A questionnaire-based survey of COVID-19 transmission in dental practice during the pandemic: comparison between the 1st-5th and the 6th-8th surges in Japan

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Research Article

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Abstract

**Background:** Previously, we conducted a questionnaire survey on infection control measures and infection status among practicing dentists in Nagano prefecture, Japan, between February 2020 and September 2021 (1-5th surge of COVID-19 cases in Japan) and found that the risk of COVID-19 infection spreading through dental care was very low. However, it was noted that the low number of infected patients during the survey period may have been a contributing factor. Subsequently, an explosive increase in the number of infected patients was observed, raising the possibility of nosocomial infections in dental treatment settings. Therefore, in this study, we reexamined the infection situation in dental care settings at the time of infection spread and compared the results with those of previous reports.

**Materials and methods**

An online questionnaire-based survey on clinical activities, infection control measures, and confirmed or probable COVID-19 cases among patients and clinical staff were conducted between February 2022 to March 2023 (6-8th surge).

**Results**

The number of COVID-19 positive patients increased approximately 50-fold between the study periods. There was a 3.5-fold increase in the rate of treatment for infected patients. Even with the increased likelihood of contact with COVID-19 patients, no cases of infection during dental treatment were observed.

**Conclusions**

The results of this study indicate that even with the possibility of contact with COVID-19 during dental treatment, the likelihood of COVID-19 clusters occurring in dental practices is low if appropriate infection prevention measures are in place.

**Introduction**

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is a highly infectious coronavirus that emerged in December 2019. SARS-CoV-2 has caused severe disease (COVID-19) outcomes and has rapidly spread since the beginning of 2020 in Japan. The primary source of transmission of COVID-19 is person-to-person contact, and the routes of transmission of COVID-19 include direct transmission via coughing, sneezing, and inhalation of droplets, as well as contact transmission via oral, nasal, and ocular mucosal contact, droplets, and aerosols. SARS-CoV-2 has been detected in saliva samples, making saliva a potential transmission route for COVID-19. Health-care workers in dental practice are at a particular risk of SARS-CoV-2 infection due to close contact with patients and potential exposure to saliva-contaminated droplets and aerosols generated during dental procedures. Therefore, dentists, dental personnel, and dental patients are potentially at high risk for exposure and transmission of this
However, few studies have reported the occurrence of COVID-19 clusters in dental offices or hospitals. In addition, there is no clinical evidence that aerosols generated during dental procedures can lead to the transmission of COVID-19. In a previous study, we conducted a questionnaire survey on infection control measures and infection status among practicing dentists in Nagano Prefecture of Japan during the period from February 2020 to September 2021 (1-5th surge of COVID-19 cases in Japan) to understand the status quo of infection in dental practices. The results showed that the risk of COVID-19 infection spreading through dental care was very low. It was suggested that COVID-19 clusters might not occur in dental settings where appropriate protective measures are implemented. However, the incidence of COVID-19 patients at the time of the survey (cumulative number of patients during the study period: 8,723; percentage of the population of the prefecture testing positive for COVID-19: approximately 0.43%) was not high, and the low incidence could be one of the reasons for the low risk of infection.

A subsequent explosion in the number of infected patients (6-8th surge of COVID-19 cases) and the emergence of new mutant viruses were confirmed in Japan. While the cumulative number of infected patients (PCR-positive patients) from the 1-5th surge was 8,723, the number dramatically increased to 440,000 from the 6th to 8th surge, which means that approximately 21.8% of the population of Nagano Prefecture was COVID-19 positive (Fig. 1). This also increased the possibility of nosocomial outbreaks in dental care settings. Therefore, in order to re-evaluate the situation of nosocomial infections in dental practice, a questionnaire survey was again conducted on the situation in which the number of infected patients had increased.

**Materials and Methods**

This survey was conducted in March 2023 using Google Forms (San Mateo, California, USA). The subjects and methods of the study were the same as in previous reports. Specifically, members of the Nagano Dental Association were invited to participate in the survey through the contact network of the Nagano Dental Association. The questionnaire consisted of questions on the number of patients, clinical activities (administrative control), infection control (vaccination, environmental/engineering control, and use of personal protective equipment [PPE]), and confirmed or suspected COVID-19 infection among patients and clinical staff. This study examined the situation from February 2022 to March 2023, when the 6-8th surge of COVID-19 infection was observed in Japan. This study was conducted in accordance with the Declaration of Helsinki and was approved by the Medical Ethics Committee of Shinshu University (approval number 5306).

**Results**

A total of 345 dentists responded to the survey (overall response rate: 31.0%). The results of the survey are summarized in Tables 1–4. Regarding treatment and patient restrictions (Table 1), 61.2% of respondents in the previous survey indicated that there were restrictions, while the percentage decreased
to 37.7% in the current survey. There were no major changes in terms of what was restricted; however, there was a decrease in restrictions on procedures generating aerosols and droplets (17.9–8.5% and 12.3–3.8%, respectively). A comparison of infection control measures with the results of the previous survey are shown in Table 2. The vaccination rate (all staff and some staff members) was 97.1%, similar to that in the previous survey. Entrance screening for COVID-19 (symptoms/signs, body temperature, facemask use, and hand hygiene) was carried out in 93.3% of clinics, a 3% decrease from the previous survey. Regarding infection control measures during procedures that generate splashes and/or aerosols, the results of this survey were similar to those of the previous survey. Surgical gloves (96.5%) and masks (surgical masks, 75.7%; N95 masks, 19.7%) were used in almost all clinics. Face/eye protection was used in approximately 80% of the clinics, and an extraoral dental suction device was used in approximately 75% of the clinics. The cleaning of potentially contaminated surfaces was performed in almost all clinics (92.8%), and draping was performed in 18.3% of the clinics. More than 80% of clinics encouraged mouth washing before oral examination and treatment (24.1% with water and 58.0% with mouthwash).

A total of 17 (4.9%) clinics experienced the dental treatment of confirmed COVID-19 positive patients, including root canal treatment, prosthetics, cutting and draining pus, tooth extraction, and oral care (Table 3). As a result, no cases of nosocomial viral infection associated with these procedures were reported.

A total of 62 (18.0%) clinics experienced dental treatment for patients who were later found to be infected (i.e., some staff members were in close contact with COVID-19 patients) (Table 4). The dental procedures performed on the patients included dental scaling, restoration of tooth caries, denture fitting/adjustment, root canal treatment, and tooth extraction which could have resulted in droplet formation during the period of possible viral infection. However, as in the previous study, no cases of viral infection from patients to dental staff members were reported.

A total of 183 dentists reported that staff members, including the dentists themselves, had been infected with COVID-19 (20 before vaccination and 163 after vaccination). The source of infection was suspected to be outside the clinic in 106 and was unknown in the remaining occurrences. Of these, 15 (4%) indicated that there was infection among the clinical staff. Twenty-one of these staff members provided dental care during the period of possible viral infection, but none of the patients who received dental care were diagnosed with COVID-19 infection. Sixty (17.4%) reported that they had closed their clinic due to infection or close contact with COVID-19 patients.

**Discussion**

In the present study, a similar questionnaire was administered to almost the same subjects to investigate COVID-19 transmission in dental practice during different infectious disease pandemics (1st -5th vs 6th -9th surge in Japan). The results of this survey showed that no nosocomial infections were observed in the dental clinics even when the number of COVID-19 patients increased explosively. The number of COVID-19 positive patients increased approximately 50-fold between the study periods that were
compared. In addition, the results of this study also showed that the number of COVID-19 patients treated at dental clinics also increased approximately 2-fold (from 9 to 17), and the number of dental staff identified as concentrated contacts of COVID-19 patients increased approximately 3.5-fold (from 18 to 62). Although dental care restrictions were in place in the early stages of the spread of the infection, the rate of dental care restrictions also declined, as indicated by the results of this survey (61.2% in the 1st -5th surge vs. 37.7% in the 6th -8th surge). As mentioned above, even with the increased likelihood of contact with COVID-19 patients, no cases of infection during dental treatment have been observed.

The results of a previous study\(^\text{12}\) suggested that entrance screening (water-front measures), standard infection control measures such as contact infection control and standard PPE (masks, face shields, eye guards, gloves, gowns, and aprons), use of extraoral vacuums, and encouraged gargling would play an important role in infection control in dental practice. In the current survey results, these infection control measures were still being implemented at the same high rates as before. In addition, vaccination coverage was also high at approximately 80% in both study periods. These results suggest that the situation in which such infection control measures are implemented in dental practices is probably the reason why COVID-19 infections associated with dental treatment are virtually nonexistent.

During the period of this study, a total of 183 dentists reported that staff members, including dentists themselves, had been infected with COVID-19. The results of this study suggested that transmission occurred outside dental care, at home, at school, at office, or at other crowded indoor settings. In fact, in this survey, 15 indicated that there was COVID-19 transmission among clinical staff members outside dental care. The risk of viral transmission is high during unmasked communication\(^\text{13,14}\). Infection of medical staff affects the delivery of health care\(^\text{15}\). At the time of this survey, 17.4% of dental clinics reported having to close their offices. In a pandemic of respiratory infections, the health of medical staff is important, as is attention to nosocomial infections.

As noted in our previous report, this survey has several limitations. First, this survey was conducted in a single prefecture in Japan. It is unclear whether similar results would be obtained in a larger national survey. Second, the overall response rate was 31.0%, which may indicate some degree of potential selection bias. Respondents may have been more concerned or worried about safety measures than non-respondents were. However, given the need for timely information and the rarity of medium to large surveys of COVID-19 measures in private dental practices, the data from this study may be useful to clinicians. Finally, because the survey was self-reported, there is a small possibility of misclassification by the individual practicing dentists who responded.

In conclusion, the results of this study indicate that even if COVID-19 infection were to spread and the number of infected patients were to increase approximately 50-fold in a short period of time, the likelihood of COVID-19 clusters occurring in dental practices is low if appropriate infection prevention measures are in place.

**Declarations**
Author Contribution

Hironori Sakai and Hiroshi Kurita drafted the study, Eiji Kondo, Hirokazu Tanaka and Akinobu Shibata collected the data, Shizuka Nakatani prepared the tables, Hironori Sakai wrote the manuscript, Hiroshi Kurita edited it and all authors reviewed it.

Human Ethics and Consent to Participate:

Not applicable. This study evaluated institutional practices in terms of infection control and did not include personally identifiable data of human participants.

Funding Declaration:

None.

Competing Interests Declaration:

The authors declare that they have no competing interests.

References


Tables

Tables 1-4 are available in the Supplementary Files section.

Figures
Figure 1

Legend not included with this version

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

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