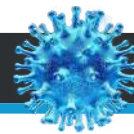
## II. Cleaning Procedure

Due to the potential survival of the virus in the environment for several days, the premises and areas

potentially contaminated with the 2019-nCoV should be cleaned before their re-use, using products containing antimicrobial agents known to be effective against corona viruses. Although there is lack of specific evidence for their effectiveness against 2019-nCoV virus, cleaning with water and household detergents and use of common disinfectant products should be sufficient for general precautionary cleaning. Tests carried out using SARS-CoV showed that sodium hypochlorite is effective. These guidelines provide guidance for environmental cleaning in dental clinic and have been adapted based on the Hospital Infection Prevention and Control guidelines drafted by NCDC in collaboration with WHO.

Area	Item/Equipment	Process	Method/ procedure
General clinical areas	Dust mops Mop (No broom will be used for sweeping)	Sweeping Cleaning Daily mopping	1.Sweep with the dust mop or damp mop to remove surface dust. 2.Sweep under the furniture and remove dust from corners. 3.Gathered dust must be removed using a hearth brush and shovel. 4.The sweep tool should be cleaned or replaced after use
Floors (clinical areas) – daily mopping	Detergent/ sanitizer –hot water, sodium hypochlorite(1%) Three buckets (one with plain water and one with detergent solution; one bucket for sodium hypochlorite(1%) ACC approved Commercially available products can be used. Eg-ASEPTICARE TB+II, Aviation RTU ,BAC - BioCide 100 (Refer to Guidelines by American Council of Chemistry For Further Knowledge)		<ul style="list-style-type: none"> <li>• Prepare cleaning solution using detergent with warm water</li> <li>• Use the three-bucket technique for mopping the floor, one bucket with plain water and one with the detergent solution .</li> <li>• First mop the area with the warm water and detergent solution.</li> <li>• After mopping clean the mop in plain water and squeeze it.</li> <li>• Repeat this procedure for the remaining area.</li> <li>• Mop area again using sodium hypochlorite 1% after drying the area.</li> <li>• In between mopping if solution or water is dirty change it frequently.</li> <li>• Mop the floor starting at the far corner of the room and work towards the door.</li> <li>• Clean articles between cleaning.</li> </ul> <p>Note: Mopping should be done twice daily</p>





Ceiling and Walls	Sweeping tool Duster Bowl/ small bucket of soap solution Plain water	Damp dusting	<ul style="list-style-type: none"> <li>• Dampdusting with a long handled tool for the walls and ceiling done with very little moisture, just enough to collect the dust.</li> <li>• Damp dusting should be done in straight lines that overlap one another.</li> <li>• Change the mop head/cover when soiled. Note: Should be done once a week or after examining a suspect case</li> </ul>
		Hot water Detergent Sodium hypochlorite 1%	<ul style="list-style-type: none"> <li>• Clean with hot water and detergent solution, disinfect it with sodium hypochlorite and keep for drying upsidedown.</li> </ul>
Doors and door knobs	Damp cloth or Sponge squeeze mop Detergent	Thorough washing	<p>The doors are to be washed with a brush, using detergent and water once a week (on one defined day); gently apply cloth to soiled area, taking care not to remove paint, then wipe with warm water to remove excess cleaning agent.</p> <ul style="list-style-type: none"> <li>• Door knobs and other frequently touched surfaces should be cleaned daily</li> </ul>
Tables/Trolleys/Plaster Area	Sodium hypochlorite (1%) Rag piece Absorbent paper Unsterile gloves Spill care kit Mop Hot water		<p>Wear non-sterile gloves.</p> <ul style="list-style-type: none"> <li>• For large spills, cover with absorbent paper/ rag piece</li> <li>• if any broken glass and sharps, using a pair of forceps and gloves, carefully retrieve.</li> </ul> <p>Use a large amount of folded absorbent paper to collect small glass splinters. Place the broken items into the puncture proof sharps container.</p> <ul style="list-style-type: none"> <li>• Cover the spill with sodium hypochlorite(1%)for 10 –20 minutes contact time.</li> <li>• Clean up spill and discard into infectious waste bin, and mop area with soap and hot water.</li> <li>• Clean the mop and mop area with 1% sodium hypochlorite. • Wash mop with detergent and hot water and allow it to dry.</li> </ul>
	Care of mop	Hot water Detergent Sodium hypochlorite 1%	<ul style="list-style-type: none"> <li>• Clean with hot water and detergent solution, disinfect it with sodium hypochlorite and keep for drying upside down.</li> </ul>

### III. Preparation of operatory

Joseph Lister first introduced use of disinfectant spray using carbolic acid to reduce microbial load in operation theatre.

**a) Fumigation-**Fumigation is a process of gaseous sterilisation which is used for killing of micro-organisms and prevention of microbial growth in air, surface of wall or floor.

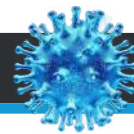
Fumigation can be done using several agents like Formaldehyde, phosphine, 1,3-dichloropropene, chloropicrin, methyl isocyanate, hydrogen cyanide.

Formaldehyde being most commonly used will be discussed in detail.

#### i) Fumigation Method-

1) Electric Boiler Fumigation Method-For Each 1000 cu.ft 500ml of formaldehyde added in 1000ml of water in an electric boiler. Switch on the boiler, leave the room and seal the door. After 45 minutes switch off the boiler without entering in to the room.

2) Potassium Permanganate Method: For every 1000 cubic feet add 450gm of Potassium



permanganate (KMnO<sub>4</sub>) to 500 ml of formaldehyde. Take about 5 to 8 bowls with equally divided parts of formaldehyde and add equally divided KMnO<sub>4</sub> to each bowl. This will cause auto boiling and generate fume.

**Neutralise residual formalin gas with Ammonia by exposing 250ml of Ammonia per litre of Formaldehyde used.**

**b) Fogging-**Foggers generate a fog or mist formed by Ultra low Volume (ULV) uniform sub-micron size liquid particles (Dry Fog). Various chemicals are used for fogging procedure like Glucoprotamine, Glutaraldehyde, Hydrogen Peroxide + Silver Nitrate. Fogging is done using an equipment called fogger.

i) Fogging Protocol-Twice daily in afternoon and After Last Patient Operated  
Operatory can be used after 20 mins of fogging.



**Fig 1-Fogger**

### c)Surface Disinfection In Operatory

- 1) The following products are effective for disinfection of hard, non-porous surfaces:
  - A 10% diluted bleach solution, an alcohol solution with at least 70% alcohol,
  - Prepare a 10% diluted bleach solution by doing the following:
    - o Mix five tablespoons of bleach per gallon of water.
    - o After application, allow 2 minutes of contact time before wiping, or allow to air dry (without wiping). V
- 2) For soft (porous) surfaces such as carpeted floor, rugs, and drapes:
  - Remove visible contamination (if present) and clean with appropriate cleaners indicated for use on these surfaces.
  - After cleaning, launder items (as appropriate) in accordance with the manufacturer's instructions. If possible, launder items using the warmest appropriate water setting for the items and dry items completely.

- If laundering is not possible, use an Sodium Hypochlorite Spray Every day on it.
- Commercially available preparation of ethanol and propanol. Eg-Bacillol 25(25 seconds action on microorganism)



**Fig 2 –Bacillol 25 Disinfecting Spray**

### IV. Preparation of Dental chair and Instruments

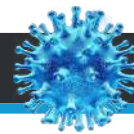


**Fig.3-Contaminated Zones Of Dental Chair**

### a) Dental Chair



**Figure 4- Parts Of Dental Chair to Be Covered With Plastic Sheets**



**Fig 5-Dental Chair Light to be Covered with Plastic**

1. Cover the following items with PLASTIC BAGS of appropriate size (large, small) if they will be touched at any time during treatment.
  - The unit is bagged with a large bag (Don't bag the handpieces), and tied loosely at the side.
  - The chair back is bagged with a large bag.
  - The arm that holds the suction is covered with a small sheath.
2. Cover the following items with PLASTIC WRAP (cover all strips) if they will be touched at any time during treatment.
  - Light handle(s)
  - Light switch(es)
  - X-ray viewer box light switch
  - The adjustment handle under the seat of the operator chair
3. No bags or cover all strips are needed on the arms of the dental unit or the hoses.  
*(Any surface (horizontal or vertical) within three feet of the patient's mouth is considered contaminated after providing treatment that produces aerosols or splatter. Covering surfaces with impermeable barriers eliminates the need for disinfection of these surfaces after each treatment. Surfaces that are difficult to clean must be covered or wrapped with barriers such as impervious paper, clear plastic film, or bags.)*

**b) Sterility of Instruments**

All instruments to be immersed in Sodium Hypochlorite+Detergent Solution for 24 hours and then transferred to Ultra sonic cleaner next day.



**Fig 6- UltraSonic Cleaner**

All Instrument packaging should be done in a clean and low contamination area, using FDA approved products:

- Sterilization pouch
- Sterilization wrap
- Sterilization container



**Fig 7- Packaging Of Instruments**

All instruments used in the mouth MUST have been sterilized or must be single-use, disposable. Instruments penetrating tissue must be sterile. "Cold sterilization" is not an acceptable method for general-purpose sterilization.

High-speed handpieces, nose cones, contra angles, low-speed motors, motor-to-angle adapters, reusable prophylaxis angles and all other dental instruments must be autoclaved before use in the mouth.

**Three major factors for effective autoclave:**



**Pressure: 15psi**



**Temperature: 121 deg C**



**Time: 30 mins**

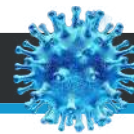
**Fig.8-Autoclaving Protocol**

*(Blood, saliva, or gingival fluid may contaminate the exterior and interior of the handpiece and only heat treatment can assure the killing of all microbial contaminants.)*

**c) High-Speed Evacuation System**

High-speed evacuation should be used when using the high-speed handpiece, three-way syringe, ultrasonic scaler, or whenever a procedure could cause splatter.





(Appropriate use of the high-speed evacuation system has been shown to reduce splatter and aerosol.)

#### d) Dropped Instruments

An instrument that is dropped must not be picked up and reused.

If the instrument is essential for the procedure, either it must be sterilized or a sterilized replacement instrument must be obtained.

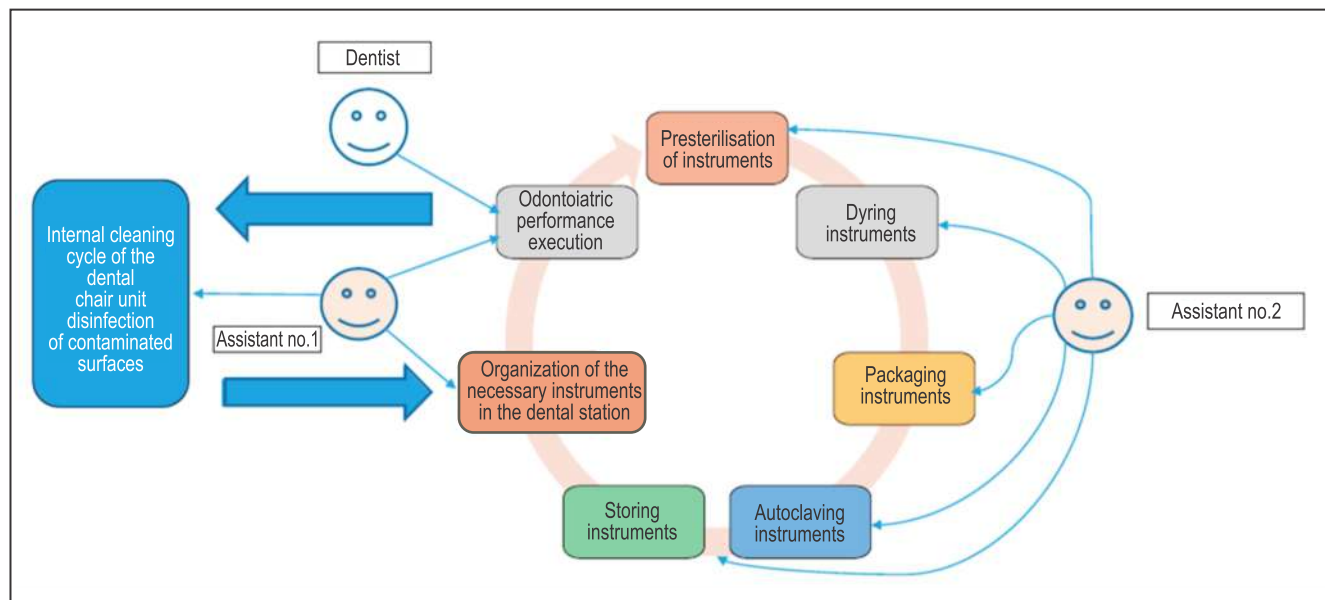


Fig 9-Sterilisation and disinfection cycle of dental instruments and dental station

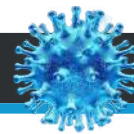
#### e) Cleanup of Operatory after Treatment

##### After Patient Treatment

**SHARP WASTE IS EXTREMELY HAZARDOUS. HANDLE IT WITH GREAT CAUTION.**

Following patient treatment, use the following protocol, in the order given, for cleaning-up:

1. Remove gloves.  
Remove the first glove by grasping it at the base of the palm with the other hand and pulling it off. Place the first glove into the palm of the gloved hand and close your fingers around it. Then slide the fingers of the ungloved hand, palm to palm, into the opening of the second glove, palm to wrist. Push your hand forward inside the glove until the glove pops off the palm of the second hand. Grasp the inside surface of the glove and pull it completely off. At no time should you touch the outside of either glove with your bare hands. Dispose of gloves in regular trash.
2. Wash your hands immediately.
3. Dismiss the patient.
4. Put on heavy-duty, nitrile rubber gloves.  
(Nitrile rubber is more puncture resistant than latex. Nitrile gloves may not prevent a puncture in your skin but they may prevent blood or other contamination on the instrument from entering the wound.)
5. Discard needles and any disposable sharp instruments (e.g. scalpel blades, suture needles, broken instruments, used burs, wires, and any item that could puncture skin) into the rigid biohazard (sharps) container at your unit. Use forceps to pick up these items. Be sure you can see the opening to the container as you drop the sharp into it. Sharps containers must remain on the unit countertop where they are readily visible and within horizontal reach of the user.
6. Hold the high-speed handpiece over the high-speed evacuator and activate the handpiece water line and air line (bur in) for 30 seconds before removing the handpiece.
7. Place handpieces into the transportation cassette and place them to the side.
8. Place all the dental instruments back into their cassettes in the correct order, removing all the blood and debris.
9. Disinfect all portable equipment and supplies with Cavicide disinfectant as follows: **SPRAY** with Cavicide disinfectant and **WIPE** clean of visible debris using paper towel. Then **SPRAY** again with Cavicide and **KEPT MOIST for at least 5 minutes**.
10. Remove un-used dental instruments from the sterilization pouch.
11. Return the dental instruments, handpieces and bur cassettes to sterilization.
12. If the sterilization window is closed, place all dental instruments, handpieces and bur cassettes in a



large plastic bag. Do not contaminate the outside of the bag. Store bag in your locker overnight and promptly return instruments in the morning.

13. Return portable equipment to the supply room.
14. Remove ALL barriers, one at a time, from the unit and any portable equipment and discard into the plastic waste bag. When all barriers are removed, place the waste bag in a rigid waste receptacle. Avoid touching the contaminated side (outside) of the barriers against any clean surfaces.

15. Any surface which is visibly contaminated with blood and all surfaces within 3 a feet radius of the patient's mouth that were not covered during patient treatment, including cabinet doors, all hoses, and portable equipment that has become contaminated, must be **SPRAYED** with Cavicide disinfectant, **WIPE** clean of visible debris, and then **SPRAYED** with Cavicide and **KEPT MOIST for at least 5 minutes**.

*All surfaces within a 3 feet radius of the patient's mouth are considered contaminated and are treated as clinical contact surfaces. All disinfectants take time to act—often 5 minutes or more. Using them on surfaces as you would use a furniture polish will not achieve disinfection. The surface must be wetted and it must remain wet for the full length of time required.*

16. Discard the paper towels and napkins.
17. Flush all vacuum lines with tap water to prevent drying of blood and debris in the lines.
18. Place the Cavicide spray bottle in the cabinet under the sink.
19. Remove gloves and discard.
20. Wash hands.
21. Remove facemask by grasping its elastic band at a point behind your head and bring the band over the top of your head. If the mask has ties, untie them. Do not allow the outside of the mask to come in contact with any skin. The mask must NEVER be left dangling from the neck, hanging from an ear or sitting on the chin.
22. Remove safety glasses or face shield by using two hands to grasp the earpieces just in front of the ear and lifting them off. Remove face shields by grasping behind the head, if it is the style that has a band encircling the head, or in a manner similar to safety glasses.
23. Wash safety glasses in the sink, rinse, and spray with the Cavicide disinfectant. Keep glasses moist with disinfectant for at least 5 minutes. Rinse and dry. If using magnifying loops then follow the manufacturers' recommendations on the types of disinfectant compatible with their lenses.
24. While wearing gloves, wash safety glasses or face shield with regular soap and water and rinse well. Disinfect by spraying with Cavicide disinfectant and keeping the surfaces wet with the disinfectant for 5 minutes. Rinse and set aside to dry. Remove and dispose of gloves and wash hands.

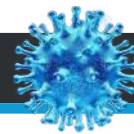
25. Remove head covering by grasping it at the back of the head and remove by bringing your hand over the top of your head.
26. Remove gown such that your hands do not touch the contaminated outside. Remove gown carefully and then roll it in on itself so that the inside becomes the outside. Place soiled gown in proper receptacle.
27. Wash hands.
28. If you leave the clinic area<sup>1</sup> any time after beginning treatment of a patient, all personal protective equipment must be removed; i.e., gloves, mask, safety glasses or face shield, and head covering, and clinic gown.

#### f) Cleanup at the End of the Day

1. Using heavy-duty, nitrile rubber gloves and Cavicide disinfectant, clean all operator items and surfaces. This includes the dental chair, unit pedestal and arms, power module, and light post. Wipe the smooth surfaces with a paper towel and the irregular surfaces with a clean hand brush or denture brush.
2. Disinfect all surfaces by liberally spraying them with Cavicide disinfectant. Avoid aiming the spray directly at any control switches on the chair or light as a short circuit may result. Surfaces must remain wet for a minimum of 3 minutes.
3. Make sure the handpieces have been removed from the tubings and then purge the unit of water as follows. Hold the handpiecetubings and syringe over a sink, basin, bucket or high speed evacuation. Operate the dental unit's handpiece flush valve and syringe until all of the water has been purged from the unit. After purging with the flush valve, operate the foot control to purge any remaining water from the unit's control blocks.
4. Before removing the nitrile utility gloves, wash them just as you would wash your hands, and then dry them with paper towels. They can then be removed in a normal manner.
5. If gloves exhibit any signs of deterioration, replace them.
6. The power module, all surfaces of the operator, and the sink must be left clean after patient treatment. No charts, paper towels, or other items may be left at the operator. No items may be placed on the top of the operator except and plastic wrap.
7. In order to permit adequate floor cleaning by the housekeeping staff, hoses must not be left on the floor, the chair must be raised to its highest position, and the foot controller placed on a paper towel on the seat.

#### g) Storage and Transport of Contaminated Items

If items such as models, dies, and bite registrations become contaminated, they are to be sprayed with sodium hypochlorite disinfectant, left wet for 5 minutes, rinsed, and placed into a clean container.



Disposable containers must be used for one patient only and then discarded.

#### h) Disinfection of Hard Surfaces

Surface disinfection is done using the sodium hypochlorite disinfectant.

**Glutaraldehyde based compounds should not be used for surface disinfection due to their potential toxicity!**

1. Clean the surface using the sodium hypochlorite and paper towels.
2. Spray the surface liberally with the sodium hypochlorite and make sure it remains moist for at least 5 minutes.
3. Dry the surface with paper towels or allow it to air dry.

#### i) Disinfection of Equipment

Glutaraldehyde or Cavicide is used for the disinfection of instruments and equipment that cannot be sterilized or will not penetrate tissues.

Heavy-duty, nitrile rubber gloves and protective eyewear or face shields must be worn when mixing and/or using chemical sterilants or disinfectants.

**GLUTARALDEHYDE CAN CAUSE BLINDNESS AND SKIN SENSITIVITY and THE VAPOR IS TOXIC.**

**Note: With the availability of heat resistant products the use of chemical sterilization should not need to be utilized in the College of Dentistry.**

1. Put on a pair of heavy-duty, nitrile rubber gloves and protective eyewear.
2. Clean and dry all instruments to be disinfected.
3. Immerse them for at least **5 minutes** in the glutaraldehyde or Cavicide solution. It is important to use the basket to immerse items in order to avoid hazardous splatter that occurs when items are dropped into the solution. **Timing begins when the last item is added to the solution.**  
*When an item is added to the solution, the solution and everything in it become contaminated. Therefore, timing begins each time an item is added. Disinfection of DIRTY items will take much longer and complete disinfection may not be achieved. Therefore, soaking dirty items in disinfectant will reduce the hazard present during the later cleaning of these items, but they must NOT be considered disinfected.*
4. Following disinfection, items must be rinsed with water, dried, and stored in a manner such that they will not become contaminated.

#### j) Miscellaneous Equipment

Various clinic materials need to be sterilized, disinfected or disposed. The following table indicates the treatment for these items.

ITEM	STERILISE	DISINFECT	DISPOSE
Air-Water Syringe	+	+	
Air-Water Syringe tip	+(metal)		+(plastic)
Anesthetic Syringe			+
Glass Slab	+		
Hand Instruments	+		
Handpieces	+		
Impression Trays-Metal	+		
Impression Trays-Plastic, Custom Acrylic			+

#### V) Biomedical Waste Management

Follow guidelines as per Bio-Medical Waste Management Rules 2016, amended 2018 & 2019

##### a) Segregation, packaging, transportation and storage

- Untreated bio-medical waste should not be mixed with other wastes
- Bio-medical waste shall be segregated into containers or bags at point of generation (as per BMWM Rules 2016)
- Bio-medical waste containers or bags should be prominently labelled with biohazard symbol (and other details as per Rules)
- Untreated bio-medical waste must not be stored >48 hrs Ensure no spillage occurs during handling and transit of biomedical waste.

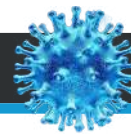
##### b) Categories for Bio-medical Waste Management

Category	Type of bag/container	Type of waste	Treatment disposal options
Yellow	Non chlorinated colour coded bags in coloured bins  Separate collection system leading to ETP	<ul style="list-style-type: none"> <li>• Human anatomical waste</li> <li>• Animal anatomical waste</li> <li>• Soiled waste</li> <li>• Expired or discarded medicines</li> <li>• Chemical waste</li> <li>• Micro, biotech &amp; clinical lab waste</li> <li>• Chemical liquid waste</li> </ul>	Incineration/deep burial
Red	Non chlorinated plastic bags in coloured bins/containers	Contaminated waste (recyclable) tubing, bottles, urine bags, syringes (without needles) and gloves	Auto/micro/hydro and then sent to recycling
White	Translucent, puncture, leak & tamper proof	Waste sharps including metals	Auto/dry heat sterilization followed by shredding /mutilation/encapsulation
Blue	Water proof card board boxes/containers	Glassware waste	Disinfection or auto/micro /hydro then sent to recycling

##### c) Labelling of Bags and Container

Bio-medical waste containers or bags should be prominently labelled with biohazard symbol (and other details as per Rules)





<p><b>BIOHAZARD SYMBOL</b> जैविक परिसंकट चिन्ह</p>  <p><b>BIOHAZARD</b> जैविक परिसंकट</p>	<p align="center">Schedule-IV Label for Transportation of Bio-Medical Waste Containers / Baes</p>	
	<ul style="list-style-type: none"> <li>Waste category No.</li> <li>Waste class</li> <li>Waste description</li> <li>Sender's Name &amp; Address</li> <li>Phone No. ....</li> <li>Telex No. ....</li> <li>Fax No. ....</li> <li>Contact Person .....</li> </ul>	<ul style="list-style-type: none"> <li>Day ----- Month -----</li> <li>Year -----</li> <li>Date of generation-----</li> <li>Receiver's Name &amp; Address</li> <li>Phone No. ....</li> <li>Telex No. ....</li> <li>Fax No. ....</li> <li>Contact Person .....</li> </ul>
<p align="center"><b><u>In Case of Emergency, Please Contact:</u></b></p> <ul style="list-style-type: none"> <li>Name &amp; Address</li> <li>Phone No.</li> </ul>		

**Fig.10-Template for labelling of Biomedical Waste**

#### REFERENCES-

1. UIC college of dentistry infection control manual infection control procedures in the operatory section 6
2. A. K. Condrin, "Disinfection and sterilization in dentistry," *Texas Dental Journal*, vol. 131, no. 8, pp. 604–608, 2014.
3. A. S. Chidambaranathan and M. Balasubramanium, "Comprehensive review and comparison of the disinfection techniques currently available in the literature," *Journal of Prosthodontics*, pp. 1–8, 2017.
4. CDC. Recommended infection-control practices for dentistry. MMWR 1986;35:237–42.
5. CDC. Recommended infection-control practices for dentistry, 1993. MMWR 1993;42(No. RR-8).
6. Guidelines for disinfection of quarantine facility (for COVID-19)-NCDC
7. COVID-19 PREVENTION: ENHANCED CLEANING AND DISINFECTION PROTOCOLS-206.543.726 www.ehs.washington.edu
8. National Training Of Trainers For Covid-19-MOHFW

# GUIDELINES FOR DENTAL HEALTH CARE PROVIDERS

## I. Introduction

## II. Classifying Worker Exposure to SARS-CoV-2 (OSHA)

- Very high exposure risk
- High exposure risk
- Medium exposure risk
- Low exposure risk

## III. Interim guidelines to be followed by the dental practitioners and auxiliaries

- Before starting the dental procedure
- During the dental procedure
- After the dental procedure

## IV. Rational use of Personal Protective Equipments

## V. Sequence for Donning & Doffing of PPE

### I. Introduction :

Dentists, dental clinic auxiliaries and dental patients can be exposed to viruses and bacteria that infect or are spread through oral cavity, saliva and respiratory tract. Dental care setups are always at risk of COVID-19 infection and its spread as our procedures involve face to face communication with patients and frequent exposure to saliva, blood and the oral cavity and respiratory system in general. Thus, dentist should protect themselves and their staff from acquiring this infection and the dental setup from transmitting the infection[1].

The typical routes of transmission for COVID-19 are either via a direct transmission via cough, sneezing or droplet infection or via contact transmission via oral, nasal and eye mucous membranes. Studies have shown that the disease can be transmitted directly or indirectly through saliva. Also other mode of spread is through Fomites. Fomites are various objects on which if Virus can retain its infective potential for specific period of time. For Aerosol splatter it is 3 to 8 Hours, copper – 5 Hours, Stainless steel – 12 hours and card board/plastic/Paper – up to 24 hours[1-3].

## II. Classifying Worker Exposure to SARS-CoV-2 (OSHA)

According to the **OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION(OSHA)**[4] worker risk of occupational exposure to SARS-CoV-2, during an outbreak may vary from very high to high, medium, or lower (caution) risk. The level of risk depends in part on the industry type, need for contact within 6 feet of people known to be, or suspected of being, infected with SARS-CoV-2, or requirement for repeated or extended contact with persons known to be, or suspected of being, infected with SARS-CoV-2. To help employers determine appropriate precautions, OSHA has divided

job tasks into four risk exposure levels: very high, high, medium, and lower risk. The Occupational Risk Pyramid shows the four exposure risk levels in the shape of a pyramid to represent probable distribution of risk. Most workers will likely fall in the lower exposure risk (caution) or medium exposure risk levels.

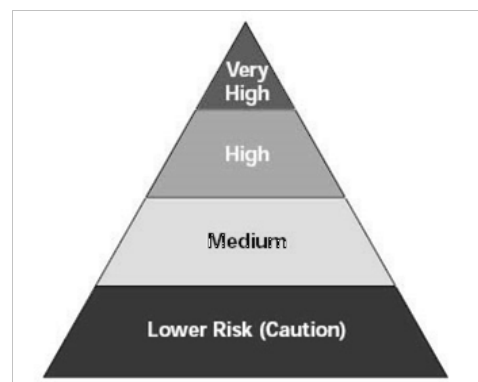
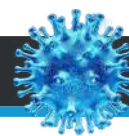


Fig 1. **Occupational Risk Pyramid for COVID19**  
(<https://www.osha.gov/Publications/OSHA3990.pdf>)

### a) Very High Exposure Risk

*Very high exposure risk* jobs are those with high potential for exposure to known or suspected sources of COVID-19 during specific medical, postmortem, or laboratory procedures. Workers in this category include: Healthcare workers (e.g., doctors, nurses, **dentists**, paramedics, emergency medical technicians) performing aerosol-generating procedures (e.g., intubation, cough induction procedures, bronchoscopies, some dental procedures and exams, or invasive specimen collection) on known or suspected COVID-19 patients.

Healthcare or laboratory personnel collecting or



handling specimens from known or suspected COVID-19 patients (e.g., manipulating cultures from known or suspected COVID-19 patients).

Morgue workers performing autopsies, which generally involve aerosol-generating procedures, on the bodies of people who are known to have, or suspected of having, COVID-19 at the time of their death.

#### **b) High Exposure Risk**

*High exposure risk* jobs are those with high potential for exposure to known or suspected sources of COVID-19. Workers in this category include:

Healthcare delivery and support staff (e.g., doctors, nurses, and other hospital staff who must enter patients' rooms) exposed to known or suspected COVID-19 patients. (Note: when such workers perform aerosol-generating procedures, their exposure risk level becomes *very high*.)

Medical transport workers (e.g., ambulance vehicle operators) moving known or suspected COVID-19 patients in enclosed vehicles.

Mortuary workers involved in preparing (e.g., for burial or cremation) the bodies of people who are known to have, or suspected of having, COVID-19 at the time of their death.

#### **c) Medium Exposure Risk**

*Medium exposure risk* jobs include those that require frequent and/or close contact with (i.e., within 6 feet of) people who may be infected with SARS-CoV-2, but who are not known or suspected COVID-19 patients. In areas without ongoing community transmission, workers in this risk group may have frequent contact with travelers who may return from international locations with widespread COVID-19 transmission. In areas where there *is* ongoing community transmission, workers in this category may have contact with the general public (e.g., schools, high-population-density work environments, some high-volume retail settings).

#### **d) Lower Exposure Risk (Caution)**

*Lower exposure risk (caution)* jobs are those that do not require contact with people known to be, or suspected of being, infected with SARS-CoV-2 nor frequent close contact with (i.e., within 6 feet of) the general public. Workers in this category have minimal occupational

contact with the public and other co-workers.

### **III. Interim guidelines to be followed by the dental practioners and auxiliaries:**

The guidelines to be followed by the dental practioners and the dental auxiliaries can be divided into three parts:

#### **A) Before starting the dental procedure**

#### **B) During the dental procedure**

#### **C) After the dental procedure**

#### **A) Before starting the dental procedure:**

##### **1] Selection of patient:**

- Thorough medical history, preferably ask over the telephone.
- Relevant questions should be asked seeking travel history, history of close contact with any person who has travelled or has been sick.
- History should also include history of recent fever, cough, running nose, body ache, difficulty in breathing at rest.
- If the history turns in positive, please ask the patient to get himself checked for COVID-19 from a medical consultant before his dental visit is scheduled.
- If the patient is suspected to be from a high-risk category from the history, treat the patient's emergency problems with medication before they get themselves medically examined and proved to be COVID-19 negative.

##### **Choice of drugs should be-**

**Analgesics-** With the use of any of the below analgesics[5]:

- 1] Diclofenac Sodium [50mg]
- 2] Diclofenac Sodium [50mg] with paracetamol[500mg] TID
- 3] Ketorolac Tromethamine 10mg QID
- 4] Acetaminophen [Paracetamol] 2500 mg in divided dosages

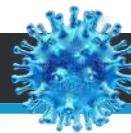
**\*As per the WHO[6] advisory the dentists should avoid using Ibuprofen. Before prescribing the analgesics, a proper history should be taken to avoid the adverse drug reactions.**

##### **Antibiotics-**

Antibiotics should be used in case of infections only. Appropriate choice of antibiotics should be used, if necessary.

- Only the **emergency dental treatment** should be performed.
- All the **elective procedures** should be postponed.(As per the **ADA**[7] and **ISOI**[1], treatments for uncontrolled bleeding, swellings compromising patient's airway,





trauma, cellulitis and/or soft tissue swelling, and oral cancers needed to be operated within 6 weeks to reduce the mortality, should only be considered as emergency dental treatments.)

- h) **Urgent elective dental care procedures** are as follows, pain from pulpal involvement, pericoronitis, dry socket management, tooth fracture, treatment necessary before medical procedures, broken or dislodged definitive prosthesis, painful restorations, denture adjustments for soreness and oncology patients, adjusting appliances like orthodontic wires or prosthesis causing ulcerations to oral mucosa and biopsy. These should be done only with the interim goal of relieving pain and discomfort with all the protective gears including **PPE'S**.
- i) Do not use aerosol producing devices.
- j) As per **ADA**[7], patients with COVID-19 who have successfully completed home isolation can receive emergency dental treatment.
- k) At least 3 days should have passed since recovery and 7 days have passed since symptoms occurred.
- l) For individuals with Lab confirmed COVID-19 who have not had symptoms and at least 7 days have passed since diagnosis and have no symptoms can be treated for emergency dental work.

**COVID-19 POSITIVE OR SUSPECTED POSITIVE PATIENT COMING IN THE DENTAL CLINICS SHOULD BE REFFERD TO A RECOGNISED COVID- 19 CENTRE FOR HIS/HER COVID-19 TREATMENT.**

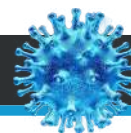
**2) Preparation of the Dentist and Dental Team:**

- a) The dental health care personnel (DHCP) must ensure that they have received their seasonal flu vaccine.
- b) **ADA**[7] recommends that DHCP experiencing influenza-like-illness (ILI) (fever with either cough or sore throat, muscle aches) should not report to work.
- c) Dental practioners and auxiliaries who are of older age, have medically compromised condition or are pregnant are perceived to be at a higher risk of contracting COVID-19 from contact with known or suspected COVID-19 patients.
- d) All DHCP should self-monitor themselves by remaining alert to any respiratory symptoms.

- e) The DHCP should remove any potential sources of fomites such as magazines, reading materials, toys and other objects that may be touched by others and which are not easily disinfected.
- f) Schedule appointments with intervals in between to minimize possible contact with other patients in the waiting room.

**B) During Dental Procedure:**

- a) Dentists should adhere to Standard Precautions which include hand hygiene, use of PPE, respiratory hygiene/etiquette, sharps safety, safe injection practices, sterile instruments and devices, clean and disinfected environmental surfaces.
- b) Dentists should preferably implement Transmission-Based Precautions which include patient placement (e.g., isolation), adequate room ventilation, respiratory protection (e.g., N-95 masks).
- c) **CDC**[8] recommends that dentists should wear a surgical mask and eye protection with solid side shields or a face shield to protect mucous membranes of the eyes, nose, and mouth during procedures likely to generate splashing or spattering [(large droplets)] of blood or other body fluids.
- d) One mask should be used per patient.
- e) As per FDA, if your mask is damaged or soiled, or if breathing through the mask becomes difficult, you should remove the face mask, discard it safely, and replace it with a new one.
- f) All the dental practioners and dental auxiliaries should adhere to the standard sequence of donning and doffing of PPE.
- g) According to the **CDC**[8], SARS-CoV-2 may be vulnerable to oxidation.
- h) So the practioners should use 1.5% hydrogen peroxide or 0.2% povidone as a preprocedural mouthrinse.
- i) Also various studies published in the **Dental Tribune**[9] have suggested the use of **10% Povidove- Iodine** as an irrigant in high speed handpieces and ultrasonic scalers because of their activities in-vitro against **SARS-CoV** and **MERS CoV** virus. But further studies need to be



done to find their effectiveness against **SARS-CoV 2** or **COVID 19** virus.

- j) Use of extraoral dental radiographs, such as panoramic radiographs or cone beam CT are appropriate alternatives to intraoral dental radiographs during the outbreak of COVID-19.
- k) Dentists must reduce aerosol production as much as possible.
- l) Use of rubber dams is must if an aerosol-producing procedure is being performed to help minimize aerosol or spatter.
- m) Shift to the use of 6 handed dentistry for controlling infection.
- n) One should prefer the use of high-volume evacuators.
- o) Use resorbable sutures to eliminate the need for a follow up appointment.
- p) Minimize the use of a 3-in-1 syringe as this may create droplets due to forcible ejection of water/air.
- q) Various studies have reported that the disinfectants (hypochlorite, ethanol) in the handpiece and 3-in-1 syringe water suppliest reduce the viral contaminants in splatter, but its action on human coronavirus is still unknown.

**C) After the dental procedure:**

- a) The PPE should be cleaned with soap and water.
- b) Reusable facial protective equipment (e.g, clinician and patient protective eyewear or face shields) should be cleaned and disinfected between patients.
- c) Non-disposable equipment (e.g., handpieces, dental x-ray equipment, dental chair and light) should be disinfected according to manufacturer's instructions.
- d) **CDC**[8] recommends that handpieces should be cleaned to remove debris, followed by heat-sterilization after each patient.
- e) Routine cleaning and disinfection procedures using cleaners and water followed by hospital-grade disinfectant to frequently touched surfaces or objects are quite effective for SARS-CoV-2 in healthcare settings.
- f) Surfaces such as door handles, chairs, desks,

elevators, and bathrooms should be cleaned and disinfected frequently.

**IV. Rational use of Personal Protective Equipments (Ministry of Health & Family Welfare):**

Personal Protective Equipments (PPEs) are protective gears which are designed to safeguard the health of workers by minimizing the exposure to a biological agent. Components of PPE are goggles, face-shield, mask, gloves, coverall/gowns (with or without aprons), head cover and shoe cover. Rationale for the use of each component of PPE as per the **MoHFW**[10] is as follows:

**1) Face shield and goggles :**

Contamination of mucous membranes of the eyes, nose and mouth is more likely due to droplets generated by cough, sneeze of an infected person or during aerosol generating procedures carried out in a clinical setting. Also touching the eyes/nose/mouth with a contaminated hand is another likely source. Hence it is of paramount importance to protect the mucous membranes of the eyes/nose/mouth by using face shields/ goggles. The flexible frame of goggles should provide good seal with the skin of the face, covering the eyes and the surrounding areas and even accommodating for prescription glasses.

**2) Masks :**

Protecting the airway from the particulate matter generated by droplets / aerosols can prevent COVID 19 infection. The droplet precautions / airborne precautions using masks are very crucial while dealing with a suspect or confirmed case of COVID-19.

Masks are of different types. The type of mask to be used is related to particular risk profile of the category of personnel and his/her work. There are two types of masks which are recommended for various categories of personnel working in hospital or community settings, depending upon the work environment:

**a. Triple layer medical mask**

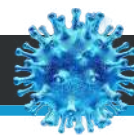
**b. N-95 Respirator mask**

**a. Triple layer medical mask:**

A triple layer medical mask is a disposable mask, fluid-resistant, provide protection to the wearer from droplets of infectious material emitted during coughing/sneezing/talking.

**b. N-95 Respirator mask:**

An N-95 respirator mask is a respiratory protective device with high filtration efficiency to airborne particles. To provide the requisite air seal to the wearer, such masks are designed to achieve a very close facial fit.



### 3) **Gloves :**

When a person touches an object/surface which is contaminated by COVID-19 infected person, and then touches his own eyes, nose, or mouth, he may get exposed to the virus. Nitrile gloves are preferred over latex gloves because they resist chemicals, including certain disinfectants such as chlorine. There is a high rate of allergies to latex and contact allergic dermatitis among health workers. Non-powdered gloves are preferred to powdered gloves.

### 4) **Coverall/Gowns:**

Coverall/gowns are designed to protect torso of healthcare providers from exposure to virus. Coveralls typically provide 360-degree protection. But the medical/isolation gowns do not provide continuous whole-body protection .

By using appropriate protective clothing, it is possible to create a barrier to eliminate or reduce contact and droplet exposure, both known to transmit COVID-19, thus protecting healthcare workers working in close proximity (within 1 meter) of suspect/confirmed COVID-19 cases or their secretions.

At present, there is a lack of comparative evidence to show whether Coverall is more effective or the medical gown in reducing transmission to health workers. Gowns are relatively easier to put on and for removal. Use of Coveralls/gowns have stringent standards that extend from preventing exposure to biologically contaminated solid particles to protecting from chemical hazards.

### 5) **Shoe covers :**

Shoe covers should be made up of impermeable fabric to be used over shoes to facilitate personal protection and decontamination.

### 6) **Head covers :**

Individuals using gowns, should use a head cover that covers the head and neck while providing clinical care for patients. Hair and hair extensions should fit inside the head cover.

## V. **Sequence for Donning & Doffing of PPE:**

### **SEQUENCE FOR DONNING PPE**

#### **1<sup>st</sup> STEP : WEAR A HEADCAP**



#### **2<sup>nd</sup> STEP : Hand Hygiene**



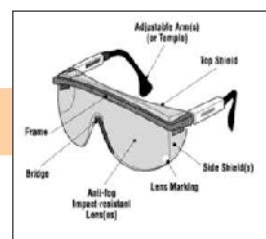
#### **3<sup>rd</sup> STEP : Put on Gown**



#### **4<sup>th</sup> STEP : Put on N-95/FFP2/FFP3**



#### **5<sup>th</sup> STEP : Put on Goggles**

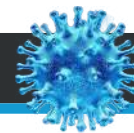


#### **6<sup>th</sup> STEP : Put on Gloves**



**Fig 2. Showing sequence for Donning PPE including 6 steps**





## SEQUENCE FOR DOFFING PPE



Fig 3. Showing sequence for Doffing PPE

## REFERENCES :

- 1) ISOI Guidelines for Dental Practitioners During COVID-19 Pandemic
- 2) Journal of Dental Research- Coronavirus Disease 2019: Emerging and Future Challenges for Dental and Oral Medicine. March 12 2020.
- 3) Journal Of Zhejiang University
- 4) OSHA Guidance on Preparing Workplaces for COVID-19
- 5) NHS Advisory on NSAIDs
- 6) WHO Guidelines COVID-19
- 7) ADA Covid-19 Infection Control Protocols and Procedures
- 8) CDC Coronavirus Disease 2019- Healthcare Professional Infection Control
- 9) <https://in.dental-tribune.com/news/generating-virus-free-aerosols-to-minimize-the-virus-spread-eg-sars-cov-2-in-dental-clinics>
- 10) Ministry of Health and Family Welfare Directorate General of Health Services Guideliness on rational use of Personal Protective Equipment

# EMERGING PROPHYLAXIS FOR DENTAL PRACTITIONERS AGAINST COVID-19

- I. **Introduction**
- II. **Non pharmacological interventions at clinical setting**
- III. **Pharmacological interventions**
  - a) **Antiviral agents**
  - b) **Chloroquine-HydroxyChloroquine (HCQS)**
  - c) **Vaccination**

## I. Introduction :

The current COVID-19 emergency warrants the urgent development of potential strategies to protect people at high risk of infection-particularly close contacts and health-care workers[1].

In order to protect staff and preserve personal protective equipment and patient care supplies, as well as expand available hospital capacity during the COVID-19 pandemic, the Centers for Disease Control and Prevention (CDC) recommends that dental facilities postpone elective procedures, surgeries, and non-urgent dental visits, and prioritize urgent and emergency visits and procedures now and for the coming several weeks[2].

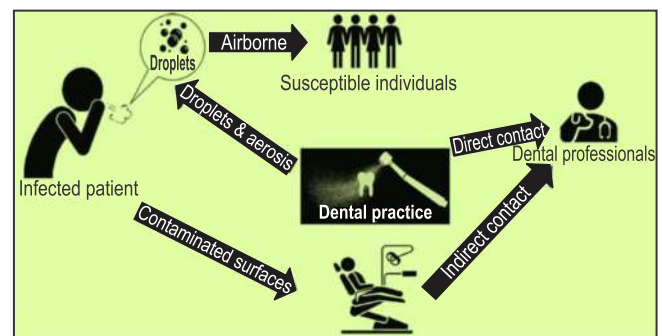
WHO has accelerated research in diagnostics, vaccines and therapeutics for this novel coronavirus. The various strategies for prevention of transmission and infection of this respiratory pathogen includes[3]:

- 1) **Health Promotion - Non Pharmacological Interventions:**
  - Isolation at home
  - Voluntary quarantine at home
  - Social distancing of entire population
  - Temporary closure of schools, universities and work places
- 2) **Pharmacological Interventions -Specific protection through chemoprophylaxis or immunoprophylaxis which includes:**
  - Antiviral agents
  - Chloroquine-HydroxyChloroquine (HCQS)
  - Vaccination

## II. Non pharmacological interventions at clinical setting:

Due to the characteristics of dental settings, the risk of cross infection can be very high between patients and dental practitioners. For dental practices and hospitals in areas that are (potentially) affected with COVID-19, strict and effective infection control protocols are urgently needed[4].

The person-to-person transmission routes of COVID-19 includes direct transmission, such as cough, sneeze, droplet inhalation transmission, and contact transmission, such as the contact with oral, nasal, and eye mucous membranes. COVID-2019 can also be transmitted through the saliva, and the fecal-oral routes may also be a potential person-to-person transmission route. The participants in dental practice expose to tremendous risk of COVID-2019 infection due to the face-to-face communication and the exposure to saliva, blood, and other body fluids, as well as the handling of sharp instruments. Dental professionals play great role in preventing the transmission of COVID-2019. The possible transmission routes of COVID-2019 in stomatology are airborne spread, contact spread, and contaminated surface spread.

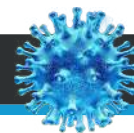


**Fig-1. Transmission routes of COVID-2019 in dental clinics and hospitals[5]**

Various practical strategies which can be implemented to block virus transmission during dental diagnosis and treatment includes patient evaluation, hand hygiene, personal protective measures for the dental professionals, mouthrinse before dental procedures, rubber dam isolation, anti-retraction handpiece, disinfection of the clinic settings and proper management of medical waste[5].

## III. Pharmacological interventions

Pre-exposure prophylaxis and postexposure prophylaxis (PEP) with antimicrobial drugs are effective in preventing illness before potential exposure or after



documented exposure to a variety of microbial pathogens, and in reducing the risk of secondary spread of infection. For example, PEP with Rifampicin is given to people exposed to index cases of invasive meningococcal infection, and oseltamivir has been recommended by WHO for people at high risk of infection before or after exposure to pandemic influenza[1].

**a) Antiviral agents:**

The implementation of antiviral treatment and prophylaxis has several requirements. The stockpile of drugs must be adequate, the safety of treatment must be very high, and costs should ideally be low. Antiviral drugs administered shortly after symptom onset can reduce infectiousness to others by reducing viral shedding in the respiratory secretions of patients (SARS-CoV-2 viral load in sputum peaks at around 5–6 days after symptom onset and lasts up to 14 days), and targeted prophylactic treatment of contacts could reduce their risk of becoming infected[1].

Protease inhibitors like Lopinavir have shown to be a strong inhibitor of the protease enzyme present in SARS-CoV which is important for the life cycle function of this virus. The largest study reported till date on use of Lopinavir plus Ritonavir for its efficacy in patients infected with COVID-19 conducted in China found no difference in the clinical outcome when compared to standard care alone. There is currently a trial NCT04304053 ongoing to look into the efficacy of Darunavir/Cobicistat plus chloroquine treatment in all who are found to be infected. Currently, there is no recommendation for use of antiviral agents for prophylaxis of COVID-19[3].

**b) Chloroquine-Hydroxy Chloroquine (HCQS):**

Chloroquine is a widely known for more than 70 years, is easily available and affordable antimalarial agent with proven chemoprophylaxis properties in malaria. Various mechanisms have shown it to have a role in SARS CoV infection, too. The SARS-CoV2 is known to bind to human cells *via* the Angiotensin Converting Enzyme 2 (ACE 2) receptor. *In vitro* studies have shown that the glycosylation process of ACE2 receptor gets affected thus causing the Vero cells pre-treated with chloroquine to be refractory to SARS-CoV infection, that may be the mechanism through which even human cells can become refractory to this infection. It has also been seen that treatment with chloroquine prevents the spread

of SARS-CoV infection in the post infection period[3].

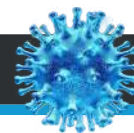
**i. Theories of mechanism of action:**

The anti-viral and anti-inflammatory activities of chloroquine may have a role in the treatment of patients with novel COVID-19. Chloroquine increases endosomal pH and interferes with the glycosylation of cellular receptor of SARSCoV and thereby it has the potential to block viral infection[4]. Chloroquine also inhibits the quinone reductase-2, that makes this agent a broad antiviral agent. It is believed that chloroquine can also interfere with ACE2 receptor glycosylation thus prevents SARS-CoV- 2 attachment to the target cells. Since the structure and mechanism of action of chloroquine and hydroxychloroquine (HCQ) are exactly same except an additional hydroxy moiety in one terminal in HCQ, both act as a weak base that can change the pH of acidic intracellular organelles including endosomes /lysosomes, essential for the membrane fusion. Data show HCQ effectively inhibited both the entry, transport and the post-entry stages of SARS-CoV-2. In addition, HCQ acts effectively on other intracellular bacterial infections such as *Coxiella burnetii* (Q fever) and *Tropheryma whipplei*. Addition of hydroxyl molecule makes HCQ less permeable to blood-retinal barrier and allows faster clearance from retinal pigment cell, thereby suggesting a lesser risk of retinal toxicity, as compared to chloroquine. Furthermore, the narrow therapeutic and safety index margin with chloroquine makes HCQ a safer option than chloroquine, specially in severely sick patients where a cytokine storm may be associated with disease severity of SARS-CoV-2. The significant decrease in the production of pro-inflammatory markers and cytokines with HCQ has made this agent a successful disease modifying anti inflammatory agent in the treatment of various autoimmune diseases including rheumatoid arthritis, systemic lupus erythematosus and Sjogren's syndrome. Long-term clinical safety profile of HCQ is better than that of chloroquine, that allows higher daily dose of HCQ with less drug-drug interactions[6].

In other human trial Hydroxychloroquine along with azithromycin was studied in Marseille, France.[5]

- HCQ plus azithromycin appeared to lead to faster reduction in viral carriage.
- Results are not adequate to support clinical use of this combination.
- Combining azithromycin along with HCQ has shown to increase the risk of QTc prolongation.
- Dose : 500 OD for 5 days. ( Monitor Qtc interval





especially when combined with HCQ).

Both these drugs have also shown to have immunomodulatory effects and can suppress the increase immune factors, which may play a role in reducing the severity of coronavirus disease.

The first ever human trial of chloroquine against COVID-19 was conducted by Chinese investigators. The study conducted in more than 100 patients found chloroquine to be superior in reducing symptom duration, exacerbation of pneumonia, radiological improvement and lead to virus-negative seroconversion. The National Health Commission of the People's Republic of China recommended inclusion of chloroquine in the Guidelines for the Prevention, Diagnosis, and Treatment of Pneumonia Caused by COVID-19. In this study, chloroquine was given in dose of 500 mg of chloroquine twice daily in mild to severe COVID-19 pneumonia[6].

Analysis revealed that chloroquine could prevent ORF1ab, ORF3a, and ORF10 from attacking the heme to form the porphyrin, and inhibit the binding of ORF8 and surface glycoproteins to porphyrins to a certain extent, effectively relieve the symptoms of respiratory distress[7].

Currently many trials are still underway to study the effect both for prophylaxis and treatment.

**ii. The National Taskforce constituted by Indian Council for Medical Research for COVID-19 recommends the use of hydroxy-chloroquine for prophylaxis of SARS-CoV-2 infection for selected individuals as follows[8]:**

**1. Eligible individuals:**

- Asymptomatic healthcare workers involved in the care of suspected or confirmed cases of COVID-19
- Asymptomatic household contacts of laboratory confirmed cases

**2. Dose:**

- Asymptomatic healthcare workers involved in the care of suspected or confirmed cases of COVID-19: 400 mg twice a day on Day 1, followed by 400 mg once weekly for next 7 weeks; to be taken with meals
- Asymptomatic household contacts of laboratory confirmed cases: 400 mg twice a day on Day 1, followed by 400 mg once weekly for next 3 weeks; to be taken with meals

**3. Exclusion/contraindications:**

- The drug is not recommended for prophylaxis in children under 15 years of age.
- The drug is contraindicated in persons with hypersensitivity to these agents, retinopathy, porphyria, epilepsy, pre-existing maculopathy, G6PD deficiency, recent myocardial infarction and QTc >500 msec. Chloroquine is not contraindicated in pregnancy.

**iii. Precautions**

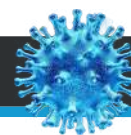
Patients taking these drugs should be frequently monitored for hematological parameters, serum electrolytes, blood glucose, hepatic and renal functions. As these drugs are known to cause QTc prolongation, routine ECG is essential prior to starting these drugs[3]. Co-administration of other drugs known to prolong the QTc interval (such as anti-arrhythmic, anti-depressants, anti-psychotics, anti-histaminic, teneligliptin, ondansetron and moxifloxacin etc.) must be avoided[6].

**iv. Key considerations:**

- The drug has to be given only on the prescription of a registered medical practitioner.
- Advised to consult with a physician for any adverse event or potential drug interaction before initiation of medication
- The prophylactic use of hydroxychloroquine to be coupled with the pharmacovigilance for adverse drug reactions through self-reporting using the Pharmacovigilance Program of India
- (PvPI) helpline/app.
- If anyone becomes symptomatic while on prophylaxis he/she should immediately contact the health facility, get tested as per national guidelines and follow the standard treatment protocol.
- All asymptomatic contacts of laboratory confirmed cases should remain in home quarantine as per the national guidelines, even if they are on prophylactic therapy.
- Simultaneously, proof of concept and pharmacokinetics studies be taken up expeditiously. Findings from these studies and other new evidence will guide any change in the recommendation.

**C) Vaccines:**

There is considerable global investment and effort towards development of a vaccine. Various clinical trials are going on around the world and we hope that the results of the ongoing trials give us more insight on prophylaxis and help in better prevention and thus decreasing the transmission of this widely spreading disease[3].



Number	Title	Interventions	Age	Intervention model	Masking	Start date	Completion date	Locations
1. NCT04299724	Safety and Immunity of Covid-19 aAPC vaccine	Biological: pathogen-specific aAPC	6 months to 80 years	Single arm clinical trial	Open label	February 15, 2020	December 31, 2024	Guangdong, China
2. NCT04276896	Immunity and safety of Covid-19 synthetic minigene vaccine	Biological: injection and infusion of LV-SMENP-DC vaccine and antigen-specific CTLs	6 months to 80 years	Single arm clinical trial	Open label	March 24, 2020	December 31, 2024	Guangdong, China
3. NCT04283461	Safety and immunogenicity study of 2019-nCoV vaccine (mRNA-1273) to prevent SARS-CoV-2 infection	Biological: mRNA-1273	18 years to 55 years	Non-randomized trial	Open label	March 3, 2020	June 1, 2021	United States
4. ChiCTR2000030906	A phase I clinical trial for recombinant novel coronavirus (2019-COV) vaccine (adenoviral vector)	Recombinant novel coronavirus vaccine (adenoviral vector)	18 and 60 years	Non-randomized trial	Open label	March 16, 2020	December 31, 2020	Hubei, China

**Table - Summary of ongoing clinical trials for Immunoprophylaxis[3]**

#### References :

1. Lancet Global Health 2020, Published Online-March 19, 2020; [https://doi.org/10.1016/S2214-109X\(20\)30114-5](https://doi.org/10.1016/S2214-109X(20)30114-5)
2. Centers for Disease Control and Prevention (CDC)- CDC Guidance for Providing Dental Care during COVID-19, Updated: April 8, 2020
3. Emerging prophylaxis strategies against COVID-19 ,Sumita Agrawal et al; Monaldi Archives for Chest Disease 2020; 90:1289
4. Coronavirus Disease 2019 (COVID-19): Emerging and Future Challenges for Dental and Oral Medicine; L. Meng et al; Journal of Dental Research 1–7, International & American Associations for Dental Research 2020; [sagepub.com/journals-permissions](https://sagepub.com/journals-permissions), DOI:10.1177/0022034520914246-  
[journals.sagepub.com/home/jdr](https://journals.sagepub.com/home/jdr)
5. Transmission routes of 2019-nCoV and controls in dental practice, Xian Peng et al; International Journal of Oral Science (2020) 12:9
6. Chloroquine and hydroxychloroquine in the treatment of COVID-19 with or without diabetes: A systematic search and a narrative review with a special reference to India and other developing countries, Awadhesh Kumar Singh et al Diabetes & Metabolic Syndrome: Clinical Research & Reviews 14 (2020) 241-246.
7. COVID-19: Attacks the 1-Beta Chain of Hemoglobin and Captures the Porphyrin to Inhibit Human Heme Metabolism, Liuwenzhong, ChemRxiv. Preprint. <https://doi.org/10.26434/chemrxiv.11938173.v5>
8. Indian Council of Medical Research [Internet]. Advisory on the use of Hydroxychloroquin as prophylaxis for SARSCoV2 infection. Accessed on: 24 March 2020. Available from: <https://www.mohfw.gov.in/>

# OPERATION THEATRE PROTOCOL FOR COVID-19 PANDEMIC

## I. Introduction

## II. Perioperative Management Protocol in View of COVID-19

## III. Local Protocols In The Operation Theatre

### I. Introduction:

The course of the COVID-19 is long, and COVID-19 is highly contagious even during the incubation period. Asymptomatic carrier of SARS-CoV-2, accounting for 1% of the laboratory confirmed cases of SARS-CoV-infection, may potentially transmit the virus during incubation time. This makes the identification and prevention of COVID-19 infection highly challenging[1,2].

The most common manifestations of COVID-19 infection include fever, dry cough, dyspnea, myalgia, fatigue, lymphopenia, increased hypersensitive C-reactive protein, and radiographic evidence of pneumonia. Complications (eg, acute respiratory distress syndrome [ARDS], arrhythmia, shock, acute cardiac injury, secondary infection, and acute kidney injury) and death may occur in severe cases[2].

The vectors of transmission are respiratory droplets or close/direct contact. Aerosol propagation is also possible in the case of prolonged exposure to high concentrations of the aerosols in a relatively closed environment. Currently, no specialized medication is available for the treatment of SARS CoV-2 infection, and supportive measures remain the mainstay of COVID-19 treatment. Individuals of all ages are susceptible to SARS CoV-2 infection. The patient's immune function is a major determinant of the disease severity. Patients with low immune function, such as older people pregnancy, hiv, neonates are more vulnerable and have high mortality after COVID-19 infection[1,2,3].

The data in various studies suggest that surgery may accelerate and exacerbate disease progression of COVID-19. Surgery may not only cause immediate impairment immune function, but also induce early systemic inflammatory response.

### II. Perioperative Management Protocol in View of COVID-19[2]:

In view asymptomatic carriers and possibility of community transmission, all patients should be considered to be suspected of covid carriers unless proved otherwise especially in an emergency surgery where there is no time to get the tests done.

RT-PCR test is the reference standard to make a definitive diagnose of COVID-19 infection. To get the test done for all cases depends on the availability of test kits and guidelines by health authorities.

Surgical team as well as anesthesia team is subjected to increased risk of getting exposed as both are dealing with air passage.

### III. Local protocols in the Operation theatre (Department of Oral & Maxillofacial surgery, Government Dental College and Hospital, Nagpur) are as follows[4,5]:

#### General guidelines:

1. **Use of masks by patients, relatives & visitors:** it is advisable to use masks and proper wearing of mask by the patients, their relatives & visitors at all times within the health care facility.
2. **To limit number of people allowed in health care facility.**
3. To encourage **social distancing** in health care facilities.
4. **Availability of hand hygiene facility:** Hand rubs & hand wash facilities to be made available & encouraged by both the staff and patient, visitors.

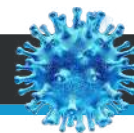
#### A. Screening of patients and history taking

1. Patients to be screened for fever, tachypnea, decreased oxygen saturation, signs of respiratory failure, irregular heart rhythm, signs of heart failure etc.
2. History should be sought for travel, history of contact with suspected or confirmed covid 19 patients.
3. Appropriate investigations should be sent including wbc count, crp, serum ferritin, x ray chest, ct chest etc.
4. Highly suspected patients to be isolated immediately and RT PCR to be sent for covid 19.
5. The staff involved in the screening and investigations performed should clearly be documented.

#### B. Admission of Patient for surgery:

1. In case of patients being taken up for surgery without testing for COVID-19, they should be treated as suspect COVID cases and should be admitted to the designated isolation rooms.





2. Patients must be given a mask and all staff managing a suspected or confirmed patient should wear PPE.
3. COVID positive cases to be admitted to the COVID isolation/ ICU depending on the condition of the patient.

#### **C. Transfer of patient to OT:**

1. Patient is transferred to the OT on the designated pathway.
2. Shielding patients and minimizing exposure to others is important.

#### **D. Receiving in the Operation Room:**

1. Preferably the patient should be shifted by the shortest route directly to the operating room.
2. Sanitization of the route from the isolation/ICU to be done before and after shifting the patient to & from the designated area.

#### **E. In the Operating Theatre:**

##### **i. Dedicated Operation Theatre**

1. It is advisable to have dedicated operating theatre for patients suspected with COVID-19.
2. The same OR and the same Anesthesia machine should only be used for COVID-19 cases for the duration of the epidemic.

##### **ii. Environmental Control**

1. The designated theatre should ideally be fully equipped and a negative pressure ventilation is recommended relative to surrounding air.
2. A high frequency of air changes (25 per hour) rapidly reduces viral load within the OT.

##### **iii. Risk Minimization**

1. To minimize the exposure in the operating theatre, it is important to minimize the number of staff designated for the surgical procedure to only essential members.
2. Ensure that all required materials, equipment & instruments are available in the operating theatre.
3. Prevent repeated opening and closing of the door.
4. The movement of personnel in and out of the theatre and in the OT complex, during the surgery should be restricted.
5. It is of good clinical practice to treat the body fluids, tissues, mask and other apparatus in contact with the patient as having potential biohazard and should be disposed as per current available recommendations.

##### **iv. During Intubation and Extubation**

1. The aerosolization and droplet transmission of the COVID-19 virus are important hazards in the environment of the operating theatres, especially with procedures such as endotracheal intubation, tracheostomy etc

2. The staff immediately present at the time of intubation and extubation in OT should be kept at a minimum.
3. Surgeons and personnel not needed for intubation should remain outside the OT until anaesthesia induction and intubation are completed.
4. All the staff in the OT must wear a fit-tested N95 mask, face shield or goggles, gowns & gloves.
5. The attempt will be made to extubate all cases in the OT suite itself at the end of surgery.

#### **v. Operation Technique**

1. Electrosurgery units should be set to the lowest possible settings for the desired effect.
2. Use of monopolar Electro surgery, ultrasonic dissectors and advanced bipolar devices should be minimized, as these can lead to particle aerosolization.
3. If available, monopolar diathermy pencils with attached smoke evacuators should be used.
4. Avoid long dissecting times on the same spot using energy devices to reduce the surgical smoke.
5. Avoid sharp injury or damage of protective equipment, in particular gloves and body protection.

#### **F. During the Recovery Phase**

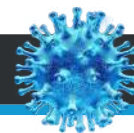
The patient should be allowed to recover in the OT suite until ready to be moved to the designated ward.

#### **G. Shifting Out from the OT**

1. Once the patient has recovered, the patient should return to the designated isolation room.
2. A minimum number of transport personnel waiting outside the operating rooms should be considered.
3. Personnel should wear personal protective equipment as recommended by the CDC.
4. Personal protective equipment should not be the same as worn during the procedure.

#### **H. Cleaning, Disinfection & Taking the Next Case**

1. The cleaning staff will use N95 mask, face shield or goggles, gown and housekeeping gloves during the cleaning and disinfection of the operation theatre.
2. The operating theatre should be cleaned as per biohazard based on current available protocols.
3. Conduct thorough decontamination of all surfaces, screens, keyboard, cables, monitors, and anaesthesia machine.
4. All unused items on the drug tray and airway trolley should be assumed to be contaminated



and discarded.

5. Depending on the rate of air exchange of the OT, the next patient can be taken one hour after the extubation of the previous case.

#### **I. Use of Personal Protective Equipment**

1. The Centres for Disease Control recommends the use of PPE for every operative procedure performed on a patient with confirmed COVID-19 infection or a patient where there is suspicion for infection.
2. The use of N95 respirators or respirators that offer a higher level of protection is recommended when performing or present for an aerosol-generating procedure (e.g. patient intubation) in COVID-19 or suspected infected patient.
3. Disposable respirators and facemasks should be removed and discarded appropriately in accordance with local policy.
4. Hand hygiene should be performed after discarding the respirator or facemask.
5. For donning and doffing of personal protective N-95 masks, follow recommendations for the same.
6. To ensure an appropriate mask fit, fit testing is mandated.

#### **J. For the Anaesthesiologist**

1. To perform a pre-anesthetic check all contact precautions should be taken during the examination.
2. Regional anaesthesia is highly recommended as this will be a safer option as compared to general anaesthesia.
3. While Handling the airway, the most experienced member of the anesthesia team, available should perform the intubation.
4. Where possible a negative pressure room or available negative pressure boxes/ devices should be used while handling the airway.
5. As far as possible, disposable airway equipment should be used.
6. Use of videolaryngoscope desirable as compared to direct laryngoscopic intubation..
7. To reduce aerolization of the virus which can happen with atomized local anesthetic agents, awake fibreoptic intubation is to be avoided,

unless there is a specific indication for the same.

8. Prepare to pre oxygenate for 5 minutes with 100% FiO<sub>2</sub>.
9. In order to avoid manual ventilation of the patient's lungs which has a potential to aerolize the virus from the airways, perform a rapid sequence induction (RSI), if manual ventilation is needed, small tidal volumes can be applied.
10. A high quality HMEF (Heat & Moisture Exchanging Filter) rated to remove at least 99.97% of airborne particles of 0.3 microns or greater should be placed between the facemask and the breathing circuit or between the facemask and the reservoir bag as applicable.
11. Both HME filters and the soda lime should be changed after each case.
12. All used airway equipment must immediately be placed in a double plastic bag and sealed. The same should then be sent for decontamination and sterilization.

#### **References:**

1. Li Q, Guan X, Wu P, et al. Early transmission dynamics in Wuhan, China, of novel coronavirus-infected pneumonia. N Engl J Med 2020; doi:10.1056/NEJMoa2001316.
2. Huang C, Wang Y, Li X, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. Lancet 2020; 395: 497–506.
3. Burke RM, Midgley CM, Dratch A, Fenstersheib M, Haupt T, Holshue M, et al. Active monitoring of persons exposed to patients with confirmed COVID-19 — United States, January–February 2020. MMWR Morb Mortal Wkly Rep. 2020 doi : 10.15585/mmwr.mm6909e1external icon.
4. World Health Organization. Report of the WHO-China Joint Mission on Coronavirus Disease 2019 (COVID-19) 16-24 February 2020 [Internet]. Geneva: World Health Organization; 2020 Available from: <https://www.who.int/docs/default-source/coronaviruse/who-china-joint-mission-on-covid-19-finalreport.pdf>.
5. WHO guidelines on COVID-19: Considerations for Optimum Surgeon Protection Before, During, and After Operation

# ROLE OF IMMUNITY BOOSTERS AGAINST COVID-19

- I. **Introduction**
- II. **Immune System**
- III. **How to help your immune system??**
- IV. **Does Yoga, Pranayam, Meditation help to boost immunity??**

## I. Introduction:

A very well said quote "**Health is wealth**" seems to be the bitter truth of our life since few months. No one had ever thought of situation the whole world is facing. Wuhan in china, where coronavirus outbreak started in December 2019 has shown that a simple virus can destroy everything. We the expert Human, we the technically higher Human, we the well civilized Human have nothing in our hand if there is no life. Have we ever thought of this? In this hopeless situation we meet a hilarious truth that even race, age, standard ,status ,can't save us .Our own Health can save us & our own immunity can save us with little precautions .Well said by ICMR head that "We don't have to run on moon ,we have to increase our immunity .

We all know that prevention is better than cure. While there is no medicine for COVID-19 as of now, it will be good to take preventive measures which boost our immunity in these times.

## II. Immune system:

Immune system, the body's defence force against disease-causing bacteria, viruses and other organisms that we touch, ingest and inhale every day. This immune response classifies as either innate which is non-specific and adaptive acquired which is highly specific. The innate response, often our first line of defence against anything foreign, defends the body against a pathogen in a similar fashion at all times. These natural mechanisms include the skin barrier, saliva, tears, various cytokines, complement proteins, lysozyme, bacterial flora, and numerous cells including neutrophils, basophils, eosinophils, monocytes, macrophages, reticuloendothelial system, natural killer cells (NK cells), epithelial cells, endothelial cells, red blood cells, and platelets.

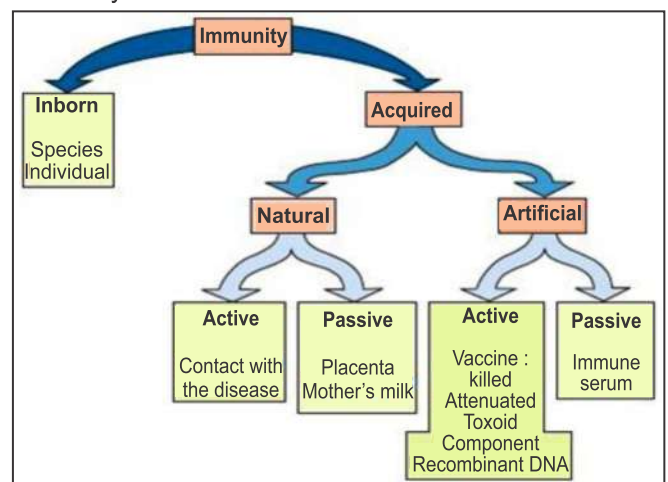
The adaptive acquired immune response will utilize the ability of specific lymphocytes and their products (immunoglobulins, and cytokines) to generate a response against the invading microbes and its typical

features are[1-3]:

1. **Specificity:** as the triggering mechanism is a particular pathogen, immunogen or antigen.
2. **Heterogeneity:** signifies the production of millions of different effectors of the immune response (antibodies) against millions of intruders.
3. **Memory:** The immune system has the ability not only to recognize the pathogen on its second contact but to generate a faster and stronger response.

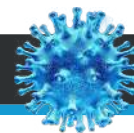
The inflammatory immune response is an example of innate immunity as it blocks the entry of invading pathogens through the skin, respiratory or gastrointestinal tract. If pathogens can breach the epithelial surfaces, they encounter macrophages in the subepithelial tissues that will not only attempt to engulf them but also produce cytokines to amplify the inflammatory response.

Active immunity results from the immune system's response to an antigen and therefore is acquired. Immunity resulting from the transfer of immune cells or antibodies from an immunized individual is passive immunity



**Fig1. Showing the classification of immunity (ref: Wikipedia).**





#### a) Cellular events:

Cells of the innate immunity are:

Phagocytes (monocytes, macrophages, neutrophils, and dendritic cells)

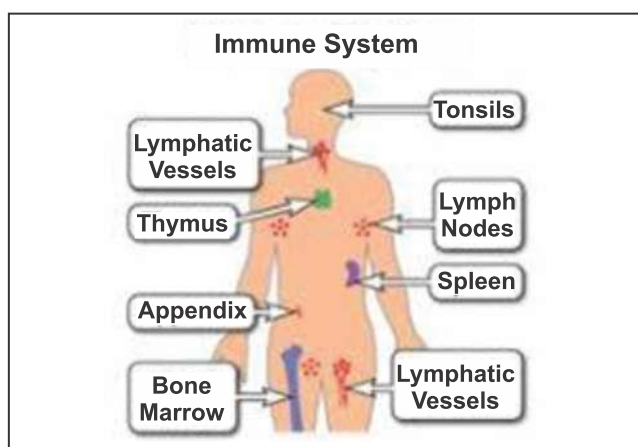
Natural killer (NK) cells

Cells of the adaptive response are:

T Lymphocytes classified as CD4+T cells and CD8+T cells

B Lymphocytes differentiate into plasma cells, which produce specific antibodies

#### b) Organ Systems Involved



**Fig2. Showing the organ systems involved**

- The organ systems involved in the immune response are primarily lymphoid organs which include spleen, thymus, bone marrow, lymph nodes, tonsils, and liver. The lymphoid organ system classifies according to the following:

Primary lymphoid organs (thymus and bone marrow), where T and B cells first express antigen receptors and become mature functionally.

Secondary lymphoid organs like the spleen, tonsils, lymph nodes, the cutaneous and mucosal immune system; this is where B and T lymphocytes recognize foreign antigens and develop appropriate immune responses.

- T lymphocytes mature in the thymus, where these cells reach a stage of functional competence while B lymphocytes mature in the bone marrow the site of generation of all circulating blood cells. Excessive release of cytokines stimulated by these organisms can cause tissue damage, such as endotoxin shock syndrome.

#### a) Function

The immune system responds variedly to different microorganisms often determined by the features of the microorganism.

#### b) Immune response to viruses[4,5]:

Interferon, NK cells, and phagocytes prevent the spread of viruses in the early stage

Specific antibodies and complement proteins participate in viral neutralization and can limit spread and reinfection

The adaptive immunity is of foremost importance in the protection against viruses - these include CD8+ T cells that kill them and CD4+ T cells as the dominant effector cell population in response to many virus infections.

#### c) Strategies of viruses to evade the immune system

Antigenic variation: It is a mutation in proteins that are typically recognized by antibodies and lymphocytes. HIV continually mutates, thus making it difficult for either the immune system to protect against it and also hinders the development of a vaccine[6,7].

By disrupting 2',5'-oligoadenylate synthetase activity or by the production of soluble interferon receptors viruses disrupt the Interferon response.

By several mechanisms, Viruses affects the expression of MHC molecules.

A virus can infect immune cells: Normal T and B cells are also sites of virus persistence. HIV hides in CD4+T cells and EBV in B cells

Vaccination safely teaches our adaptive immune systems to repel a wide range of diseases, and thus protect ourselves and others. There is currently no vaccine for coronavirus, and we may not see one for 18 months or longer. So, for now, our immune systems must adapt unaided to this potentially deadly threat.

#### III. How to help your immune system??:

Here some ideas to stay healthy



Be active



Eat healthy



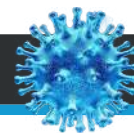
Don't smoke



Meditate



Read books



a. Have you Checked your dietary habits??

Food may be helpful for boosting the immune system and preventing colds and the flu. Here's a look at five types of nutrients that your immune system needs to perform and which foods to find them in.

b. Vitamin C

An essential nutrient, vitamin C acts as an antioxidant. Antioxidants help fight free radicals, a type of unstable molecule known to damage the immune system. There's some evidence that vitamin C may be particularly helpful in boosting the immune systems of people under major stress. To increase your vitamin C intake, add these foods to your diet. e.g citrus fruits and juices (such as orange and grapefruit), kiwi fruit, red and green peppers, broccoli, strawberries[8].

c. Vitamin E

Like vitamin C, vitamin E is a powerful antioxidant. Research suggests maintaining an ample level of vitamin E is crucial for maintaining a healthy immune system, especially among older people. To get your fill of vitamin E, look to these foods: wheat germ oil, almonds, sunflower seeds, hazelnuts, peanut butter.

d. Zinc

Zinc is an essential mineral involved in the production of certain immune cells. The National Institutes of Health (NIH) caution that even mildly low levels of zinc may impair your immune function. Here are some top food sources of zinc: oysters, baked beans, cashews, raisin bran, and chickpeas.

e. Carotenoids

Another type of antioxidant, carotenoids are a class of pigments found naturally in a number of plants. When consumed, carotenoids are converted into vitamin A (a nutrient that helps regulate the immune system). Carotenoids are better absorbed when cooked or eaten with fat. Look to these foods to boost your carotenoids: carrots, apricots, papaya, mango, sweet potato, spinach, collard greens.

f. Omega-3 Fatty Acids

Omega-3 fatty acids are a type of essential fatty acid known to suppress inflammation and keep the immune system in check. Although it's not known whether omega-3s can help fight off infections (such as the common cold), research suggests that omega-3s can protect against autoimmune disorders like Crohn's disease, ulcerative colitis, and rheumatoid arthritis. Try these omega-3-rich foods: oily fish (including mackerel, tuna, salmon, sardines, herring, and trout), flaxseed, walnuts, chia seeds

g. Role of various systems on immunity

The autonomic nervous system (ANS) has a direct

role in physical response to stress and is divided into the sympathetic nervous system (SNS), and the parasympathetic nervous system (PNS). When the body is stressed, the SNS contributes to what is known as the "fight or flight" response.

Your sympathetic nervous system is responsible for how your body reacts to danger and is responsible for the fight or flight response. While your parasympathetic nervous system is responsible for maintaining homeostasis, which is your body's built-in stability monitor. Think of it like a generator – making sure everything from your body temperature to your water intake is functioning smoothly. Your parasympathetic nervous system makes sure things are balanced. It works to relax you and helps conserve and restore energy [9].

You need both systems to run properly. You need your sympathetic nervous system to keep you alive when true danger is detected and you need your parasympathetic nervous system to restore and relax you so that your body can run business as usual.

#### IV. Does Yoga, Pranayam, Meditation help to boost immunity??

We do not know exactly if or how exercise increases your immunity to certain illnesses. There are several theories.

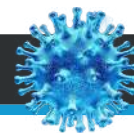
Physical activity may help flush bacteria out of the lungs and airways. This may reduce your chance of getting a cold, flu, or other illness.

Exercise causes change in antibodies and white blood cells (WBC). WBCs are the body's immune system cells that fight disease. These antibodies or WBCs circulate more rapidly, so they could detect illnesses earlier than they might have before. However, no one knows whether these changes help prevent infections.

The brief rise in body temperature during and right after exercise may prevent bacteria from growing. This temperature rise may help the body fight infection better. (This is similar to what happens when you have a fever). Exercise slows down the release of stress hormones. Some stress increases the chance of illness. Lower stress hormones may protect against illness [10].

Studies have shown that people who follow a moderately energetic lifestyle, benefit most from starting (and sticking to) an exercise program. A moderate program can consist of:

Bicycling with your children a few times a week  
Taking daily 20 to 30 minute walks  
Going to the gym every other day



Playing golf regularly

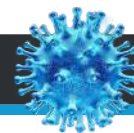


Meditation, in its many forms, can tweak the brain and body in a number of beneficial ways. It's been shown to increase volume in certain brain regions, to reduce anxiety and depression and improve immunity. In the journal Translational Psychiatry, helps out the molecular mechanisms behind meditation's effects on the immune system. And it turns out that the effects are more than from just the relaxation element – there seems to be something intrinsic about meditation itself that can shift gene expression and even boost mood over time [12,13].



Fig3. Showing different yoga poses to help boost immunity(ref:internet)





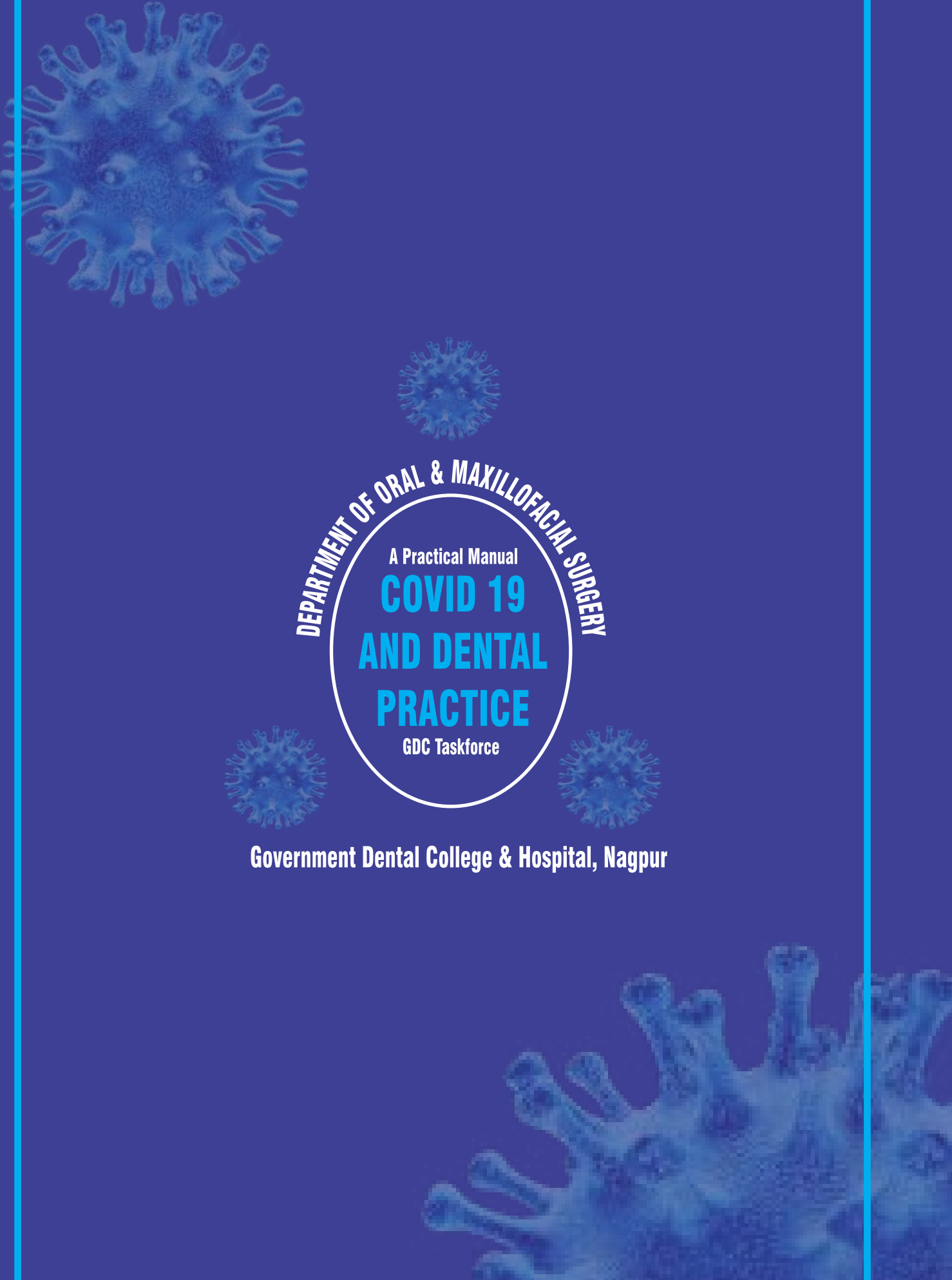
Yoga is a holistic practice that strengthens our physical body, as well as the microscopic systems that are not visible to the eye. As a result, the body's natural defence mechanisms also improve. A healthy, disease-free body can be easily achieved by adopting a healthy lifestyle, including eating unprocessed, whole foods, maintaining a regular yoga and meditation practice, getting plenty of sleep, and minimizing stressors. Ayurveda, yoga, and meditation are the keys to achieving our full potential. To reap the immune-boosting results of yoga, be sure to maintain a daily practice[14].

While a regular yoga practice can result in increased health, know that it is not a substitute for medical treatment. It is important to learn and practice yoga postures under the supervision of a trained teacher.

We all know that many of us will be asymptomatic who will not burden hospital. Immunity plays key role in fighting any disease ,our best investment would be doing or changing lifestyle .We should ask our selves only one question "Am I really healthy even when I am a doctor or a health professional" Time to think & know the sustainable, the time is giving a knock on our mind it maybe the new beginning.

#### References :

1. Arce-Sillas A, Álvarez-Luquín DD, Tamaya-Domínguez B, Gomez-Fuentes S, Trejo-García A, Melo-Salas M, Cárdenas G, Rodríguez-Ramírez J, Adalid-Peralta L. Regulatory T Cells: Molecular Actions on Effector Cells in Immune Regulation. *J Immunol Res*. 2016;2016:1720.
2. Lawrence H, Mawdesley AE, Holland JP, Kirby JA, Deehan DJ, Tyson-Capper AJ. Targeting Toll-like receptor 4 prevents cobalt-mediated inflammation. *Oncotarget*. 2016 Feb 16;7(7):7578-85.
3. Denson LA. The role of the innate and adaptive immune system in pediatric inflammatory bowel disease. *Inflamm. Bowel Dis*. 2013 Aug;19(9):2011-20.
4. Gack MU, Diamond MS. Innate immune escape by Dengue and West Nile viruses. *Curr Opin Virol*. 2016 Oct;20:119-128.
5. Channappanavar R, Perlman S. Pathogenic human coronavirus infections: causes and consequences of cytokine storm and immunopathology. *Semin Immunopathol*. 2017;39:529-39.
6. Shin HS, Kim Y, Kim G, Lee JY, Jeong I, Joh JS, et al. Immune Responses to Middle East Respiratory Syndrome Coronavirus During the Acute and Convalescent Phases of Human Infection. *Clin Infect Dis*. 2019;68:984-92.
7. Liu PT, Stenger S, Li H, Wenzel L, Tan BH, Krutzik SR, et al. Toll-like receptor triggering of a vitamin D-mediated human antimicrobial response. *Science* (2006) 311:1770–3. doi: 10.1126/science.1123933
8. Mora JR, Iwata M, von Andrian UH. Vitamin effects on the immune system: vitamins A and D take centre stage. *Nat Rev Immunol*. (2008) 8:685–98. doi: 10.1038/nri2378
9. McEwen BS, Stellar E. Stress and the Individual. Mechanisms leading to disease. *Arch Intern Med*. 1993;153:2093–101.
10. Glaser R, Kiecolt-Glaser JK, Speicher CE, Holliday JE. Stress, loneliness and changes in herpes virus latency. *J Behav Med*. 1985;8:249–60.
11. Cohen S. Psychological stress, immunity and upper respiratory infections. *Curr Dir Psychol Sci*. 1996;5:86–90.
12. Kiecolt-Glaser JK, Marucha PT, Malarkey WB, Mercado AM, Glaser R. Slowing of wound healing by psychological stress. *Lancet*. 1995;60:362–5.
13. Marucha PT, Kiecolt-Glaser JK, Favagehi M. Mucosal wound healing is impaired by examination stress. *Psychosom Med*. 1998;60:362–5.



DEPARTMENT OF ORAL & MAXILLOFACIAL SURGERY

A Practical Manual  
**COVID 19  
AND DENTAL  
PRACTICE**

GDC Taskforce

**Government Dental College & Hospital, Nagpur**