



(REVIEW ARTICLE)



## Effect of preprocedural oral rinses with active ingredients like chlorhexidine, povidone-iodine and cetylpyridinium chloride in neutralizing SARS-COV-2 concentration in aerosol

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### Abstract

The havoc of COVID 19 pandemic, has created a situation of panic among the health care professionals and general population worldwide. The Virus being a droplet infection has increased the vulnerability of infection among the dental professionals, affecting the clinical practice. The patient being reluctant to visit the dentist due to fear of cross contamination in the dental office has reduced the patient in flow to a certain extent. Various measures have been suggested by the health authorities to avoid the transmission of the virus in the dental office. One such measure is the use of a preprocedural rinse. This acts as the need of the hour to reduce the virus transmission from the patients and prevent cross contamination in dental clinics. Various formulation of mouthwashes are used for preprocedural rinsing. The most common being chlorhexidine, povidone-iodine, cetylpyridinium chloride and hydrogen peroxide. The antimicrobial property of these have also been found to be effective against severe acute respiratory syndrome corona virus 2. These ingredients in mouth washes are found to temporarily neutralize the virus load for certain amount of time in saliva and other oral fluids. Thus preprocedural rinse can reduce the risk of transmission of virus and can be used as an adjunct with air filters and PPE kits for prevention and protection from infection.

**Keywords:** Neutralize; Oral Rinses; SARS-COV-2; Aerosols; COVID-19

### 1. Introduction

World has been going through unexpected times making lives across the globe at risk. As of march 11, 2019 WHO declared COVID-19 outbreak as a pandemic [1]. COVID-19 is a viral infection caused by severe acute respiratory syndrome corona virus 2 (SARS-COV-2) responsible for acute respiratory distress and is transmitted by respiratory droplets generated when an infected person coughs, sneeze or exhales. These droplets are heavy and fall on floor quickly, for the transmission of infection one has to be in close proximity to the infected person. Research has confirmed presence of SARS-COV-2 in aerosol which are responsible for cross contamination and stay in surroundings for longer time [2]. Dental professionals work closely to the patients making them at high risk of infection and in dental setting procedures involving ultrasonic scalers, water-air three-way syringe and also high-speed handpiece are known to generate aerosols and disperse them making dental setting as a source of cross contamination and infection. Certain precautionary measures are recommended to reduce aerosol microbiota like preprocedural oral rinses as there is evidence of anti-microbial properties of mouthwashes and their effectiveness against HSV-1, HSV-2, Hepatitis, Influezna and others [3]. In a recent study conducted by Colgate Palmolive research in partnership with Rutgers University's public health research institute and regional biosafety laboratories oral rinses are found to neutralize 99.9% virus in the oral fluids after 30 seconds of contact suggesting neutralization of virus in aerosols [4].

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## 2. SARS-COV-2

SARS Corona virus-2 is a single stranded RNA virus of zoonotic origin transmitted through direct contact or by contact with a contaminated surface [5]. The incubation period of corona virus ranges from 7 to 14 days and research have found virus to be at peak level in nasal cavity and oro- pharyngeal tissues during initial days. Virus enters human cells by binding to ACE-2 and its number is higher in oral mucosa especially in epithelial layer, tongue and minor salivary glands therefore these salivary glands act as reservoir for transmission and infection of virus through saliva [6].

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## 3. Dental aerosol

Aerosol is defined as colloidal system of solid or liquid particles in a gas, size of aerosol is less than 5µm in diameter and is capable of causing infection. It consists of water, saliva, blood debris and microorganisms like fungi, virus, bacteria, and protozoa along with toxins. They are produced during procedures involving ultrasonic scalers, three-way syringes and high speed handpiece or when patient coughs, sneezes and even during gag. Organisms commonly present in aerosols are *Corynebacterium diphtheria*, *Mycobacterium tuberculosis*, *Haemophilus influenza* and also SARS Corona virus –2. Corona virus in aerosols can stay viable for 3 hours and travel up to several meters, found in a study [7]. To reduce the risk of infection from aerosol microbiota, it is recommended to do preprocedural rinses, routine sterilization and disinfection, flushing of water supply every 30 patients etc [8].

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## 4. Mouth rinses

According to ADA, mouthwashes are of two types: cosmetic and therapeutic. Cosmetic mouthwashes are used in patients with halitosis whereas therapeutic mouthwashes are used to prevent or control dental caries, gingivitis and halitosis by the action of its active ingredients [9]. The active ingredients of oral rinses like chlorhexidine [CHX], cetylpyridinium chloride [CPC], hydrogen peroxide [HP], povidone-iodine [PVP-I] have been found to reduce microbial content in aerosol by 64.8% [10].

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## 5. Povidone- iodine

Povidone-iodine is an oral antiseptic solution commonly used in dental practice after scaling. In the recent study of in-vitro inactivation of SARS-COV-2 using povidone-iodine oral antiseptic rinse revealed 100% inactivation of the virus within 15 seconds of contact in the oral fluids [11]. This virucidal property of povidone-iodine can be an effective measure in reducing virus concentration in dental aerosols. PVP-I in two concentrations was tested for virucidal activity one undiluted and another at 1:2 dilution at 0.5% concentration affects the surface protein of enveloped viruses [12]. The common adverse effects by PVP-I are temporary burning sensation, local irritation and itching which can last from several minute to hours. It is contraindicated in pregnant women, lactating women & patients allergic to the active ingredient [13].

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## 6. Cetylpyridinium chloride

It is a quaternary ammonium compound which acts an antiseptic & antimicrobial agent. A Colgate Palmolive study showed mouthwashes with CPC as an active ingredient neutralized 99.9% of virus that causes COVID- 19 within 30 seconds of contact & virus remains in inactivate state for 60 minutes. This is available in market under the brand names: Colgate Plax and Colgate total, although this is not a treatment or cure for COVID-19 but it can be used to prevent spread of infection by taking oral care, also if CPC is used as a pre procedural rinse it can act as a potential protective measure against COVID-19 [14].

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## 7. Chlorhexidine

Chlorhexidine is the agent which has shown most positive antibacterial results, it's a diguanidohexane with pronounced antiseptic properties. Clinical investigations have found that two daily rinses with 10ml of 0.2% aqueous solution of chlorhexidine digluconate almost completely inhibited plaque deposition, calculus formation and gingivitis in human models. It has a broad anti-bacterial spectrum and is equally effective at low and high concentrations [15]. In a recent clinical study of two patients found COVID-19 positive chlorhexidine mouthwash 0.12%, 15ml was found to reduce SARS-COV-2 load in saliva for 2 hours. Although virus concentration increased 2-4 hours after the use of mouthwash but this reduction for 2 hours can be helpful during a dental treatment to reduce virus concentration in aerosols and reduce risk of cross contamination [16].

Spread of virus through aerosols & the risk of transmission can be prevented with a preprocedural rinse during a dental procedure. Mouthwashes are found effective in reducing microbial load in saliva and other oral fluids, also studies have found reduction in microbial load in aerosols post use of mouthwash [11; 17]. Since there is evidence regarding mouthwashes with ingredients like chlorhexidine, povidone-iodine, cetylpyridinium chloride temporarily neutralizing SARS-COV-2 in saliva [4; 12; 17] also it may reduce the viable virus in aerosols produced during a dental procedure over a short period of time reducing risk of transmission.

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## 8. Conclusion

Mouthwashes play an important role in maintaining oral hygiene and with a lot of options available in the market, it is commonly practiced by the people. All of these mouthwashes have active ingredients which are responsible for anti-microbial activity of the solution. These solutions are being used in daily practice by dentists to reduce microbial content in oral cavity and also prevent disease progression. Research has found oral rinses with active ingredients like povidone-iodine, cetylpyridinium chloride, chlorhexidine neutralizes SARS-COV-2 in saliva and oro-pharyngeal fluids for a short duration of time. It is possible that virus load also reduces in aerosols produced during dental procedures by preprocedural rinses. This measure can be used as an adjunct to Personal Protective Equipment used by dental and health care professionals in this time of pandemic. Gargling with mouthwash with these ingredients may also help in preventing transmission of virus from person to person for a limited period of time.

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## Compliance with ethical standards

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### *Disclosure of conflict of interest*

We hereby declare that there are no conflict of interest in connection to this manuscript.

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