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Dental experts work closely with patients and present an expanded danger of individual to-individual

transmission of SARS-CoV-2. Also, the utilization of ultrasonic scalers, air-water needles, and moderate

and high velocity airoter handpieces, which are regular in the dental office, produce splash and aerosols.

The utilization of preprocedural mouthrinses has been proposed to lessen the viral burden in saliva and oropharyngeal tissues, consequently diminishing viral burden in dental aerosols. Although some mouthrinses exhibit an antiviral impact, there is restricted proof about the clinical adequacy of any

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mouthrinse in the decrease of SARS-CoV-2 in the dental aerosols.

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# Original Research Article Mouthwash to defeat COVID-19? –An update

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# 1. Introduction

The current covid 19 pandemic has infected over 15.9 million people and resulted in the death of over 1.85.000 people at the time of writing this review.<sup>1</sup>

The  $2^{nd}$  wave has evolved at a phenomenal speed as compared to the 1st wave. There could be several factors responsible for the increased number of cases in the second wave. It is observed that the mutant virus has more effective transmission capability and its incubation period is also lesser but the research of incubation period of individual mutant strains has to be carried out yet to draw the conclusion.

The 1<sup>st</sup> wave was caused by SARS-COV-2 whereas the  $2^{nd}$  wave is caused by several mutants of SARS-COV-2. The 1<sup>st</sup> wave mainly caused respiratory problems whereas  $2^{nd}$  one showed gastrointestinal problems, oropharyngeal problems along with the severe respiratory problems.

The disease is caused by SARS-COV-2. It is an enveloped virus that is surrounded by a lipid bilayer.

Lipids are fundamental cell components that play various biological roles ranging from being a structural building block to a signalling molecule as well as a central energy store. Role of lipids includes the fusion of the viral film to the host cell, viral replication and viral endocytosis and exocytosis.<sup>4</sup>

The situation with the oral and oropharyngeal cavities, which incorporates the mouth and throat, is inseparably connected to the overall wellbeing and prosperity of an individual. Colonization by pathogenic miniature creatures or an unevenness of the physiological microbiome in the oral cavity can assume a fundamental part in the turn of events and propagation of diseases.<sup>5,6</sup>

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 $<sup>1^{</sup>st}$  wave affected mainly older age groups and  $2^{nd}$  wave is affecting younger as well as older age groups. $1^{st}$  wave had less cases of breathlessness whereas  $2^{nd}$  has more cases of breathlessness.<sup>2,3</sup>

Individuals who are on mechanical ventilation breathing machines in medical clinics, colonization of microorganisms in the oropharyngeal locale is normally seen and can bring about more genuine sequelae in intubated patients, where their spread into the lower respiratory tract can bring about ventilator-related pneumonia (VAP).<sup>7</sup>

Most of pioneering oral mucosal contagious contaminations are because of Candida albicans and Aspergillus fumigates species. Mucor and Cryptococcus also have a major role in causing oral infections, whereas Geotrichum, Fusarium, Rhodotorula, Saccharomyces and Penicillium marneffei are uncommon pathogens in the oral cavity. The clinical presentation incorporates pseudo-films, abscesses, ulcers, pustules and broad tissue necrosis including bone.<sup>8</sup>

Oral candidiasis is the most well-known human parasitic disease. The analysis of candidiasis is regularly made based on clinical doubt of the average mucosal changes and angular cheilitis. It presents as smooth white plaques, patches, or papules that can be cleared off with an erythematous and sometimes bleeding area leaving behind. The exemplary appearance of pseudomembranous candidiasis is classified as "curdled milk". Burning sensation and foul taste might associate with the lesion. The persistent pseudomembranous oral candidiasis isn't recognizable from its acute counterpart that arises in patients with HIV disease and those taking corticosteroid inhalers. The buccal mucosa is oftentimes influenced by pseudomembranous candidiasis followed by the tongue and the palate. Disposal of inclining factors, if conceivable, is the foundation of treatment alongside antifungal regimen.<sup>9</sup>

The mucous layer of the esophagus is normally lined by the defensive inborn immune mechanical barrier called the nonkeratinized delineated squamous cell epithelium. Because of this, Candida albicans might be essential for the commensal that colonizes the esophagus in certain people, representing about 20%. However, processes that impair the immune system, as well as those that cause local lesions in the esophageal upper cortex, can lead to the proliferation and colonization of Candida albicans. Hence, candida holds fast to the mucous layer and structures yellow-white patches. We can see the plaques on upper endoscopy and can't wash from the mucosa with water system. These plaques can be found diffusely all through the whole esophagus or confined in the upper, center, or distal esophagus. The clinical signs of the patients are frequently identified with the degree of esophageal mucosal harm, and the most widely recognized manifestations are torment on gulping, trouble gulping, and torment behind the sternum. Different manifestations incorporate stomach torment, acid reflux, weight reduction, looseness of the bowels, sickness, heaving, and melena.<sup>10</sup>

Aspergillosis has been accounted for as the second most common entrepreneurial parasitic contamination. In

most cases, oral aspergillosis lesions are yellow or dark in shading, with a necrotic ulcerated base, traditionally situated on the palate or back of the tongue.<sup>11</sup>

Third basic contagious contamination is mucormycosis. Mucormycosis is an uncommon and possibly deadly intrusive contagious contamination brought about by saprophytic oxygen consuming parasites Rhizopus, Rhizomucor, and Cunninghamella genera of the request Mucorales, presently called Rhidopodaceae, which colonize the oral and nasal mucosa and paranasal sinuses.<sup>12</sup>

The illness for the most part develops quickly in immunocompromised or debilitated patients; that is, those with uncontrolled diabetes, uncontrolled human immunodeficiency infection contamination, threatening hematological sicknesses, and strong organ transplantation.<sup>12</sup>

In patients with serious viral pneumonia, for example, flu and COVID-19, intense respiratory trouble disorder (ARDS) is a typical difficulty that requires emergency unit confirmation and mechanical ventilation (MV), utilization of corticosteroids and interleukin adversaries, for instance tocilizumab to counter the huge incendiary respiratory routes narrowing and ensuing cytokine storm.

Importantly, acute viral pneumonia damages alveolar epithelial and endothelial tissues, dysregulates immune system and causes cellular immune dysfunction.Upon the background lung damage, immune dysfunction and corticosteroid therapy in viral pneumonia, invasive fungal infections (IFIs) like aspergillosis and mucormycosis can spontaneously set in.

Traditionally, uncontrolled diabetes mellitus (DM) and other immunosuppressive conditions, for example, neutropenia and corticosteroid treatment are realized danger factors for mucormycosis. The foundation of mucormycosis requires spores inward breath or potentially cultivating onto the airways or any weak epithelium; developing into angioinvasive hyphae—using host conditions like hyperglycaemia, ketoacidosis, iron over-burden and neutropenia—causing endothelial harm, prompting neighborhood discharge, apoplexy and putrefaction; and possible spread to include different organs.

The clinical appearances of mucormycosis have been customarily partitioned into in any event six separate conditions: rhinocerebral, aspiratory, cutaneous, gastrointestinal, CNS, dispersed, and different (e.g., bones, kidney, heart, and mediastinum). Patients who have rhinocerebralmucormycosis regularly present with objections of facial agony or migraine; fever is additionally a typical sign. Augmentation of the disease posteriorly into the cerebrum brings about development of abscesses and corruption of the front facing projections. When the disease invades inferiorly into the mouth, a black, necrotic eschar is often found on the palate; this finding is exceptionally reminiscent of the presence of intrusive mucormycosis. Lingual mucormycosis is an uncommon event, which may happen because of the utilization of contaminated tongue depressors.

Symptoms include fever, headache, coughing, shortness of breath, abdominal pain, bloody vomit, and possible altered mental status. One-sided facial swelling, nasal or sinus congestion, black lesions on nasal bridge or upper inside of mouth are observed.

The diagnosis is through clinical history and actual assessment. The solitary conclusive approach to make an analysis of mucormycosis is by imagining the trademark hyphae in areas of tissue and by developing the parasite in the laboratory.<sup>13,14</sup>

Doubt of mucormycosis requires a CT scan of the maxilla, circles and cerebrum. Specifically, proof of intracranial cerebrum abscesses and orbital expansions is basic. Sinus and orbital expansions are perceived by layer or periosteal thickenings just as hard disruption.<sup>13</sup>

This highlights the significance of practicing great mouth and throat cleanliness as a methods for limiting danger in the advancement of both community acquired and hospital acquired diseases.

Upkeep of good/legitimate oral cleanliness during and post Coronavirus is fundamental. As inadvertent utilization of antibiotics and steroidal treatment makes individual immunosupressed, patients will be more prone to opportunistic infections. Every one of the patients are encouraged to swish with mouth wash twice a day for a month. Additionally, it is encouraged that to change the toothbrushes after recuperation from Coronavirus as they can hold onto microorganisms. Patients with inclined dental issues like caries, periodontitis, and so on should visit the separate specialist as they are more inclined to contaminations of oral cavity. Denture wearers are encouraged to soak their dentures in denture cleanser shortterm every day. It is encouraged to put the dentures in 2% betadine arrangement subsequent to getting recuperated from Coronavirus.

Antiseptic mouthwashes have been broadly utilized as a standard measure before routine dental treatment, particularly preoperatively.

Oral washes ranging from chlorhexidine (CHX), hydrogen peroxide (H202), cetylpyridinium chloride (CPC), povidone-iodine (PVP-I), fundamental oils (EO) have been suggested.

CHX (0.2%) is the most commonly utilized mouthrinse preoperatively. Be that as it may, it is insufficient against lipid wrapped Coronavirus infection.

Thus, this article reviews diverse mouthrinses, which are powerful against Coronavirus.

# 1.1. Oral antiseptics used against Oropharyngeal infections

Oral microflora is the total of microorganisms dwelling in the mouth, and in excess of 700 bacterial species have been identified that can be found intraorally. Oral cavity isn't sterile as it harbors different microorganisms likeActinomyces, Arachnia, Bacteroides, Bifidobacterium, Eubacterium, Fusobacterium, Lactobacillus, Leptotrichia, Peptococcus, Peptostreptococcus, Propionibacterium, Selenomonas, Treponema, and Veillonella.<sup>15</sup>

Oral cavity likewise conveys certain infections like herpes, adenoviruses, sars cov-2, and so forth in contaminated individuals. It also has typical organisms like candida, apergillus, etc.

Mouthwashes are broadly utilized answers for flushing the mouth, because of their capacity to decrease the quantity of microorganisms in the oral cavity and province shaping units in dental vaporizers. In spite of the fact that there is still no clinical proof that the utilization of mouthwashes could forestall SARS-CoV-2 transmission, the American Dental Association (ADA) and the Center for Disease Control and Prevention (CDC) have suggested the utilization of pre-procedural mouthwashes before oral methodology. So utilization of mouth rinses before the dental treatment would be beneficial.<sup>16</sup>

Chlorhexidine (CHX) CHX is an expansive range disinfectant that demonstrations against Gram-positive and Gram-negative microbes, aerobes, facultative anaerobes, and organism by expanding the penetrability of the bacterial cell divider, causing its lysis. Bernstein D, Schiff G, Echler G, et al. study shows chlorhexidine has an in vitro impact against lipid-wrapped infections, for example, flu A, parainfluenza, herpesvirus 1, cytomegalovirus, and hepatitis B. AlthoughCOVID-19 is an encompassed infection, 0.12% CHX gluconate was recommended to have next to zero impact against Covid when contrasted with other mouthwashes.<sup>17,18</sup>

However, Yoon et al discovered SARS-CoV-2 concealment for two hours subsequent to utilizing 15 ml 0.12% CHX once, recommending that its utilization would be useful for the control of COVID-19 transmission.<sup>18,19</sup>

Bonesvoll P, Lokken P, Rolla G, Paus PN. et al. study showed Chlorhexidine details have been appeared to hold oral antimicrobial movement for up to 12hrs. It is a more powerful antimicrobial in vivo in light of the fact that it predicaments to clean oral surfaces and is delivered after some time (substantivity).

In spite of lower action towards Covid, a mix of chlorhexidine with alcohol may offer a helpful technique for decreasing viral burden over longer times.<sup>20</sup>

Chlorhexidine mouthwashes have been a basic clinical instrument for more than 40 years to diminish oral bacterial greenery and prevent contamination and mucositis in malignancy patients getting chemotherapy and radiotherapy.<sup>21</sup>

In any case, there are no detailed examinations surveying the effect of mouthwashes in explicitly preventing or treating viral diseases in neutropenic patients.

Veitz-Keenan A, Ferraiolo DM directed a metaexamination which showed that chlorhexidine (flush or gel) can diminish hazard of ventilator related pneumonia in patients going through mechanical ventilation, although causative living organisms were not described.<sup>22</sup>

Hydrogen peroxide (H2O2) H2O2 has been utilized in dentistry alone or joined with salts since the beginning of the century. As a mouthwash, it is a scentless, clear, and drab fluid. Absence of an antagonistic delicate tissue impact was found in numerous investigations of 1%–1.5%H2O2used as an every day wash more than 2 years follow-up.<sup>18,23</sup>

Rosling BG, Slots J, Webber RL, et al. Gusberti FA, Sampathkumar P, Siegrist BE, et al. led an in vitro study and tracked down that 3% H2O2effectively inactivated adenovirus types 3 and 6, adeno-related virustype 4, rhinoviruses 1A, 1B, and type 7, myxoviruses, influenza An and B, respiratory syncytial infection, strain long, and Covid strain 229E inside 1–30 minutes, finding that Covids and flu infections were the most sensitive. Since SARS-CoV2 is defenseless against oxidation, preproceduralmouthrinses containing oxidative specialists, for example, 1% H2O2have been proposed to diminish the salivary viral load.<sup>18,24</sup>

Cetyl pyridinium chloride (CPC) CPC is a quaternary ammonium compound that is ok for use in people. CPC 0.05% has been utilized to lessen dental plaque and gum disease as an option in patients who foster mucosal aggravation and stains identified with CHX.<sup>18,25</sup>

Cook N, Williams AJ, Tropsha A, et al. study shows the antiviral impact of CPC has been shown in influenza patients, essentially lessening the length and seriousness of cough and sore throat. Theories about a potential activity over SARS-CoV-2 depend on its lysosomotropic component of activity and its capacity to annihilate viral capsids. These discoveries show that CPC could be successful against other encompassed infections, for example, coronaviruses.<sup>18,26</sup>

Iodopovidone Povidone-iodine (PVP-I) is a waterdissolvable iodine complex that has been generally utilized as a pre-careful skin hostile to septic and as a mouthwash. It is normally utilized in a 1% fixation for mucositis, prophylaxis of oropharyngeal diseases, and anticipation of ventilator-related pneumonia.

Its antimicrobial action occurs after free iodine dissociates from polyvinylpyrrolidone, then iodine rapidly penetrates microbes to disrupt proteins and oxidises nucleic acid structures causing microbial death.

Beforehand, examines have shown that PVP-I has higher virucidal movement than other normally utilized clean specialists, including CHX and benzalkonium chloride. It is protected, revealing a commonness of 0.4% hypersensitivity cases, doesn't deliver tooth or tongue discolouration or taste

aggravations and, dissimilar to alcohol based items, can be utilized when utilizing electrocautery.<sup>18,27</sup>

Kariwa H, Fujii N, Takashima I. Eggers M, Koburger-Janssen T, Eickmann M, et al. study uncovers its adequacy has been very much shown against various infections, including SARS-CoV, MERS-CoV, and flu infection A (H1N1).<sup>28</sup>

Kirk-Bayley J, Sunkaraneni VS, Challacombe SJ. Have recommended that 0.23% PVP-Imouthwash for in any event 15 seconds before procedures may decrease salivary viral burden, demonstrating its utilization in COVID-19-positive patients.<sup>18,29</sup>

Fundamental Oils (EO) EO mouthwash contains synthetic mixtures initially extricated from plants: eucalyptol 0,092%, menthol 0,042%, methyl salicylate 0,060% and thymol 0,064%.<sup>30</sup>

Some investigations of antiviral effects in the oral cavity were reported.

Croughan W, Behbehani A. study showed EO has intense virucidal impact in vitro against enveloped infections, for example, HSV-1 and herpes simplex sort 2 (HSV-2), HIV-1 and influenza, however restricted proof against non-enveloped viruses like rotavirus and adenovirus.<sup>31,32</sup>

One randomized clinical preliminary researched the adequacy of EO in the decrease of HSV-1 and HSV-2 infection in saliva for in any event 30 minutes after oral mouthrinse of 30seconds. Furthermore, it was shown that antiviral movement against encompassed infections happened quickly, in only 30 seconds. Viruses attach to the host cell film by the layer surface glycoproteins present on its envelope.

EO could act by preventing the attachment of the virus, influencing the glycoproteins of the envelope. In addition, EO may prevent the entrance of infection by viral envelope burst which doesn't permit the films combination. Furthermore, there is proof that EO and their significant parts have shown powerful antiviral activity to other Coronaviruses, like SARS-CoV, albeit the system of activity of these oils and their segments were discovered to be essentially through hindrance of viral replication.<sup>32,33</sup>

Dennison D, Meredith G, Shillitoe E, Caffesse R. led in vitro study assessed impacts of EOs with ethanol mouthrinse and showed that distinctive SARS-CoV-2 strains can be viably inactivated under conditions imitating nasopharyngeal discharges. It upholds the possibility that a preprocedural mouthrinse with EO may conceivably lessen SARS-CoV-2 load in saliva. In any case, this theory should be tried in human clinical trials.<sup>32,34</sup>

# 2. Emergency Dental Pain Management during the Outbreak of Pandemic

Proof has arisen on the human-to-human transmission of the extreme intense respiratory Covid 2 (SARS-CoV-2) in medical care and family settings. As the infection spreads basically through beads, sniffles and pressurized canned products, there is a high danger of transmission of SARS-CoV-2 during dental procedures.<sup>35</sup>

As of late, it was discovered that SARS-CoV-2 could be identified in salivation examples which may permit viral transmission even among patients without cough or other respiratory symptoms.<sup>36</sup>

In the first place, oral medical care suppliers ought to focus on new circumstances, for example, pulpitis, pericoronitis, osteitis. boil or restricted bacterial contamination, dental injury, broad caries or faulty or broken rebuilding efforts that reason agony or tissue harm, evacuation of stitches, changes in false teeth and apparatuses that reason harm to oral constructions and substitution of transitory filling in the endodontic access openings in patients with torment. Corrective and other elective dental strategies, like orthodontic treatment, trade of blend rebuilding efforts for stylish reasons, elective periodontal consideration, purposeful root waterway treatment, prosthodontics, or elective oral medical procedures, ought to be deferred. Second, it is pivotal to abstain from congestion in emergency territories and lounge areas, since there is proof that the nearby contact between susceptive people and tainted people (being inside about 1.8 m or inside the room or care space of an affirmed COVID-19 case) increment the danger for SARS-CoV-2 infection.<sup>37</sup>

In the event of rising dental consideration, the primary after measures focused toward avoidance by respiratory drop and contact transmission ought to be received:

To survey speculated patients through their signs and indications, particularly fever and cough by checking temperature and oxygen immersion levels. In these cases, dental techniques ought to be deferred, and wellbeing specialists ought to be informed.

To give staff schooling and to observe standard working techniques and the utilization of Personal Protective Equipment (PPE) including N95 respirators, clinical gloves, security glasses, hair covers and dispensable covers. To clean hands with cleanser and water or hand rub with 70% ethanol or 70% isopropanol, before and after assistance.

Extraoral radiographs and cone beam computed tomography are best over intraoral radiographs to prevent cough or retching reflexes and, therefore, aerosol generation.

To utilize rubber dam separation during dental procedures and keep away from the utilization of ultrasonic and sonic scalers, air cleaning, air-water needle, air scraped spot units,3 way needle and rotating handpieces.<sup>38</sup>

Mouth rinses ought to be given before the treatment as a prophylactic measure, so the viral burden in the aerosols will be decreased.

Avinash S. et al study showed SARS-CoV-2 infection was totally inactivated by PVP-I oral antiseptic in vitro, at

all fixations tried in just 15 seconds. Hydrogen peroxide arrangements at the suggested oral rinse groupings of 1.5% and 3.0% showed insignificant viricidal impact after contact times up to 30 seconds.<sup>39</sup>

Yoon JG et al. directed a clinical report that broke down impacts of CHX mouthwash on SARS-CoV-2 viral burden showed that the viral burden in salivation diminished fleetingly for 2 hours subsequent to utilizing 15 mL of 0.12% CHX mouthrinse.<sup>19,32</sup>

Seneviratne et al study showed the impact of diminishing salivary burden with CPC and PI mouth-rinsing was seen to be supported at 6 h time point.<sup>40</sup>

Proposed suggestions Gently wash for 30 seconds in the oral cavity and 30 seconds toward the rear of the throat with: 1.5% or 3% H2O2 15 ml;<sup>24</sup> PVP-I, 0.2%, 0.4%, or 0.5%, 9 ml;<sup>27</sup> 0.12% CHX15 ml;<sup>19</sup> or 0.05% CPC 15 ml.<sup>25</sup>

## 3. Conclusion

Oral hygiene intervention, along with the gargling/mouthwash with an antiseptic having virucidal properties is imperative during this pandemic of COVID 19. Based on the Occupational Safety and Health Administration guidelines, PVP-I, EO and CPC are safe to use as a mouth rinse, and the existing in-vitro studies and patient-based clinical trials confirm its virucidal property against SARS-CoV-2. Usage of mouth rinses prior to aerosol producing operating procedures, will relatively reduce the viral load in the aerosols.

#### 4. Source of Funding

None.

### 5. Conflict of Interest

The authors declare that there is no conflict of interest.

#### References

- 1. Available from: https://github.com/CSSEGISandData/COVID-19.
- Jain V, Iyengar KP, Vaishya R. Differences between First wave and Second wave of COVID-19 in India. *Diabetes Metab Syndr*. 2021;15(3):1047–8. doi:10.1016/j.dsx.2021.05.009..
- 3. Jain VK, Iyengar KP, Vaishya R. 2021.
- Donnell V, Thomas D, Stanton R, Maillard J, Robert C, Jones SA, et al. Potential Role of Oral Rinses Targeting the Viral Lipid Envelope in SARS-CoV-2 Infection. *Function (Oxf)*. 2020;1(1):zqaa002. doi:10.1093/function/zqaa002.
- Avila M, Ojcius DM, Yilmaz Ö. The Oral Microbiota: Living with a Permanent Guest. DNA Cell Biol. 2009;28(8):405–11. doi:10.1089/dna.2009.0874.
- Scher JU, Bretz WA, Abramson SB. Periodontal disease and subgingival microbiota as contributors for rheumatoid arthritis pathogenesis. *Curr Opin Rheumatol.* 2014;26(4):424– 9. doi:10.1097/bor.000000000000076.
- Infectious Diseases Society of America. Guidelines for the management of adults with hospital-acquired, ventilator-associated, and healthcare-associated pneumonia. *Am J Respir Crit Care Med.* 2005;171:388–416.

- Singh N. Trends in the epidemiology of opportunistic fungal infections: Predisposing factors and the impact of antimicrobial use practices. *Clin Infect Dis*. 2001;33(10):1692–6.
- Reichart PA, Samaranayake LP, Philipsen HP. Pathology and clinical correlates in oral candidiasis and its variants: A review. *Oral Dis.* 2000;6:85–91.
- Sitheeque MAM, Samaranayake LP. Chronic Hyperplastic Candidosis/Candidiasis (Candidal Leukoplakia). Crit Rev Oral Biol Med. 2003;14(4):253–67. doi:10.1177/154411130301400403.
- Segal BH, Romani LR. Invasive aspergillosis in chronic granulomatous disease. *Med Mycol*. 2009;47(1):282–90.
- Pauli MA, Pereira LM, Monteiro ML, Camargo AD, Rabelo GD. Painful palatal lesion in a patient with COVID-19. Oral Surg Oral Med Oral Pathol Oral Radiol. 2021;131(6):620–5.
- Badiee P, Hashemizadeh Z. Opportunistic invasive fungal infections: Diagnosis and clinical management. *Indian J Med Res.* 2014;139:195–204.
- Baskova L, Buchta V. Laboratory diagnostics of invasive fungal infections: An overview with emphasis on molecular approach. *Folia Microbiol.* 2012;57:421–30.
- Aas JA, Paster BJ, Stokes LN, Olsen I, Dewhirst FE. Defining the Normal Bacterial Flora of the Oral Cavity. J Clin Microbiol. 2005;43(11):5721–32. doi:10.1128/jcm.43.11.5721-5732.2005.
- Singh GP, Vivekananda L, Roy P. Effect of preprocedural oral rinses with active ingredients like chlorhexidine, povidoneiodine and cetylpyridinium chloride in neutralizing SARS-COV-2 concentration in aerosol. GSC Adv Res Rev. 2021;6(3):132–5. doi:10.30574/gscarr.2021.6.3.0048.
- 17. Seneviratne CJ, Balan P, Ko KKK, Udawatte NS, Lai D, Ng DHL, et al. Efficacy of commercial mouth-rinses on SARS-CoV-2 viral load in saliva: randomized control trial in Singapore. *Infection*. 2021;49:305–11. doi:10.1007/s15010-020-01563-9.
- Buenaventura AV, Castro-Ruiz C. Use of mouthwashes against COVID-19 in dentistry. *Br J Oral Maxillofac Surg.* 2020;58(8):924–7. doi:10.1016/j.bjoms.2020.08.016.
- Yoon JG, Yoon J, Song JY. Clinical significance of a high SARS-CoV-2 viral load in the saliva. J Korean Med Sci. 2020;35(20):195.
- Bonesvoll P, Gjermo P. A comparison between chlorhexidine and some quaternary ammonium compounds with regard to retention, salivary concentration and plaque-inhibiting effect in the human mouth after mouth rinses. *Arch of Oral Biol.* 1978;23(4):289–94. doi:10.1016/0003-9969(78)90021-3.
- Ferretti GA, Raybould TP, Brown AT, Macdonald JS, Greenwood M, Maruyama Y, et al. Chlorhexidine prophylaxis for chemotherapyand radiotherapy-induced stomatitis: A randomized double-blind trial. *Oral Surg Oral Med Oral Pathol.* 1990;69:331–8. doi:10.1016/0030-4220(90)90295-4.
- Veitz-Keenan A, Ferraiolo DM. Oral care with chlorhexidine seems effective for reducing the incidence of ventilatorassociated pneumonia. *Evid Based Dent.* 2017;18:113–4. doi:10.1038/sj.ebd.6401272.
- Marshall MV, Cancro LP, Fischman SL. Hydrogen Peroxide: A Review of Its Use in Dentistry. *J Periodontol*. 1995;66(9):786–96. doi:10.1902/jop.1995.66.9.786.
- Vergara-Buenaventura A, Castro-Ruiz C. Use of mouthwashes against COVID-19 in dentistry. *Br J Oral Maxillofac Surg.* 2020;58(8):924–7. doi:10.1016/j.bjoms.2020.08.016.
- Komine A, Yamaguchi E, Okamoto N, Yamamoto K. Virucidal activity of oral care products against SARS-CoV-2 in vitro. *J Oral Maxillofac Surg Med Pathol.* 2021;33(4):475–7. doi:10.1016/j.ajoms.2021.02.002.
- Baker N, Williams AJ, Tropsha A, Ekins S. Repurposing Quaternary Ammonium Compounds as Potential Treatments for COVID-19. *Pharm Res.* 2020;37(6):104. doi:10.1007/s11095-020-02842-8.
- Lamas LM, Dios PD, Rodríguez MTP, Pérez VDC, Alvargonzalez JJC, Domínguez AML, et al. Is povidone iodine mouthwash effective against SARS-CoV-2? First in vivo tests. Oral Dis. 2020;doi:10.1111/odi.13526.
- Kariwa H, Fujii N, Takashima I. Inactivation of SARS coronavirus by means of povidone-iodine, physical conditions, and chemical reagents.

Jpn J Vet Res. 2004;52:105-12.

- Challacombe SJ, Kirk-Bayley J, Sunkaraneni VS, Combes J. Povidone iodine. Br Dent J. 2020;228(9):656–7. doi:10.1038/s41415-020-1589-4
- 30. Yadalam PK, Varatharajan K, Rajapandian K, Chopra P, Arumuganainar D, Nagarathnam T, et al. Antiviral Essential Oil Components Against SARS-CoV-2 in Pre-procedural Mouth Rinses for Dental Settings During COVID-19: A Computational Study. *Front Chem.* 2021;9:1–11. doi:10.3389/fchem.2021.642026.
- Croughan WS, Behbehani AM. Comparative study of inactivation of herpes simplex virus types 1 and 2 by commonly used antiseptic agents. *J Clin Microbiol*. 1988;26(2):213–5. doi:10.1128/jcm.26.2.213-215.1988.
- Reis INR, Amaral G, Mendoza AAH, Graças YT, Mendes-Correa MC, Romito GA, et al. Can preprocedural mouthrinses reduce SARS-CoV-2 load in dental aerosols? *Med Hypotheses*. 2021;146:110436. doi:10.1016/j.mehy.2020.110436.
- Reis INR, Amaral G, Mendoza AAH, Graças YT, Mendes-Correa MC, Romito GA, et al. Can preprocedural mouthrinses reduce SARS-CoV-2 load in dental aerosols? *Med Hypotheses*. 2021;146:110436. doi:10.1016/j.mehy.2020.110436.
- Dennison DK, Meredith GM, Shillitoe EJ, Caffesse RG. The antiviral spectrum of Listerine antiseptic. Oral Surg Oral Med Oral Pathol Oral Radiol Endodontol. 1995;79:442–8. doi:10.1016/s1079-2104(05)80124-6.
- Ghinai I, Mcpherson TD, Hunter JC, Kirking HL, Christiansen D, Joshi K, et al. First known person-to-person transmission of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) in the USA. *Lancet.* 2020;395(10230):1137–44. doi:10.1016/S0140-6736(20)30607-3.
- 36. Xu C, Wang A, Hoskin ER, Cugini C, Markowitz K, Chang TL, et al. Differential Effects of Antiseptic Mouth Rinses on SARS-CoV-2 Infectivity In Vitro. *Pathogens*. 2021;10(3):272. doi:10.3390/pathogens10030272.
- Christensen GJ. Elective vs. mandatory dentistry. J Am Dent Assoc. 2000;131(10):1496–8.
- Harrel SK, Molinari J. Aerosols and splatter in dentistry: a brief review of the literature and infection control implications. J Am Dent Assoc. 2004;135(4):429–37.
- Bidra AS, Pelletier JS, Westover JB, Frank S, Brown SM, Tessema B. Comparison of In Vitro Inactivation of SARS CoV-2 with Hydrogen Peroxide and Povidone-Iodine Oral Antiseptic Rinses. *J Prosthod.* 2020;29(7):599–603. doi:10.1111/jopr.13220.
- Seneviratne CJ, Balan P, Ko KKK, Udawatte NS, Lai D, Ng DHL, et al. Efficacy of commercial mouth-rinses on SARS-CoV-2 viral load in saliva: randomized control trial in Singapore. *Infection*. 2021;49(2):305–11. doi:10.1007/s15010-020-01563-9.

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