

# Difference in Disinfection Protocols in Dental Institutions and Private Dental Practice Pre and Post COVID - A Questionnaire-Based Study

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## Abstract

**Background:** Aerosols (< 50µm) containing microorganisms are generated from an infected individual and propelled a short distance by coughing and talking without a mask. Combined with a closed environment such as a dental clinic, it can cause a greater degree of transmission. It has been found that virus can survive upto 72 hrs on plastics, fabrics and metals. Microorganisms in blood, oral fluid, conjunctival, nasal droplets can thrive for even 29 days. Thus, proper disinfection especially in a clinical setting that caters to sick patients becomes a must. The challenge for a dentist is more because it involves multiple people in a chain starting from the doctor, assistant, runner, supervisor, laboratory technician to runner and doctor again.

**Objective:** to create an awareness of the importance of disinfection among dental practitioners in the pandemic situation by answering if there is a change in disinfection protocol in the current clinical setting.

**Methods:** A questionnaire involving closed end multiple choice questions on the different disinfectants used, the frequency and concentration of disinfectant used on different materials, equipment, surfaces pre and post COVID was distributed electronically to 300 private dental practitioners in Tamilnadu. The responses were collected and tabulated. Descriptive and inferential statistics were done.

**Results:** The survey revealed that the fumigation frequency has increased to 43% participants. In our survey there has been an enormous 87% increase in use of PPE especially filter face pieces and gowns fierce the pandemic. There is an increased usage of sodium hypochlorite for disinfection of surfaces and a reduction in the usage of alcohol-based products. As for the disinfection of skin and oral mucosa povidone iodide is still most predominantly used disinfectant followed by alcohol-based products. Solutions used for

instrument disinfection have also been increased. UV has become a better option for many dentists after the pandemic for disinfecting impressions, dentures, instruments, casts etc. Impression disinfection has also seen a 22% surge with glutaraldehyde being the most regularly used solution. There is a total percentage increase in disinfection of dentures and casts too. The survey also revealed a drastic increase in concentration and duration of disinfection too.

**Conclusion:** From the survey conducted among 300 dentists in Tamilnadu it may be concluded that the pandemic has caused an increased fear of contraction of the virus and thus their need to use disinfectants more intensively even though it is not necessary in most cases. One must keep in mind the possible health hazards and environmental pollution too. One must be aware of the indication, Pros and cons of using a particular disinfectant. More research is needed on producing disinfectants that are less toxic and environment friendly and the long-term side effects of usage of newer disinfectants that are currently in the market.

**Keywords:** disinfection, COVID 19 Pandemic, questionnaire based study, dental practice

## 1. Introduction

The novel coronavirus is a major public health concern claiming millions of lives and causing long term irreparable damage to the health of million others. It has been declared as a global pandemic and a first-class infection. (1) The virus has a rapid transmission and high virulence making it difficult to both prevent and treat. The need for halting the transmission is as important as taking the vaccine, as the primary cause of spreading is simply close contact with the infected person.

Aerosols ( $< 50\mu\text{m}$ ) containing microorganisms are generated from an infected individual and propelled a short distance by coughing and talking without a mask. (2) Combined with a closed environment it can cause a greater degree of transmission. (3) It has been found that virus can survive upto 72 hrs on plastics, fabrics and metals. (4) Microorganisms in blood, oral fluid, conjunctival, nasal droplets can thrive for even 29 days. (4) Thus, proper disinfection especially in a clinical setting that caters to sick patients becomes a must. The challenge for a dentist is more because it involves multiple people in a chain starting from the doctor, assistant, runner, supervisor, laboratory technician to runner and doctor again. (2)

A recent study on most commonly used workhorse disinfectants like quaternary ammonium compound and chlorhexidine gluconate showed that the chemicals are ineffective against coronavirus family. (5,6) Also recommendations by several health-related organisations like CDC and FDA have shifted towards the use of alcohol-based disinfectants either as primary or adjunct to other compounds. Several studies have called upon increased usage of disinfectants in terms of frequency and concentration (zhiang et al 2020, sharafi et al 2021, deyab 2020). (1,7,8) But Dewey et al in his review has highlighted several health hazards such a COPD, asthma, allergies especially on use of volatile disinfectants. (9) Depending on each chemical, the entry may be through ingestion, dermal absorption, inhalation etc. We are yet to determine the long-term adverse effects of the chemicals. (9)

The study aims to create an awareness of the importance of disinfection among dental practitioners in the pandemic situation. It answers if there is a change in disinfection protocol in the current clinical setting. The difference in the use of type, frequency and concentrations of the disinfectant products is analysed before and after the pandemic through a questionnaire-based survey. It collectively shows the mindset of dentists in Tamilnadu in context to the disinfection methods that is needed for handling spread of contact-based infection transmissions.

## 2. Materials and methods

The proposal was submitted and accepted at the institutional review board. A questionnaire involving closed end multiple choice questions on the different disinfectants used, the frequency and concentration of disinfectant used on different materials, equipment, surfaces pre and post COVID was distributed electronically to 300 private dental practitioners in Tamilnadu. The responses were collected and tabulated. Descriptive and inferential statistics were done using Microsoft excel. Paired t test was done to reject or accept null hypothesis.

## 3. Results

**Table 1:** locality of practice of participants

<b>Locality of practice</b>	
<b>Urban</b>	178
<b>Semi urban</b>	103
<b>Rural</b>	19

**Table 2:** frequency of fumigation

<b>frequency of fumigation</b>	<b>Pre COVI D</b>	<b>Post COVI D</b>
<b>Daily</b>	45	130
<b>Weekly</b>	63	96
<b>Monthly</b>	55	36
<b>Less frequent</b>	82	24
<b>Never</b>	55	14

**Table 3:** difference in disinfection seen pre and post COVID

	Percentage of increase post COVID	T value	P value
Frequency of fumigation	NA	0	1
Solutions used in fumigation	16%	1.183404	0.28141
Personal protective equipment	87%	2.552605	0.03796*
disinfection of surfaces	31%	1.115301	0.28656
disinfection of skin and oral tissues	22%	1.457128	0.18843
disinfection of instruments	28%	3.275555	0.00602*
disinfection of impressions	26%	2.272711	0.0441*
disinfection of dentures	22%	2.238204	0.04494*
disinfection of casts	25%	2.42228	0.03218*

\*denotes result is significant at  $p < .05$

**Table 4:** difference in concentration of disinfectants pre and post COVID

If concentration of disinfectant solution been increased after the pandemic	No	Yes
Surfaces	92	208
Skin and oral tissues	146	154
Instruments	112	188
Impressions	144	156
Casts	172	128
Dentures	164	136

**Table 5:** difference in disinfection duration pre and post COVID

If there is increase in duration of disinfection after the pandemic	No	Yes
Surfaces	36	264
Skin and oral tissues	72	228
Instruments	66	234
Impressions	96	204
Casts	124	176
Dentures	115	185

The study was conducted among 300 dentists among which 156 private practitioners, 144 others being both faculty in an institution and also private practitioners. The survey revealed that the fumigation frequency has increased with about 43% participants fumigating their area

of practice everyday which was only 13% before COVID pandemic. As for the usage of solutions used in fumigation, there is a 16% increase in the number of people post COVID with hypochlorite being the most commonly used disinfectant. In our survey there has been an enormous 87% increase in use of PPE especially filter face pieces and gowns fierce the pandemic. There is an increased usage of sodium hypochlorite for disinfection of surfaces and a reduction in the usage of alcohol-based products. As for the disinfection of skin and oral mucosa povidone iodide is still most predominantly used disinfectant followed by alcohol-based products. Solutions used for instrument disinfection have also been increased. UV has become a better option for many dentists after the pandemic for disinfecting impressions, dentures, instruments, casts etc. Impression disinfection has also seen a 22% surge with gluteraldehyde being the most regularly used solution. There is a total percentage increase in disinfection of dentures and casts too. The survey also revealed a drastic increase in concentration and duration of disinfection too.

#### **4. Discussion**

The awareness on the importance of disinfection has increased through the years. Earlier in 1997 Clapeau et al made a similar survey in the tropical areas of France and found that 68% of dental surgeons were using only solid or liquid cleansing soaps and the others using antiseptic or disinfectant solutions for washing hands. The dentist's chair was cleaned or disinfected daily in 68% of the centers, mostly with soap (43%) or diluted bleach (23%). Single-use disposable items were often reused: 88% of centers reused gloves, 64% anesthetic cartridges and 32% disposable needles. (10)

With the threat of new viruses and emergence of more virulent species people have started making stringent efforts in prevention of infection. In 2016, in a survey to evaluate cross contamination among dental students in Puducherry, Tamilnadu concluded that 96.66% of the students considered eye guard, gowns/aprons/lab coat, gloves, face mask, head cap as necessary part of the personal protective equipment (11) and in 2020 Sinha et al said that PPE were selectively used based on the procedure done (12). In our study there has been an enormous 87% increase in use of PPE especially filter face pieces and gowns.

In a study by Yassir et al in Iraq, he found that 12.6% of the participants had no belief in disinfection of dental impression before the pandemic and also those who disinfected mainly used alcohol-based disinfectants in spray method (13). In Tamilnadu about 8% of the practitioners don't disinfect impressions post COVID period and aldehydes, chlorides are also used along with alcohol to a greater extent during disinfection. Kiren et al did a survey post COVID among students in an institution located in Tamilnadu and found a drastic increase in fumigation practice. 38% of the participants seem to fumigate their clinic at the end of the day; 22% fumigated at the end of each treatment; 40% of them fumigated once in a week (13). In our study similar results were found where 43% dentists fumigate daily, 32% weekly, 12% monthly and only 4% never fumigate post COVID period.

The results of the study state that there is a significant change in disinfection protocols after the pandemic. It can be accepted that the disinfection of instruments, impressions, surfaces and skin and oral tissues has intensified in terms of duration. Also, in terms of concentration

of the disinfection there is a phenomenal change in surfaces, skin and oral tissues, instruments, impressions, casts and dentures. In the event of this pandemic dentists have adopted a change in the type and brand of disinfectants they use. The use of PPE has also drastically increased.

There are several studies on the impact of disinfectants on inanimate objects. Quaternary ammonium complexes can destroy fabrics, cotton gauzes, and even plastics. They are hence not recommended in the disinfection of filter face pieces, PPE and sterile clothes and gauzes. (5) Chlorine based chemicals tend to affect polyethylene, poly esters and polystyrene. (15) Almost every disinfectant and its byproduct were found to be hazardous to the environment polluting either air or water. (15, 16)

Disinfectants can also cause a number of health and environmental hazards. (16) When it comes to health hazards preliminary studies have stated that sodium hypochlorite can cause irritation, allergies, bronchospasms. (9,16) Microscopic studies reveal cell death on contact with the substance. In the same way hydrogen peroxide can cause DNA mutation and protein damage. (16) The overall health hazards of various disinfectants can include from mild allergies to a decrease in fertility and even neurological defects of the newborn. (9,15,16) Harsh chemicals tend to induce production of inflammatory cytokines and decrease the mitochondrial function leading cell death or mutation. (16)

The coronavirus belongs to a group of large, enveloped viruses that are easily susceptible to disinfection. (17) The size and presence of lipid layer in the envelope are advantageous as lipophilic disinfectants can easily penetrate the envelope. (17) Current literature has concluded that SARS-CoV-2 is susceptible to > 75% ethanol, 0.7% formaldehyde, 70% isopropanol, 0.5% hydrogen peroxide, and UVC for 15 mins. (15) But there has been a gross increase in both duration and concentration of the disinfectants after the pandemic. Moreover, the choice of disinfectants plays a major role in elimination of the virus. Sodium hypochlorite, hydrogen peroxide and ethanol were found to have better virucidal activity than QACs, chlorhexidine gluconate and iodides. (9) Studies have advocated the usage of vaporised hydrogen peroxide and UV for residue of PPE and filter face pieces. (16) N95 can be disinfected using 85°C heat in 100% humidity or using hydrogen peroxide. (15) Also, disinfectants containing at least 2 g/L chlorine, or detergent or 70% ethanol are found effective on surfaces. (15) For fabrics and related products, a hot water (90°C) cycle and detergent have been found adequate. (15) It is recommended that all impressions should at least undergo a disinfecting procedure by immersion in 1% sodium hypochlorite for a minimum of 10 minutes. (18). Cast partial dentures with chrome cobalt alloy should be immersed in iodophors or 1:10 hypochlorite for 10 minutes. Iodophors or chlorine compounds are preferred for heat resin dentures and all acrylic equipment. (19)

The disinfection activity in general can be virucidal or antiviral (inhibition of replication). (16) Some disinfectants can be virucidal when the duration and concentration of application is more and antiviral when less. (16) Other than duration and concentration, activation of the disinfection is dependant on several factors like pH, humidity, temperature, presence of moisture, absence of organic material that aggregate the viruses etc. (16)

Taking into consideration all the facts, it is necessary to analyse which disinfectant is better for a particular situation. The choice of disinfectant, its concentration and duration should depend on whether the procedure is non critical, semi critical or critical, possibility of infection in the patient, reaction of the chemical with object, possible health and environmental hazard, its efficacy (whether a virucidal or an antiviral activity is needed) etc.

## 5. Conclusion

From the survey conducted among 300 dentists in Tamilnadu it may be concluded that the pandemic has caused an increased fear of contraction of the virus and thus their need to use disinfectants more intensively even though it is not necessary in most cases. One must keep in mind the possible health hazards and environmental pollution too. One must be aware of the indication, Pros and cons of using a particular disinfectant. More research is needed on producing disinfectants that are less toxic and environment friendly and the long-term side effects of usage of newer disinfectants that are currently in the market.

## References

- [1]. Zhang S, Wang C, Lin M, Deng Q, Ye Y, Li Z, Qiu L and Wang Z (2020) Analysis of the Virus Contamination and Disinfection Effect in Isolation Ward of Patients With COVID-19. *Front. Public Health* 8:486-489.
- [2]. Sekhsaria S, Sharma A, Tiwari B, Sharma A, Mahajan T. Changing paradigm in prosthodontics practice post COVID-19 outbreak. *IP Ann Prosthodont Restor Dent* 2020;6(2):71-76.
- [3]. Peng X, Xu X, Li Y, Cheng L, Zhou X, Ren B. Transmission routes of 2019-nCoV and controls in dental practice. *Int J Oral Sci.* 2020 Mar;12(1):9-11
- [4]. Kampf G, Todt D, Pfaender S, Steinmann E. Persistence of coronaviruses on inanimate surfaces and their inactivation with biocidal agents. *J Hosp Infect.* 2020 Mar;104(3):246–51.
- [5]. Cassandra L. Schrank, Kevin P. C. Minbiole and William M. Wuest Are Quaternary Ammonium Compounds, the Workhorse Disinfectants, Effective against Severe Acute Respiratory Syndrome Coronavirus-2? *ACS Infect. Dis.* 2020, 6, 1553–1557
- [6]. Lin Q, Lim JYC, Xue K, et al. Sanitizing agents for virus inactivation and disinfection. *VIEW.* 2020;e16-19.
- [7]. Sharafi SM, Ebrahimpour K, Nafez A. Environmental disinfection against COVID-19 in different areas of health care facilities: a review. *Rev Environ Health.* 2020 Aug 26;36(2):193-198.
- [8]. Deyab MA. Coronaviruses widespread on nonliving surfaces: important questions and promising answers. *Z Naturforsch C J Biosci.* 2020 Sep 25;75(9-10):363-367.
- [9]. Hannah M. Dewey, Jaron M. Jones, Mike R. Keating and Januka Budhathoki-Uprety Increased Use of Disinfectants During the COVID-19 Pandemic and Its potential Impacts on Health and Safety *ACS Chem. Health Saf.* 2022, 29, 1, 27–3
- [10]. Clapeau, G & Decroix, B & Bakayoko-Ly, R & Varenne, Benoit & Dosso-Hien, D & Decroix, M. (1997). [Survey of methods of cleaning, decontamination, disinfection and

- sterilization in dental health services in tropical areas]. *Santé* (Montrouge, France). 7. 323-9.
- [11]. Santha Devy, A., S.Rajkumari and Uma, A.N. 2016. Control of Cross Infection at Dental Clinic-A Survey. *Int.J.Curr.Microbiol.App.Sci.* 5(3): 9-14.
- [12]. Sinha, Dharmendra Kumar,; Kumar, Chandan; Gupta, Arya; Nayak, Lakshmikan; Subhash, Sambit; Kumari, Ritu. Knowledge and practices about sterilization and disinfection. *Journal of Family Medicine and Primary Care: February 2020 - Volume 9 - Issue 2 - p 793-797*
- [13]. Yassir AD, Jebur AN, et al (2021): Evaluation of dental impression disinfection protocol followed by undergraduate, general practice, and specialized dentists in Iraq, *Ann Trop Med & Public Health*; 24(S2): SP24215
- [14]. Kiren J, et al. Sterilization Protocols Followed by Dentists during Covid-19 Pandemic Awareness and Practice Based Survey. *Ann Med Health Sci Res.*2021;11:239-244
- [15]. Dhama K, Patel SK, Kumar R, Masand R, Rana J, Yattoo MI, Tiwari R, Sharun K, Mohapatra RK, Natesan S, Dhawan M, Ahmad T, Emran TB, Malik YS, Harapan H. The role of disinfectants and sanitizers during COVID-19 pandemic: advantages and deleterious effects on humans and the environment. *Environ Sci Pollut Res Int.* 2021 Jul;28(26):34211-34228.
- [16]. Ghafoor D, Khan Z, Khan A, Ualiyeva D, Zaman N. Excessive use of disinfectants against COVID-19 posing a potential threat to living beings. *Curr Res Toxicol.* 2021;2:159-168.
- [17]. van Doremalen, N., Bushmaker, T., Morris, D. H., Holbrook, M. G., Gamble, A., Williamson, B. N., Tamin, A., Harcourt, J. L., Thornburg, N. J., Gerber, S. I., Lloyd-Smith, J. O., de Wit, E., and Munster, V. J. (2020) Aerosol and Surface Stability of SARS-CoV-2 as Compared with SARS-CoV-1. *N. Engl. J. Med.* 382, 1564–1567.
- [18]. Blair FM, Wassell RW. A survey of the methods of disinfection of dental impressions used in dental hospitals in the United Kingdom. *Br Dent J.* 1996 May 25;180(10):369-75
- [19]. Khan A, Madanshetty P, Musani S, et al. Coronavirus Disease 2019—The Changing Face of Dentistry. *Int J Prosthodont Restor Dent* 2020;XX(X):1–6.