



The IDAK Sentinel

Helping you keep your guard up against COVID 19

Issue No. 2



Dr. B. Devi Priya

FROM THE EDITOR'S DESK

As we approach the third year of the pandemic, the coronavirus continues to make our lives difficult and confusing. As new variants emerge, it is no wonder that each one of us have turned into armchair epidemiologists trying to figure out how risky it is to attend a New Year's Eve party.

We are proud to present the second issue of our "IDAK Sentinel" series. This issue contains useful articles for the public as well as dental professionals. The pandemic shows no signs of abating, at least for the near future and it looks like masks will continue to be one of our most visible weapons in the battle to defeat it.

NOT ALL MASKS ARE CREATED EQUAL. In a nutshell, cloth/surgical masks just don't cut the virus. It is time to upgrade your mask to N95/ KN95/ KN94 respirators to hold your guard against the latest variants. Plaque Vs Plague highlights the role of a gum specialist during the current crisis. The final article projects the role of ACE 2 receptors in mouth and stresses on the importance of maintenance of oral hygiene.

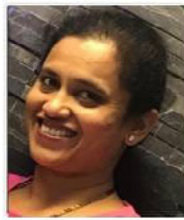
The information presented in this issue is update to the best of our knowledge. However, guidance and advice keep changing due to the evolving nature of COVID-19.

"We're learning as we go along. That's going to continue for a long time."



Dr. Devi Priya

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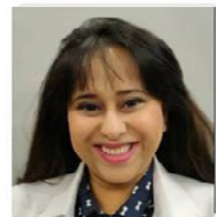
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Facemasks- Revisited



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As the world entered its second full year of the coronavirus pandemic, masks became a ubiquitous sight, from sports stadiums to the highest political offices.

December 2021 marks two years since the first concerning cases of a new respiratory disease began to emerge in Wuhan, China. Within weeks, the virus – Sars-CoV-2 – had spread across the world and ushered in a frightening new disease for the 21st Century: Covid-19.

Health agencies across the world realized quickly that even relatively humble disposable masks, if worn correctly over the mouth and nose, went a long way to preventing the spread of the virus. In 2021, as the world entered its second full year of the Covid-19 pandemic, masks were a ubiquitous reminder of the health emergency the world was grappling with.

Standardization of Surgical Mask

Different countries have various agencies to approve the surgical grade mask. Manufacturers have to meet the ASTM F2100 standard in USA and EN14683 standard in Europe before marketing masks for medical uses. They can be tested on the basis of bacterial filtration efficiency (BFE) at 3.0 μm , particle filtration efficiency (0.1 μm PFE), fluid resistance, breathability and flame spread.

There are 3 ASTM level masks: ASTM level 1, ASTM level 2 & ASTM level 3.

1. ASTM level 2 and level 3 can filter $\geq 98\%$ bacteria and 0.1 μm particulates, while level 1 mask can filter $\geq 95\%$. (In exhaled air)
2. Level-3 mask has better fluid resistance.

EN14683 standard masks can be divided into four categories: Type I, Type IR, Type II and Type IIR.

- Type I and Type II can filter $\geq 95\%$ and $\geq 98\%$ bacteria respectively; however, they are not resistant to fluid.
- Type IR and Type IIR have same BFE as Type I and Type II respectively but, they are resistant to fluid.



Method of Mask wearing (Donning)

- Clean your hands with soap and water or alcohol based sanitizer.
- Hold the mask; inspect it for any physical damage if present don't use it.
- Mask with ear loop- hold it by ear loop, and place the loops behind ears.
- Mask with ties- Bring the mask to the nose level, secure the upper tie first at crown of head.
- Adjust the mask at nose level by pinching or molding to secure the fit around nasal contour.
- Then secure the lower tie at the nape of neck.
- Pull the bottom of mask to cover chin region.

Method of Mask removing (Doffing)

- Perform hands cleaning with soap and water or sanitizer before touching the mask.
- Avoid touching the front of the mask which is usually contaminated.
- Only touch the ear loops/ties.
- Face Mask with Ear loops: Hold both of the ear loops and gently lift and remove the mask.
- Face Mask with Ties: Untie the bottom bow first then untie the top bow and pull the mask away from face as the ties are loosened.
- Immediately throw the mask if single use such as surgical mask in the trash.
- Clean hands with soap and water or hand sanitizer.



Caring of Mask

- If cloth mask is not wet or soiled and intended to reuse, keep it in a clean plastic, re-sealable bag.
- When need to use it again, hold the mask at the loops/ties while removing it from the bag.
- Mask should not be pulled down to chin and then keep it on again. While doing this, inner side of mask may be contaminated by the exposed area of below the chin (Submental & Submandibular region) which is potentially contaminated.
- One should have his own mask and it should not be shared with others.
- Wash cloth masks at least daily in soap or detergent and hot water (60 C).
- In case of unavailability of hot water, wash mask at normal temperature water with soap and, then either boil it for 1 minute or; soak it in 0.1% chlorine for 1 minute followed by thorough rinsing with normal water to make sure no chlorine residue remains at mask.
- Dry it and wear.

Alternatives to Cloth/fabric masks for the general public

In the context of non-medical mask shortage, face shields may be considered as an alternative noting that they are inferior to mask with respect to prevention of droplet transmission. If face shields are to be used, ensure proper design to cover the sides of the face and below the chin. In addition, they may be easier to wear for individuals with limited compliance with medical masks (such as those with mental health disorders, developmental disabilities, deaf and hard of hearing community and children).

Potential harms of wearing mask

- Self-contamination when mask is touched or adjusted by hands and face (nose, mouth or eyes) is touched with the same hand without hand hygiene or it may happen when masks are not changed when wet, physically damaged or soiled.
- Mask may cause a false sense of security that leads individual not to follow other preventive methods like frequent hand hygiene and physical distancing.
- Wearing mask for long hours or frequently may cause facial skin damage, irritant dermatitis or worsening acne.
- Breathing difficulties, especially with respirators and in hot & humid environment.
- Difficulty with communication in-general, and it is more difficult for the people who use lip reading for communication such as deaf person.
- It is difficult or harmful for many individuals to wear masks, especially for children, developmentally challenged persons, psychiatric patients, elderly persons with cognitive impairment, active asthma or COPD patients, facial trauma patients etc.
- Improper disposal of used/ contaminated masks may increase risk contamination in sanitation workers and environment hazard.



Double-Masking:

Why do I need to double mask?

As new, more contagious variants of the novel coronavirus spread around the world, public health officials are advising us to upgrade our mask protection. One of the easiest ways to do that is to wear two masks at the same time. Double-masking can improve the fit of your mask by closing gaps around the edges, and it creates multiple layers of protection against droplets coming in or out. Double-masking can increase your protection against the coronavirus.

Can I wear two surgical masks?

Wearing two disposable surgical masks together is NOT recommended. A standard surgical mask is a blue, rectangular mask made of paper-like material. While surgical masks are great filters against viral droplets, they tend to fit poorly, leaving gaps on the sides, which reduces their efficiency. Wearing two at the same time doesn't solve the fit problem. Adding a cloth mask on top of a surgical mask helps close the gaps and creates a snugger fit.

Should I double mask with an N95 or KN95?

The N95 mask is the gold standard for medical masks, and the KN95, made in China, is similar. When worn correctly, both masks will filter 95 percent of the hardest-to-trap particles. If you have access to a genuine N95 or KN95 and it fits well, you don't need to double mask. If you are not sure if it is genuine, then double-masking may be a safer option.

If I'm double-masking, why do I need to knot and tuck my surgical mask?

The best way to double mask is to wear a surgical mask as the first layer and cover it with a cloth mask. Tightening your surgical mask is not required, but if it fits poorly, knotting the ear loops and tucking in the corners can improve its filtering efficiency by as much as 20 percent.

What's the best way to check for leaks?

The C.D.C. recommends a simple method: Just cup your hands around the edges of your mask and breathe. If you feel air escaping around the edges, you'll want to tighten your nose bridge and ear loops or choose a cloth mask with more flexible material that gives you a better fit. The CDC notes that "If the mask has a good fit, you will feel warm air come through the front of the mask and may be able to see the mask material move in and out with each breath."



PLAQUE VS PLAGUE: PERIDONTAL ESSENCE OF THE COVID-19 MENACE

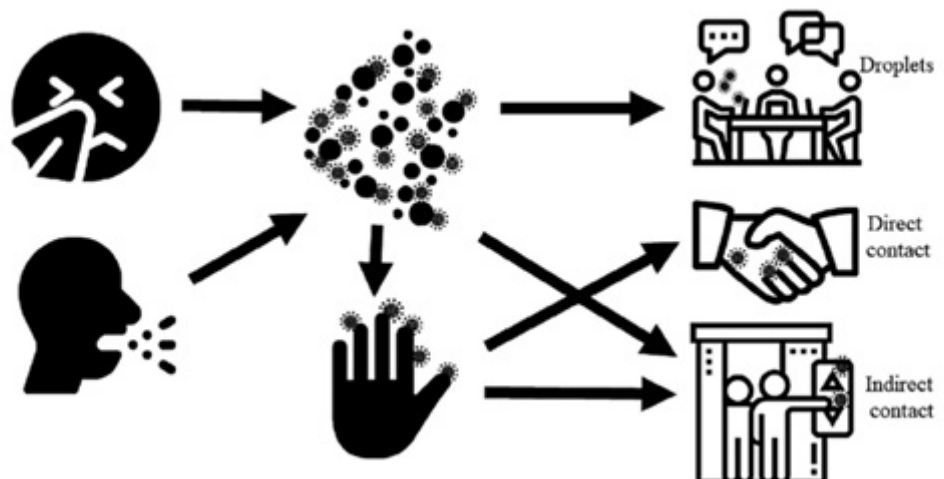


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On January 8, 2020, a novel coronavirus was officially announced as the causative pathogen of COVID-19 by the Chinese Centre for Disease Control and Prevention. The epidemic of coronavirus disease 2019 (COVID-19) that started from Wuhan, China has become a major challenging public health problem for not only China but also countries around the world. The novel coronavirus was initially named 2019-nCoV and officially as severe acute respiratory syndrome coronavirus 2 (SARSCoV-2). The fluid nature of the pandemic, the uncertainty, inconsistent reporting, and overall anxiety truly shook the globe to its core. Everyone involved in the delivery of dental care landed in a state of limbo, which was also true for our patients. This global experience will likely result in permanent changes across a wide swath of life as we know it once the pandemic is over.

The most common symptoms of COVID-19 are fever, dry cough, and tiredness. Other atypical symptoms include aches and pains, nasal congestion, headache, conjunctivitis, sore throat, diarrhea, loss of taste or smell or a rash on skin or discoloration of fingers or toes. Most people (about 80%) recover from the disease without needing hospital treatment. Older people, and those with underlying medical problems like high blood pressure, heart and lung problems, diabetes, or cancer, are at higher risk of developing serious illness. However, anyone can catch COVID-19 and become seriously ill. People of all ages who experience fever and/or cough associated with difficulty breathing/shortness of breath, chest pain/pressure, or loss of speech or movement should seek medical attention immediately. If possible, it is recommended to call the health care provider or facility first, so the patient can be directed to the right clinic.





Based on findings of genetic and epidemiologic research, it appears that the COVID-19 outbreak started with a single animal-to-human transmission, followed by sustained human-to-human spread. It is now believed that its interpersonal transmission occurs mainly via respiratory droplets and contact transmission. Although patients with symptomatic COVID-19 have been the main source of transmission, asymptomatic patients and patients in their incubation period are also carriers of SARS-CoV-2. A contact is defined as 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 min; (2) direct physical contact with a probable or confirmed case; and (3) direct care for a patient with probable or confirmed COVID-19 disease without using proper personal protective equipment or other situations as indicated by local risk assessments.

The diagnosis of COVID-19 can be based on a combination of epidemiologic information (e.g., a history of travel to or residence in affected region 14 d prior to symptom onset), clinical symptoms, CT imaging findings, and laboratory tests (e.g., reverse transcriptase polymerase chain reaction [RT-PCR] tests on respiratory tract specimens) according to standards of the WHO (2020). It should be mentioned that a single negative RT-PCR test result from suspected patients does not exclude infection. Clinically, we should be alert of patients with an epidemiologic history, COVID-19-related symptoms, and/or positive CT imaging results.

EFFECT OF COVID-19 ON PERIODONTAL TISSUES: ORAL MANIFESTATIONS OF CORONA:

Current research shows that coronavirus damage to respiratory and other organs could be related to the distribution of angiotensin-converting enzyme 2 (ACE2) receptors in the human system. Therefore, cells with ACE2 receptor distribution may become host cells for the virus and further cause inflammatory reactions in related organs and tissues, such as the tongue, oral mucosa and salivary glands. COVID-19 acute infection, along with associated therapeutic measures, could potentially contribute to adverse outcomes concerning oral health, likely leading to various opportunistic fungal infections, recurrent oral herpes simplex virus infection, unspecific oral ulcerations, fixed drug eruptions, dysgeusia, xerostomia linked to decreased salivary flow, ulcerations and gingivitis as a result of the impaired immune system. Necrotizing periodontal lesions associated with corona have shown high levels of *Prevotella intermedia* in the metagenomic analysis. Oral vesiculobullous lesions were reported by various authors suggestive of Covid 19 co-infections.

NEGLECTED ORAL HYGIENE

It is obvious that proper oral hygiene is partially dependent on the mental health status of the patient. It has been reported that psychological disturbances can lead patients to neglect oral hygiene and that the resultant accumulation of plaque is detrimental to the periodontal tissue. Stress can come in many forms, but we all experience it. For many, the uncertainty surrounding coronavirus has been the most difficult aspect. The idea of ventilator associated pneumonia and poor oral health when intubated is a known fact and fortunately very avoidable. Numerous studies have shown that improved oral care can significantly reduce the incidence of ventilator-associated pneumonia in ICU patients. It can also reduce the risk of acquiring a bacterial superinfection.

CHANGES IN DIETARY INTAKE

The unstructured days designed by the dreadful pandemic have placed everyone in an unproductive and sluggish milieu. This may result in disruption to our normal sleeping patterns, a change of eating habits and, a neglect of oral hygiene for some too. Emotional conditions and psychological factors



affect the choice of foods, the physical consistency of the diet, and the quantities of food eaten. This can involve, for instance, the consumption of excessive quantities of refined carbohydrates and softer diets requiring less vigorous mastication and therefore predisposing to plaque accumulation at the approximal risk site. Stress also leads to other behavioral changes such as overeating, especially a high-fat diet, which then can lead to immunosuppression through increased cortisol production.

BEHAVIOURAL ALTERATIONS:

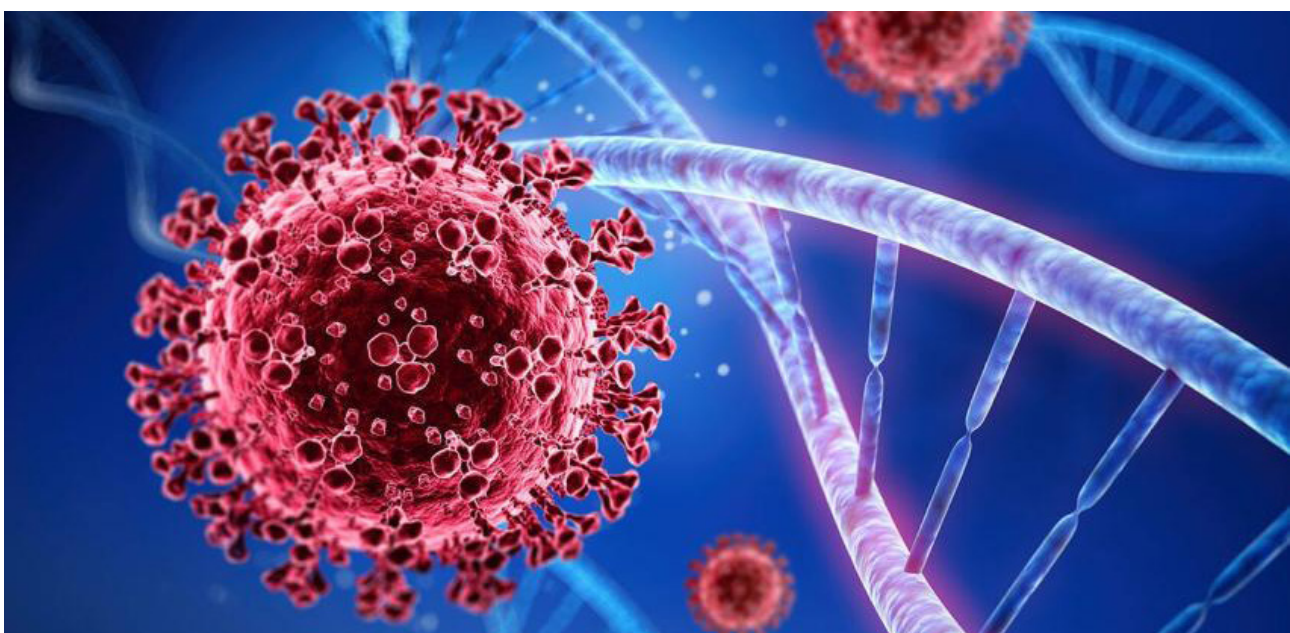
Disruption to normal routine and the uncertainty of the future can increase stress and depression. Studies by Wimmer et al (2002) show that chronic stress, not only increases the severity of periodontal disease but also decreases the effectiveness of treatment. In addition, passive coping strategies, such as smoking and increasing alcohol consumption, have been found to be more pronounced in individuals with more advanced disease. Among the many harmful oral habits, which are believed to be induced by emotional disturbances, smoking is possibly the most important in relation to worsened periodontal conditions. Circulating nicotine results in (i) vasoconstriction, produced by the release of adrenaline and noradrenaline, which is supposed to result in a lack of nutrients for the periodontal tissue; (ii) suppression of in vitro secondary antibody responses and (iii) inhibition of oral neutrophil function.

EFFECT OF PERIODONTITIS ON COVID-19: HEALTHY ORAL CAVITY – STRONG BARRIER:

A healthy oral cavity acts as a barrier against all kinds of diseases, this is also true for COVID-19. Chronic systemic inflammation associated with periodontitis may presuppose a higher risk of increased severity of COVID-19 in periodontitis patients. This predicate is supported by the available scientific evidence supporting the relevance of oral health, and specifically, of periodontal health, on systemic health.

INFLUENCE OF INFLAMMATION ON COVID-19:

Improved oral hygiene may also reduce risk of complications. A study published in the British Dental Journal highlighted the importance of improved oral hygiene during a SARS-CoV-2 infection in order to reduce the bacterial load in the mouth and the risk of a bacterial superinfection. Since inflammatory and dysbiotic factors as well as comorbidities affect systemic health, it is possible that periodontal status indicates the risk of complication of COVID-19



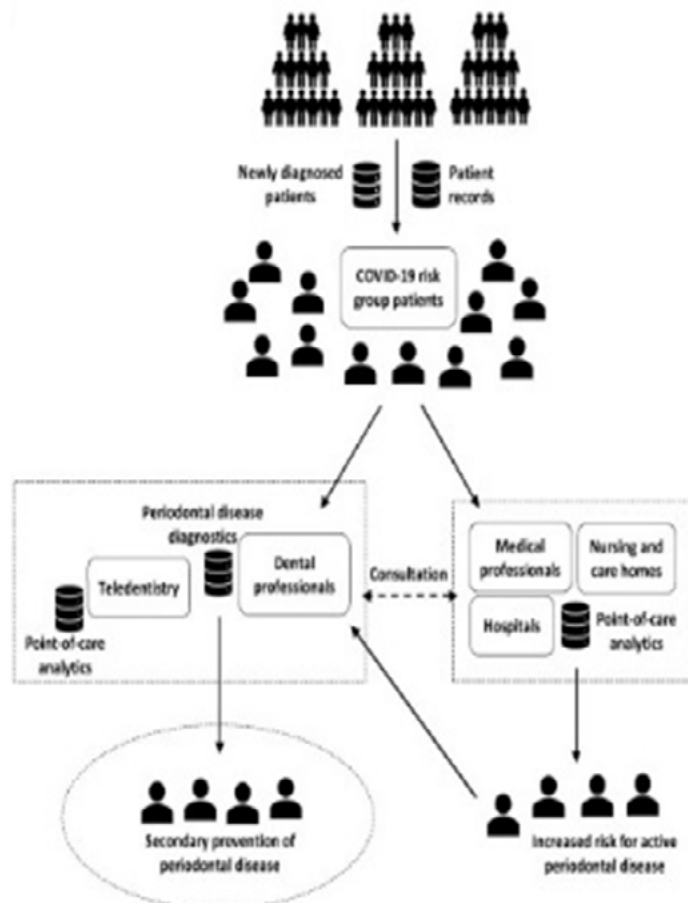


CONCEPT OF NETOSIS:

NETosis is a regulated form of neutrophil death leading to the release of extracellular chromatin and the assembling of proteins, including antiviral proteins, primed by an initial pathogenic stimulus. Under certain specific conditions, neutrophils can exhibit a double-edged activity. Neutrophil extracellular traps (NETs) are involved in the pathogenesis of COVID-19 by promoting a pro-inflammatory and a procoagulant state leading to multiorgan failure. This particular form of host defense promoted by neutrophils is closely related to the well-known cytokine storm observed in severe COVID-19 patients. Such pathophysiology finds evidence in periodontal disease as well. Coupled with impaired removal, NETs have been implicated in both these disease forms to promote a state of inflammation and be a source of constant harm to the tissues involved. This potentially forms groundwork to implicate periodontal disease as predisposing towards adverse COVID-19 related outcomes. This introduces the possibility of patients suffering from periodontitis at an increased risk of COVID-19 related adverse outcomes.

SHARED RISK FACTORS:

There is enough evidence to propose that periodontal disease acts as a risk factor for COVID-19. Periodontitis could be indicative of systemic health as it has been widely associated with several disorders such as diabetes, hypertension, obesity etc. Furthermore, these comorbidities and additional factors are common risk factors in patients with severe COVID-19 illness. There are various shared risk factors among periodontal disease and COVID-19. Some of them include aging, male gender, diabetes, hypertension, cardiovascular disease, obesity, chronic obstructive pulmonary disease, asthma, smoking, stress, HIV, cancer, liver disease, rheumatoid arthritis etc.





ROLE OF PERIODONTIST:

PATIENT EDUCATION:

In the present situation of lock down and quarantine where easy access to a dentist is not possible, we should be champions of prevention and not just focus on treatment. This window of opportunity allows more time to primarily focus on oral hygiene instructions and could be rewarding in more ways than we think. There has never been a better opportunity to change the way we think and focus on patient education. Particularly with regards to disease progression, ways to control periodontal conditions at home, and the benefits it brings.

CONCLUSION:

For years, the dental profession has been aware of the direct connection between the mouth and the body. Many believe that the mouth is the mirror to one's health. COVID-19 is a learning opportunity, not just for patients, but ourselves as students and clinicians too. Highlighting the importance of prevention; by using the time for more than treatment alone, it will allow patients to engage and understand their periodontal condition and take ownership and responsibility for their disease management and prevention.

New strategies and approaches to identify patients at risk of periodontal disease could be beneficial to enhance secondary prevention, especially if targeted to COVID-19 risk groups. Diagnostic biomarkers for periodontal disease have been researched extensively. Potential biomarkers in oral fluid with currently available rapid non-invasive point-of-care technology, such as aMMP-8, could help to extend screening and identification of patients at risk for periodontal disease also to situations and places where professional dental expertise and equipment are limited or unavailable. i.e., nursing and care homes, and rural and distant places. The oral fluid point-of-care technologies could also be useful in the hands of medical professionals (diabetes, CVD, etc.) to identify patients at risk for undiagnosed periodontal disease and to refer them to a dentist for examination and evaluation. Finally, if there is a causality between periodontal disease and severe COVID-19 infections, these point-of-care oral fluid biomarker technologies could possibly also help in the assessment of the risk of deterioration and complications.

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Respirators



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A respirator is a device, usually worn by health care workers, that covers nose and mouth to protect from acquiring an illness or breathing in other dangerous substances, such as chemicals or infectious particles.

They can be further classified as Air-purifying and Air-supplied respirators.

1. Air-purifying respirators- They remove aerosols (airborne droplets and solid particles), vapor gases or a mixture of contaminants from the air through the use of filters, or cartridges. They purify/filter the air in the working area and do not supply oxygen from external source.

There are four different types of air –purifying respirators.

a. Filtering face-piece respirators (FFR) - They remove particles from the inhaled air by filtering; nevertheless, they don't protect from hazardous gases.

- The FFR classes include N (not resistant to oil), R (somewhat resistant to oil), and P (strongly resistant to oil) series, which are available at 95, 99, and 100 filtration efficiency levels.

N95 is the most widely used respirator by health care workers in this group (Fig.1).

1. It provides a tight fitting against the wearer's face, covering the nose and mouth.
2. Minimal leakage when donned properly.
3. Filter is made up of melt blown non-woven polypropylene.
4. It may have an exhalation valve located on the filter, which reduces breathing resistance during exhalation. Also, valve controls carbon-dioxide and heat build-up in the mask (Fig.2)
5. Filter Capacity- filters 95% of particles in the inhaled airstream, protect from aerosols (airborne droplets and solid particles).

Recommendations-

1. Use during treatment/care of respiratory virus infected patients (e.g. Coronavirus positive) in isolation, hospital wards, ICU setups etc. with other personal protective equipment (PPE).
2. Use during Aerosol generating procedure (AGPs), (Endotracheal intubation, Ultrasonic scaling etc.).
3. It can be used in crowded/ confined public places if other options are not available; however, this is not recommended by studies, and it is not encouraged as well due to less availability. N95 must be prioritized and conserved for HCWs, especially during pandemic when resources are stretched.
4. Ideally it should be discarded after each patient encounter and after AGPs. It should not be used when it is physically damaged, wet or shows any visible blood or body fluid. Also, when it is unable to create a tight seal or shows any breathing difficulty, it should be discarded.

Limitations-

1. It cannot protect against harmful gases and vapors.
2. Limited Supply.



Fig.1- N95 Mask



Fig.2 - N95 mask with Exhaust Valve

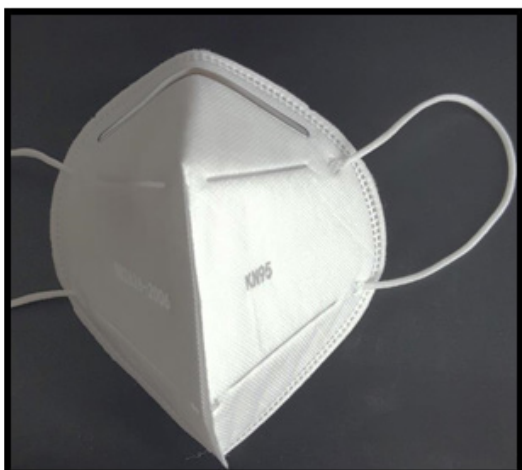


Fig.3 KN95 Mask

N99 and **N100** have filtering capacity of 99% and 99.97% of airborne particles respectively. This is the American Standard of measuring filtering capacity of respirators that is managed by NIOSH. Similarly, KN95 a Chinese respirator is equivalent to N95 (Fig.3).

Dust Mask- It is a comfort half-face mask that covers nose, mouth and chin with single or double straps and usually, made up of paper like material. Although it looks similar to FFRs, it is neither respirator nor protect from toxic air. Unlike FFR, they do not require any approval from agencies of Standardization. They can be worn during construction or household activities like mowing, gardening, sweeping, dusting etc. (Fig.4).

Recommendation – It can be used by general public in the public setups during this pandemic when other types of mask are not available; however, it must not be confused with N95 or other respirators.



Fig.4- Dust Mask

b. Elastomeric Half Face-piece Respirators-

These devices are reusable with exchangeable cartridges or filters. The face piece is made up of rubber or silicone that forms a tight seal against the user's face. They protect against gases, vapors, and/or particles if equipped with the appropriate filters and/or cartridges. Cartridges should be changed according to use and manufacturer's guidelines (Fig. 5).



Fig. 5- Elastomeric Half Face-piece Respirator with Cartridges

c. Elastomeric Full Face-piece Respirators –

These full face pieces cover roughly from the hairline to below the chin. These types of respirators tend to provide a more reliable face seal than FFRs or elastomeric half face piece respirators (Fig. 6).



Fig. 6 - Elastomeric Full Face-piece Respirator with Cartridges



Powered Air-Purifying Respirator –

Powered Air-Purifying Respirators (PAPRs) are battery-powered devices that use a blower to pull air through attached filters (for particles) or cartridges (for gases or vapors) to clean it before delivering it to the breathing zone of the wearer (Fig.7).

Fig.7- Person wearing Powered Air-Purifying Respirator

2. Air-supplied respirators- They provide clean breathing air from a source independent of the work area and protect users from many types of airborne contaminants (particles, gases, and vapors) and, in certain cases, oxygen-deficient atmospheres (Fig. 8).

There are three types of atmosphere-supplying respirators:

- i. Supplied-air respirators (SARs)
- ii. Self-contained breathing apparatus (SCBAs)
- iii. Combination SARs/SCBAs.



Fig. 8- Person wearing Air Supplied Respirator with cylinder



Mask Recommendations for Medical or Dental care personnel (HCWs)

Use of Surgical Mask

1. Health care workers (HCWs) should continuously wear a surgical mask during their routine activities throughout the shift with other personal protective equipment. It is more important when working in potential higher transmission risk areas such as emergency rooms, triage, OPDs, cancer, transplant units, Covid-19 wards etc.
2. HCWs should make sure that the mask is changed when it is wet, visibly soiled, or damaged.
→ Mask should not be touched to adjust or displaced from the face, if it happens, the mask should be removed properly and replaced, and hand hygiene should be performed.
3. The surgical mask along with other personal protective equipment is changed after contact with any patient.
4. Administrative staff and other staff of healthcare facilities who do not work in clinical areas do not necessarily need to use a surgical mask during routine activities; however, fabric mask is highly recommended. In addition, if resources allow, they can also use surgical masks following complete instructions of wearing and removing of mask.
5. In any condition, masks should not be shared between health workers.
6. HCWs should follow the guidelines properly to dispose the surgical mask, and its reuse should be avoided.

Use of Respirators

1. It is already described in the previous section that respirators provide protection from aerosols and airborne particles. There are various procedures in the medical and dental treatment that create aerosol which are defined as Aerosol generating procedures (AGPs). AGPs in infected patients can create infected aerosols which transfer infection by inhaling if precautionary measures have not been taken.
2. AGPs in Medical treatment - Endotracheal intubation, Tracheostomy, bronchoscopy, CPAP/ BiPAP Chest physiotherapy, Air-way suction, Nebulization procedure, Sputum induction etc.
3. AGPs in Dental treatment - Ultrasonic scaler, Piezoelectric hand piece, Air-driven high-speed hand piece without rubber dam, Air polishing, Air-water syringe, Tooth preparation with Air Turbine hand piece, Tooth preparation with air abrasion.
4. Areas where AGPs are performed for Covid-19 confirmed and suspected cases, such as ICU, Operation theatre, Dental clinic etc. certified respirators like N95 or equivalent (FFP2) or higher versions should be used by HCWs. It should be worn for entire shift following the proper instructions of donning and doffing.
5. Dressing rooms, cafeterias and other shared places of hospitals where mask wearing is not feasible, HCWs should follow the meticulous hand hygiene measures and physical distancing.



Reuse of N95 masks:

Sudden increase in demand of respirators with limited supply compels health care facilities to reuse or extend the use of respirators, especially N95. CDC recommends guidelines for the hospitals to protect HCWs in these circumstances that include:

1. Reduce the number of HCWs who require respirators using methods of engineering and administrative control.
2. Use reusable respirators, for instance elastomeric half-mask & full face-piece and other alternatives.
3. Conserve N95 masks for those who are at the highest risk of contracting infection.
4. Allow extended use and/or limited reuse of N95 if acceptable by local health authority.

Extended use of N95 mask can be described as of wearing the same N95 while in close contact with multiple infected patients, without removing it between patient encounters. Implementation of extended use practice can be applied in wards and other areas where patients are infected with the same pathogen, for example Covid-19 wards.

Reuse of N95 masks describes removing of mask after patient encounter, store it and, put it on again for the next infected patient. However, there are certain guidelines and restrictions which limit the number of times a N95 can be reused.

Policies to follow extended or reuse practice should be formulated by local health authorities while taking care of availability of respirators, rate and severity of infection, patient load etc. Overall, it should be tailored according to the requirement and supply of respirators (N95).

Mask should be discarded properly in the designated area in case of extended use after the shift while for reuse, after removing either it should be hung in specified area or kept in clean, breathable container like a paper bag between uses.

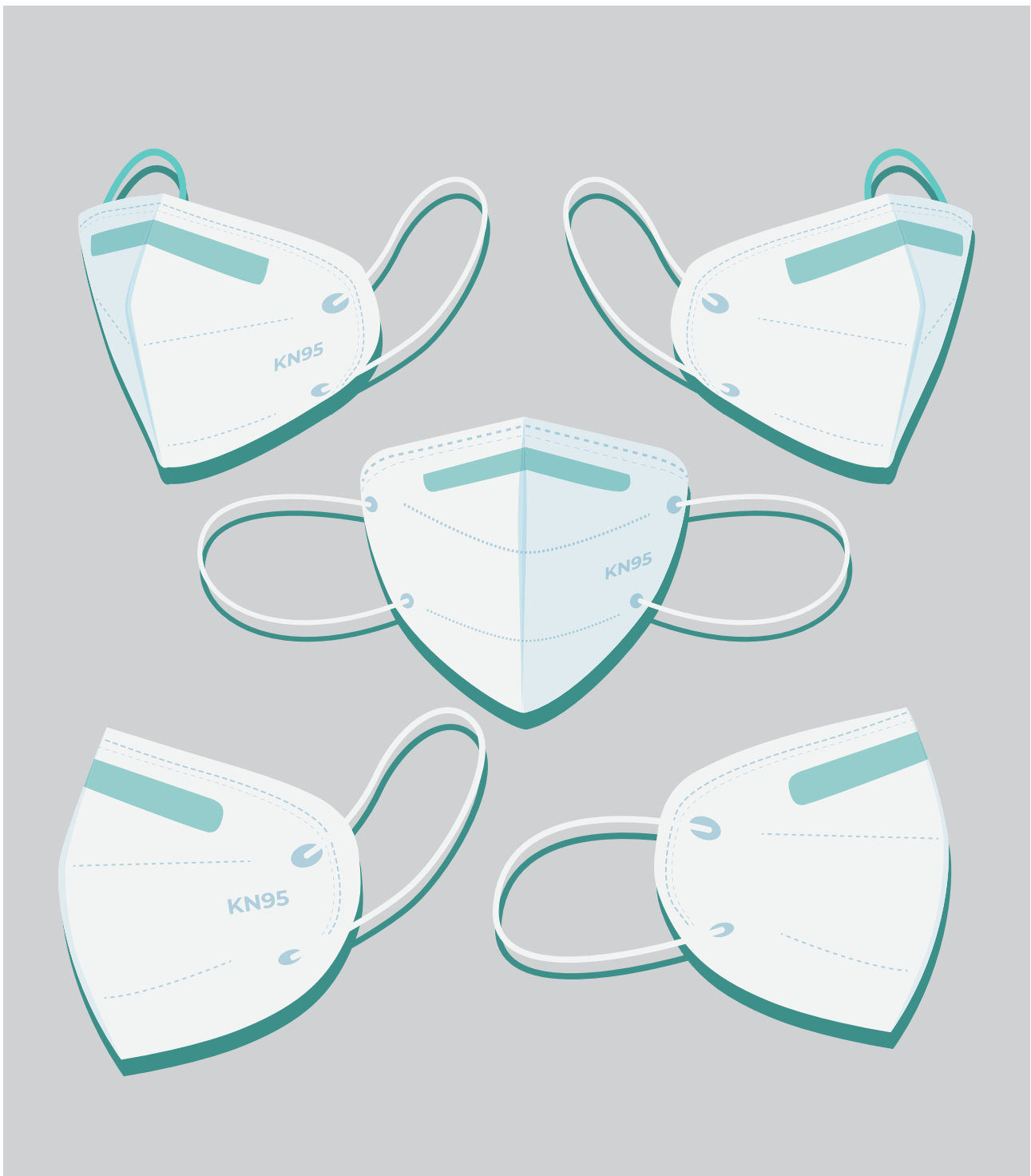
N95 mask should be discarded:

1. After performing AGPs.
2. If it is soiled or shows visible blood or other body fluids.
3. Following close contact with, any patient co-infected with an infectious disease requiring contact precautions.
4. If it is physically damaged, difficult to breathe through or with inadequate seal.

While there is no study to describe the maximum number of safe reuses for a N95; however, up to five uses are accepted by a single wearer. The most significant risk of Extended Use and Reuse of N95 is of contact transmission from touching the surface of the contaminated respirator (self-inoculation). To overcome the risk of contact transmission of Coronavirus from reuse policy of N95 respirators, user should keep the mask in clean breathable paper bag minimum for 5 days between each use. Eventually, to apply this strategy, each HCW requires at least five N95 at a time. If there is further constraint in supply, decontamination of respirators may be an option.

Presently, N95 respirators are for single use; nevertheless, decontamination and reuse have been suggested as a crisis capacity strategy during the pandemic when supply of respirators is extremely limited. Choosing a decontamination method for respirators, its impact should be assessed on the

filter performance, fit and seal of mask, and efficacy against pathogen such as Coronavirus. Hence, it is necessary to consult the manufacturer company and follow its recommendation. If decontamination recommendations are not given by manufacturer, it can be decontaminated by accepted methods; however, these decontaminated masks should not be used during AGPs. To date, Ultraviolet germicidal irradiation, vaporous hydrogen peroxide, and moist heat have provided the most promising results. These methods do not degrade the filter performance or affect fit and seal of respirators. They show satisfactory antimicrobial properties as well. Nevertheless, they can be used only for a limited number of times.



ACE 2 receptors and its role in the COVID-19 era



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INTRODUCTION

The epidemic of coronavirus disease 2019 (COVID-19), originating in Wuhan, China, has become a major public health challenge for not only China but also countries

around the world. Coronaviruses are a large family of viruses that cause illnesses ranging from common cold to the more severe diseases such as Middle East

Respiratory Syndrome(MERS-CoV) and Severe Acute Respiratory Syndrome (SARS-CoV).

A novel Coronavirus is a new strain which has not been identified in humans previously. COVID-19 or Corona Virus disease clinically manifests as severe acute respiratory syndrome corona virus 2 or SARS-CoV 2. The pandemic of novel corona virus disease is having an overshadowing impact on all our lives.

How Corona Virus disease is caused.

One of the disease progression studies states that SARS CoV 2 virus possesses the typical coronavirus structure with the “spike protein” or “S Protein” in the membrane envelope. The S protein from coronavirus can bind to the ACE 2 receptors of the host to facilitate viral entry into target cells. ACE2(angiotensin-converting enzyme 2) is a protein on the surface of many cell types. It is an enzyme that generates small proteins – by cutting up the larger protein angiotensinogen – that then go on to regulate functions in the cell.

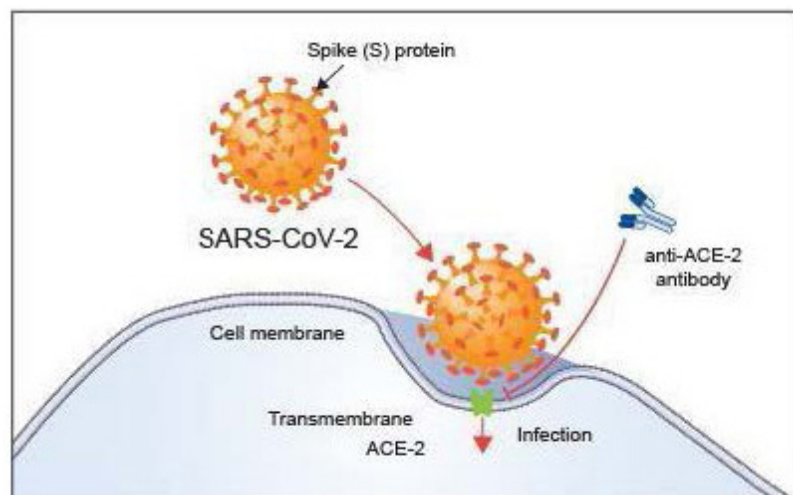


Fig 1. Binding of Corona Virus to ACE 2 Receptors

RISK FACTORS

1. The high affinity between ACE2 and SARS-CoV 2 protein suggested that the population with higher expression of ACE2 might be more susceptible to 2019-nCoV.
2. Genetic risk- A gene cluster on chromosome 3 is a risk locus for SARS CoV-2 related respiratory failure. A new controlled study of more than 3000 hospitalised COVID 19 patients has confirmed it as the major genetic risk factors for severe SARS COV 2 infection and hospitalization. About 50 % South Asians and 16% Europeans carry this risk today.
3. Demographic risk factors: Advanced age and being a male.
4. Zinc deficiency is a predisposing factor for SARS/COV-2 infection. As with ever infection, the virus further decreases the serum and nasal zinc, which may reach a critically low level. Its been recently proposed that the local drop in nasal zinc levels may induce transient anosmia due to decreased function of zinc dependant metalloenzyme carbonic anhydrase which maintain taste and smell function.

Loss of taste and smell

It is one of the early symptoms reported in the COVID-19 patients and the virus is abundantly found in the salivary secretion of the infected symptomatic and asymptomatic patients . It is studied that people with baseline zinc deficiency may have prolonged anosmia (loss of smell) and more severe COVID 19 symptoms.

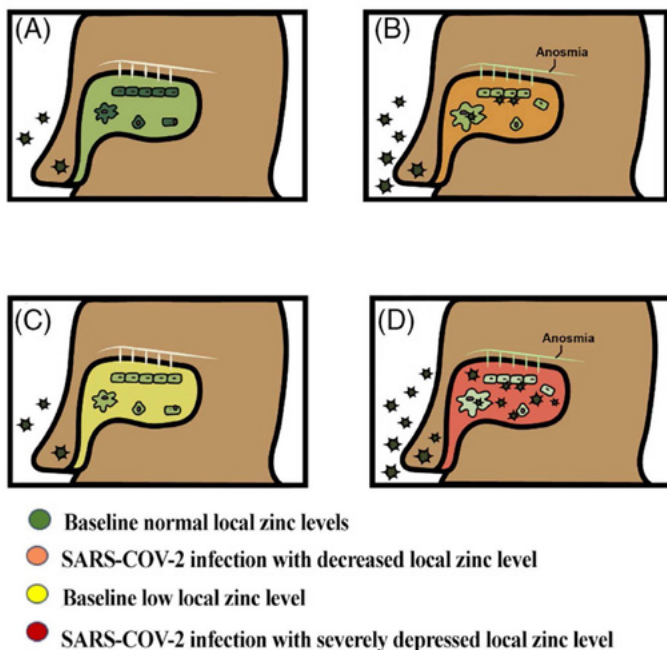


Fig 2. Relation between Zinc Deficiency and SARS/COV-2 infection

5. Sites of ACE 2 receptor expression:
 - a. Apart from respiratory, cardiovascular, GI tract, renal- excretory and reproductive systems there is a significant ACE 2 expressions in brain/CNS.

ACE 2 receptor expression is detected highest in pons/medulla oblongata which are respiratory centers of brain. This may in part explain the respiratory distress.

- b. ACE 2 receptor expression detected in retinal cells of the eye/visual system-suggests the role of eye/visual system as entry points for SARS-COV 2 invasion. Hence, are eye glasses face shields as important as facemasks.



Fig 3. A medical personnel wearing all protective equipment

ACE 2 expression in oral sites

- c. Among different oral sites, ACE 2 expression was higher in tongue than buccal and gingival tissues. These findings indicate that the mucosa of oral cavity may be a potentially high-risk route of 2019-nCov infection.



Fig 4. Differential expression of ACE2 in different oral sites

- Red – tongue
- Green – floor of mouth
- Blue – base of tongue
- Purple -other areas

Hence, it is possible to ascertain that poor oral hygiene is a modifiable risk factor for COVID19 complications and that there is a vital place for the promotion of good oral hygiene like tongue brushing/cleaning along with regular tooth brushing and mouth rinsing as a preventive public health intervention during the pandemic.

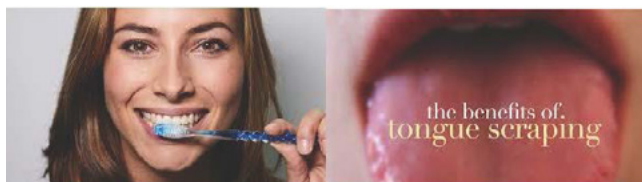
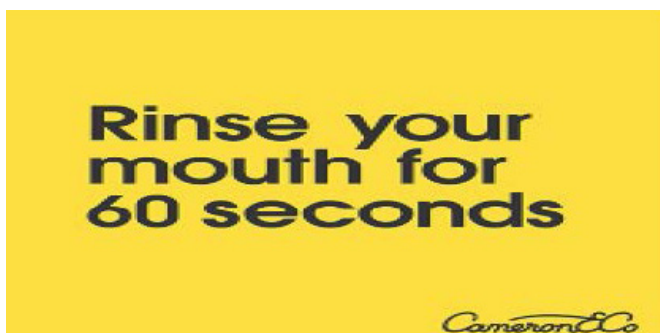


Fig 5. Tooth brushing and tongue scraping

ORAL PREVENTIVE MEASURES

1. Studies have stated that preprocedural mouthrinse like Chlorhexidine rinse, 0.2% povidone iodine rinse, 1.5 % hydrogen peroxide rinse can reduce the potential risk of SARS CoV 2 transmission associated with dental aerosol generating procedures.

Chlorhexidine rinse was significantly more effective at reducing aerosol contamination compared to povidone iodine and other agents because that's the only molecule that has sustained release into saliva.



2. Tongue brushing along with regular tooth brushing is important to reduce oral viral load to an extent.
3. Dietary modifications during COVID -19 - Zinc and Vitamin D therapy has shown favourable results by preventing complications in hospitalized patients.

CONCLUSION

The infection routes and pathogenesis of 2019-nCov are not fully understood by far, and further study of 2019-nCoV host cell receptor ACE2 could be valuable for the better prevention and treatment of the COVID-19.

Along with the use of masks, social distancing and eyewear, an additional recommendation for the use of antiviral mouth rinses like Chlorhexidine, which have the ability to maintain low viral loads in the mouth for a long period of time during which healthcare workers can complete their consultation and treatment procedures can significantly help in the prevention of SARS-COV-2 infection spread in the community.



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