Contaminated Toothbrushes and Potential COVID-19 Transmission: Concerns and Recommendations

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Abstract

Substantial past evidence has demonstrated microbial contamination of oral devices and possible transmission of viral diseases, drawing attention to habits related to using and storing toothbrushes. Since toothbrushes are in intimate contact with the oral cavity, the question arises as to whether they can transmit COVID-19.

An electronic search was performed in four databases to identify relevant literature about the possible contamination or transmission of SARS-CoV-2 through toothbrushes until May 2021. Forty-five records were retrieved, and after a thorough search, we found no articles reporting significant evidence. However, studies with other viral diseases have indicated that improper use and storage of toothbrushes could contribute to indirect disease transmission.

Therefore, this narrative review supports the implementation of toothbrush disinfection and storage measures to minimize the risk of SARS-CoV-2 infection among cohabitants and community settings. Finally, recommendations and a suggested protocol to reduce the potential risk of transmission between cohabitants are provided.

Keywords

- COVID-19
- contamination
- oral health
- SARS-CoV-2
- toothbrushes
- transmission

Introduction

The severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) has caused the coronavirus disease 2019 (COVID-19) outbreak and a global concern.^{1–3} Most governments implemented strict measures to limit viral transmission such as isolation, personal protective equipment, and handwashing.¹

Evidence has suggested that inadequate measures could indirectly contribute to COVID-19 infection between people living together,⁴ drawing attention to habits related to using and storing oral appliances.^{5–7} In the past, considerable evidence has demonstrated microbial contamination of toothbrushes and possible transmission of viral diseases to users.^{8–11} Like other microorganisms, SARS-CoV-2 has

been detected in the oral mucosa,^{12,13} and saliva samples turn the oral cavity into an important route of transmission and potential reservoir of the virus.^{13–16} Since toothbrushes are in intimate contact with the oral cavity, the question arises as to whether they can transmit COVID-19. Not to mention that experts have suggested that a fecal-oral route of SARS-CoV-2 transmission is possible, with the potential to contaminate toothbrushes stored near the toilet.^{17,18}

Therefore, the purpose of this review was to answer the following questions:

- Has SARS-CoV-2 been found on toothbrushes?
- Is there evidence of the transmission of the SARS-CoV-2 through toothbrushes?

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Fig. 1 Prisma flowchart.

with different microorganisms.^{6,7} Previous studies have found proviral DNA on the toothbrush of an HIV-positive patient.²¹ In the same way, HCV-RNA was found in toothbrushes of patients with hepatitis C.²²

Authors have suggested a possible oral-fecal route of SARS-CoV-2 transmission,^{17,18} indicating that toothbrushes placed near toilet seats could be contaminated.¹⁷ Moreover, it has been reported the presence of Herpes simplex virus type 1 from 48 hours to 7 days on stored toothbrushes, especially in moist environments such as bathrooms.²³ Similarly, rhinovirus contamination was found in toothbrushes and other home surfaces of people with a common cold.²⁴

Earlier studies have demonstrated that toothbrushes could behave as vectors for the transmission and reinfection of viral diseases.^{8,9} It has been reported that cross-contamination of toothbrushes used by human papilloma virus (HPV) patients,¹⁰ hepatitis B,¹¹ and hepatitis C patients²⁵ may occur between family members and inmates who often share the device.²⁶ It is essential to emphasize that in the context of COVID-19, some patients did not show any symptoms during the early stage of infection,^{27,28} and infected subjects can spread the disease even before developing symptoms²⁹⁻³¹ through infected saliva.³²⁻³⁴

Recently, González-Olmo et al⁴ have found that 3% of cohabitants share toothbrushes, 64.2% used the same toothbrush container, and 50.3% the same toothpaste, suggesting that inadequate measures and habits could indirectly contribute to COVID-19 infection between people living together.⁴

Regarding the disinfection and storage of toothbrushes, no experimental studies were found related to SARS-CoV-2 infection. However, concerning other viruses, Devine et al³⁵ demonstrated that tetrasodium EDTA reduces Herpes simplex virus and poliovirus infectivity, suggesting its use to neutralize enveloped and nonenveloped viruses on dental appliances. Other studies have indicated that microwave and ultraviolet (UV) irradiation can effectively disinfect virus-infected toothbrushes.^{36,37} Moreover, ozone, a powerful cellular oxidant, has been considered a promising bactericidal, virucide, and antifungal agent for toothbrushes after 30 minutes of exposure.³⁸

Although the real impact of decontaminants on SARS-CoV-2 is still uncertain, it has been suggested that the use of some mouthwashes may reduce the oral viral load, decreasing the risk of transmission and the severity of COVID-19.^{39,40} Different antiseptics, including cetylpyridinium chloride, delmopinol hydrochloride, povidone-iodine,

and chlorhexidine digluconate, have demonstrated in vitro SARS-CoV-2 inactivation.⁴¹⁻⁴⁴ Lamarca et al³² have emphasized toothbrush disinfection in family and community settings (schools and hospitals) and suggested a hygiene protocol for disinfecting toothbrushes against SARS-CoV-2.

Depending on their storage, toothbrushes can become a source of cross-infection.^{6,45} Studies comparing microbial contamination of toothbrushes used between 1 and 3 months suggested that toothbrushes should be replaced after 3 to 4 weeks.⁴⁶⁻⁴⁸ Concerning viral contamination, Glass and Jensen recommended replacing toothbrushes every 2 weeks.⁴⁹ Besides, the storage of toothbrushes in closed containers and close contact with other devices may increase the number of microorganisms.^{46,50-52} In addition, some authors recommended not sharing toothbrushes or toothpaste tubes.^{4,17}

Suggested Protocol for Storage and Disinfecting Toothbrushes

Although evidence has not yet been established, the following recommendations are made as a precautionary measure in the COVID-19 preventive approach:

- Do not share toothbrushes.
- Do not store them in closed containers.
- Disinfection of the toothbrush handle with a proven disinfectant tested against SARS-CoV-2 (in community settings).
- Disinfection of the toothbrush bristles with a proven in vitro oral rinse tested against SARS-CoV 2 for 1 minute.
- Replace toothbrushes every month in uninfected persons living with a polymerase chain reaction (PCR)-positive patient.
- If sharing the restroom with many people, prefer to store toothbrushes in another clean place.
- If a COVID-19 infection is confirmed, replace the toothbrush after 2 weeks, keep it separate, and use a personal toothpaste tube.

Conclusions

No studies on the possible transmission of SARS-CoV-2 via toothbrushes were identified for inclusion in this review. Although there is no substantial published evidence, studies with other viral diseases have indicated that improper use and storage of toothbrushes could contribute to indirect disease transmission. Therefore, this narrative review supports the implementation of toothbrush disinfection and storage measures to minimize the risk of SARS-CoV-2 infection among cohabitants and community settings. Dentists should educate their patients about this. However, these recommendations urgently need to be validated with studies related to COVID-19.

Conflict of Interest

The authors do not have any financial interest in the companies whose materials are included in this article.

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