

# Nursing strategies for COVID-19 prevention and control in a selected dental clinic

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**Aim:** To comprehensively introduce the prevention and control measures that we can take in dental clinics during the pandemic period of coronavirus disease 2019 (COVID-19) and provide some practical experience for the development of nursing and health policies applicable to COVID-19.

**Background:** The outbreak of COVID-19 has placed the global health system under threat, which seriously influences the normal operations of human society. Safe and effective nursing measures should be taken to ensure the normal operation of dental clinics.

**Sources of evidence:** We searched and referenced many references on the PubMed database. Through the combination of related literatures and our experience, we describe various strategies, including personnel management, personal protection, disinfection and isolation, adopted in the dental clinic of our Chinese hospital during the pandemic of COVID-19.

**Discussion/Conclusions:** We introduced strategies for the nursing staff in dental clinics to assist them with the prevention and control of COVID-19. The successful implementation of the protective measures could ensure the safety of medical staff and patients, and contributed to the normal operation of dental clinics during the pandemic period.

**Conclusions for nursing and health policy:** During the pandemic, frontline nurses are under physical and mental pressure facing the threat of infection while at work. In addition to pandemic prevention, we should also pay attention to the needs of nursing staff. More reasonable and effective nursing and health policies should be formulated to ensure their safety and protect their rights and interests. This is the only way that the prevention and control of COVID-19 can be achieved, and we can prepare for future public health events.

**Keywords:** COVID-19, Dental clinics, Health policy, Infection control, Nursing, Policy making

## Introduction

Coronavirus disease 2019 (COVID-19) is a newly identified infectious disease caused by a novel coronavirus (SARS-CoV-2). After causing a shock in China, it became a global

pandemic from the spread of epidemics. The World Health Organization (WHO) announced it as a Public Health Emergency of International Concern (PHEIC) on 30 January 2020. Through the adoption of a series of preventive and therapeutic measures, the transmission of COVID-19 was dramatically suppressed in China, and the pandemic situation has been alleviated in most provinces of China. However, the global situation has become worse as more and more countries reported COVID-19 outbreaks. According to the a report of WHO, by 7 September 2020, COVID-19 had been diagnosed in more than two hundred countries with more than 27 million people infected, and more than 880000 people had died from it. The pandemic situation was more serious in the Americas, Europe and Eastern Mediterranean regions compared with other regions. Among them, the United States,

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India, Brazil and Russia accounted for about 60% of infected people in the world. COVID-19 has brought great threats to the global health system, and which seriously influences the normal operation of human society.

With the emergence of emerging infectious diseases, nurses constitute a major group in the fight against infection. According to a previous study, the importance of infection control and prevention has not attracted enough attention (Nasiri et al. 2019), which is a serious threat to the health of medical and nursing staff and patients. Furthermore, applicable and effective nursing measures play a vital role in the prevention and control of pandemic situations. Because dental clinics require special working conditions, we must pay more attention to the control of nosocomial infection, and implement more professional and effective strategies to standardize the nursing work facing the challenge of COVID-19 or similar infectious diseases. Here, we report on strategies and experiences that are useful for the nursing staff of dental clinics in the prevention and control of COVID-19 during the pandemic period.

### **COVID-19 brings enormous challenges to the management of dental clinics**

At present, it has been confirmed that respiratory droplets and close contact transmission are the main routes of COVID-19 transmission. Moreover, due to the detection of novel coronavirus in urine and faeces, environmental pollution caused by them is also a potential route of transmission (Sheervalilou et al. 2020). In addition, due to the risk of SARS-CoV-2 transmission by aerosols (van Doremalen et al. 2020; Sommerstein et al. 2020), we may be infected without protective equipment such as masks. According to current epidemiological research, COVID-19 has an incubation period of 1–14 days, and even longer in some extreme cases (Lauer et al. 2020) and there are also asymptomatic infected people (Sohrabi et al. 2020; Sun et al. 2020). In general, diversified transmission channels and long incubation period make COVID-19 a highly contagious disease, which is not conducive to the prevention and control of pandemic situations.

The specific characteristics of COVID-19 brings plenty of difficulties to the routine work of dental clinics (Meng et al. 2020). Especially in the diagnosis and treatment of oral diseases, the medical staff constantly come into close contact with patients' saliva and blood. Moreover, in the process of operation, the use of various handpieces and ultrasonic instruments inevitably cause the spatter of saliva and blood, as well as the production of aerosols. Therefore, during the pandemic period of COVID-19, we must strictly screen patients who come to the hospital. Medical staff must have

the concept that every patient may be a potential source of infection, and take the required prevention and control measures. Below are the strategies we have incorporated in our dental clinics in our hospital which will help inform the international community of medical and nursing workers as well as evidence from the international literature.

### **Strategies which can be implemented during routine nursing work**

#### **Personnel management**

##### *Improving personnel management system*

To ensure the safety of patients and medical staff and maintain the normal operation of dental clinics, we should formulate specific regulations and measures according to superior documents and guidelines, which are conducive to the prevention and control of COVID-19. Moreover, all the staff in and out of the hospital should be checked every day, and stop working to undergo medical examination if they report with fever, cough and other related symptoms.

##### *Personnel training for dental clinics*

We need to ensure that all medical and nursing staff undergo inservice training around epidemiologic characteristics, clinical manifestations, diagnostic criteria, prevention measures and other related knowledge of COVID-19. In addition, intensive training of the occupational protective measures should be provided for nurses, such as the standard demonstration of the wearing of biochemical protective clothing. To improve learning efficiency and restrict gathering, we can participate in some online lectures and get trained in batches.

##### *Reasonable division of labour*

There are many dental chairs, complicated instruments and various disinfection and isolation measures in dental clinics in hospitals. In order to facilitate the management of daily work, especially under the situation of COVID-19, reasonable allocation of the disinfection and isolation work should be paid more attention at all levels, and which can be linked with comprehensive personal assessment.

##### *Patient management*

Reinforcing the management of consulting rooms and establishing a practical pre-examination and triage system is necessary. Studies indicate that community-wide mask wearing contributes to the control of COVID-19 (Cheng et al. 2020). Therefore, everyone who enters the dental clinic should wear a medical mask. After taking the temperature at the entrance

of the clinic, the nurses collect the complete personal histories of each patient and their family members, such as a travel history to pandemic areas in the previous 14 days or more. Moreover, we need to pay attention to whether the patients have any discomfort such as cough. Except for some special circumstances, family members are not allowed to accompany patients to the clinic so as to reduce the chance of cross-infection. For patients with fever, they first get screened in the fever clinic to exclude COVID-19 and then enter a specially reserved consulting room for diagnosis and treatment. The thorough registration and data statistics of these patients to strengthen disease detection is required.

### Self-protection

#### *Basic protection*

It is required that all staff who enter the consulting room and have direct contact with patients must wear masks, work caps, shoe covers and long-sleeved work clothes. Work clothes and hats should be replaced every day, and masks should be replaced every 4 h. Remember to replace them immediately in case of pollution or humidity.

#### *Wash hands and wear gloves*

Hand washing is one of the most important measures to prevent the spread of nosocomial infection. In order to prevent the spread of microorganisms, before and after contact with patients, wash hands in strict accordance with the "six step washing method" under flowing water. Wearing gloves before physical examination or other procedures that require direct contact with patients. After the procedure, take off gloves and sterilize hands with alcohol hand sanitizer, and then replace a pair of new gloves to receive the next patient. It is strictly prohibited to use the same pair of gloves when receiving different patients and to touch public surfaces when wearing gloves. Thorough hand washing needs to be promoted even when there is no obvious pollution and use of hand sanitizer only where soap and water are not available. The diagram of six step washing method must be posted at each sink, and each treatment table must be equipped with an alcohol-based hand sanitizer.

#### *Use of personal protective equipment*

To date, hundreds of species of microorganisms have been identified in saliva, which can cause the spread of many kinds of diseases, including COVID-19 (Li et al. 2020). During the treatment of oral diseases, the use of high-speed turbo drill, ultrasonic cleaning machine, and cutting and grinding machine will produce lots of droplets and aerosols derived

from saliva. Many studies have shown that total bacteria concentration in the air around the mouth of patients during the operation of oral disease is higher than that of patients without operation (Hallier et al. 2010; Vilarinho Oliveira et al. 2018). As early as 1998, Disciaciati et al. (1998) added dye into the water supply of dental chair to observe the splashing during the operation. The results showed that the dental chair, patients, medical staff and the operating platform equipped with disinfected equipment were all within the splashing range. Nejatidanesh et al. (2013) observed 144 cases of splash points on the periodontium and the doctor's mask after the operation, which indicated that the nose and the inner canthus were the most polluted areas (Nejatidanesh et al. 2013). In addition, Prasanth et al. (2010) detected streptococcus and staphylococcus on the surface of the cart near the dental chair after the treatment. Moreover, previous studies suggested that the aerosols could cause serious pollution in an enclosed dental clinic (Vilarinho Oliveira et al., 2018; Zemouri et al. 2020). Therefore, during the diagnosis and treatment of oral diseases, the medical staff must wear disposable surgical masks or medical protective masks, goggles, surgical caps, isolation gowns and medical protective gowns. Disposable isolation gowns and protective gowns should not be reused, while goggles and protective masks should be cleaned with wet towel first and then wiped with 75% ethanol for disinfection.

### Strict disinfection and isolation

#### *Environmental management*

Strictly divide into sterile area, clean area and polluted area. A previous study showed that after an oral operation in a clinic with multi dental chairs, the bacteria concentration was 5 times higher than before, while in a clinic with one dental chair, the difference was reduced to 2 times (Al Maghlouth et al. 2004). The Brazilian Ministry of Health stipulated that the minimum safety distance of two dental chairs is 2 m, while later studies show that the spreading scope of bacteria generated during an oral operation exceeds this distance. In addition, in a clinic with several dental chairs, separating them with boxes can decrease the level of fungal contamination (Vilarinho Oliveira et al., 2018). Therefore, during the pandemic, we should strictly comply with the principle of "one patient one consulting room, one patient one disinfection".

#### *Before diagnosis and treatment*

Several studies have confirmed that we can reduce the number of indoor bacteria caused by oral operation through

rinsing the mouth of patients before operation (Feres et al. 2010). Hence, patients can use 1% hydrogen peroxide to rinse the mouth pre-operation. Besides, before operation we should replace the disposable cup and treatment pad, prepare the disposable instrument tray, and unpack the sterile instruments in the presence of patients, which can eliminate patients' concerns about the disinfection measures of clinic.

#### *During diagnosis and treatment*

Strengthen the concept of "four hand operation". Nurses should transfer various instruments, materials and drugs in a timely manner to reduce the chance of doctors wearing gloves to make contact with patients and equipment during diagnosis and treatment. Moreover, in order to effectively reduce splash pollution during the operation, literature emphasizes and recommends the use of an air cleaner to reduce aerosol pollution during dental procedures (Chen et al. 2010). Another study also indicates that an air purification system can effectively reduce the number of bacteria in dental clinics (Hallier et al. 2010). Furthermore, the combination of preoperative gargle and the use of air cleaner is more effective than any one of the interventions alone (Devker et al. 2012; Narayana et al. 2016). Another study describes a protective device that may be used to reduce microbial aerosols in dental clinics during the COVID-19 pandemic (Teichert-Filho et al. 2020). Negative pressure air rooms can be used to reduce aerosol pollution during dental procedures as conditions permit.

#### *After diagnosis and treatment*

After the diagnosis and treatment of a patient, disinfect the spittoon with 1000 mg/L effective chlorine disinfectant. The mats, cups and chest towels should be thrown into medical garbage bags. Reusable medical fabric should be thrown into orange red special bag and sprayed with 1000 mg/L effective chlorine disinfectant before to be further disposed. After a day of diagnosis and treatment, wipe the consulting room, including the floor, operation tables and dental chairs with 1000–2000 mg/L effective chlorine disinfectant or 75% ethanol.

#### *Air disinfection*

The use of high-speed dental handpieces and ultrasonic cleaning machine can produce droplets of different sizes from 0.001 to 1000  $\mu\text{m}$ . Particles with diameters greater than 100  $\mu\text{m}$  quickly diffuse to the human body and object surface, while smaller particles can float in the air. These droplets mixed with saliva and blood of patients result in environmental pollution. Investigation shows the significant

air contamination during dental procedures (Pasquarella et al. 2010). As virus concentration in the air depends on air circulation, the best method of air disinfection is ventilation. Open all doors and windows of the clinic every day, and improve air circulation mechanically when necessary, as the use of negative pressure air rooms could effectively reduce aerosol particles produced by dental procedures. In addition, disinfect the clinic with ultraviolet radiation twice a day for 30 min each time. The surface of the air purifier should be wiped twice a day with 1000 mg/L effective chlorine disinfectant. Moreover, after the filter screen of the central air conditioning system is disassembled, soak it in 1000 mg/L effective chlorine disinfectant for 30 min twice a day to disinfect.

#### *Equipment disinfection management*

The medical apparatus and instruments of dental clinics are various and exquisite. Most of them such as dental turbines may contact patients' saliva and blood, which can directly cause the spread of various pathogenic bacteria under circumstance of incomplete disinfection. Therefore, all contaminated instruments must be disinfected strictly according to the instructions of Disinfection Technical Specifications. For example, the general instruments should be treated according to the "Disinfection, Cleaning, Drying and Sterilization" procedure. However, for the contaminated turbines, we should take the "Wipe Disinfection, Ultrasonic Cleaning with Liquid Rinse and Oil Injection, Independent Sealed Packaging and High-Pressure Steam Sterilization" process. In addition, disposable medical devices should be placed by category after use, such as disposable syringe needles, probes, tweezers and other sharp instruments should be placed in medical sharps containers. All medical wastes should be treated pursuant to the provisions of the Regulation on medical wastes Management, and the nurses should do a good job of storage and sorting for disinfected instruments.

#### *Water supply pipeline and sewage treatment*

To avoid cross contamination, CDC suggested that the waterlines should be flushed for at least 20–30 s between patients during the treatment. During the pandemic period, filtered water is used for the water supply of dental turbines and automatic cleaners in the stomatology department of our hospital. The water supply pipeline should be flushed intermittently twice a day for 5 min each time with 1000 mg/L effective chlorine disinfectant; then, distilled water can be used for the following treatment. Wastewater is discharged into the hospital's sewage treatment system through an independent pipeline. Besides, the bathroom should be treated

with Disinfectant (each tablet containing 500 mg of available chlorine) four times a day.

### The operation of our clinic during the pandemic

In January 2020, the National Health Commission of the People's Republic of China included Novel Coronavirus Pneumonia as a category B infectious disease, just like severe acute respiratory syndrome (SARS), which we should manage as a category A infectious disease. Since then, in most cities of China, routine dental operations have been suspended, and dental emergencies are treated only under strict protective measures. During the outbreak of COVID-19, our clinic strictly complies with relevant regulations. After the pandemic is under control in Shanghai, our clinic resumes some outpatient and hospitalization services for patients. Even so, an outpatient appointment system is adopted to screen and limit the number of patients, which can reduce large-scale gatherings in the clinic and contribute to the prevention and control of cross-infection. According to our statistics, the volume of outpatient and emergency visits significantly decrease this year compared with the same period of 2019 in our clinic, as shown in Figure 1. Furthermore, benefitting from the above prevention and control measures, there have been no confirmed cases of COVID-19 in our clinic. The successful implementation of the above protective measures can ensure the safety of medical staff, nurses and patients, and contribute to the normal operation of dental clinics during COVID-19 pandemic.

### Implications for Nursing & Health Policy

Nurses have always played a crucial role in the treatment of patients and the fight against public health events (Mo et al. 2020). In face of infectious diseases, nurses around the world are under huge pressure. They not only fight the virus, but also solve practical problems, such as the shortage of protective supplies and staff, which put their own lives in danger.

The pandemic situation is a global problem. As clinical frontline staff, nurses are directly in contact with the patients and doctors. They should protect not only patients but also doctors and themselves from infection. At the same time, the global shortage of medical facilities also makes the prevention, detection and treatment of COVID-19 more difficult.

During the pandemic, frontline medical and nursing staff are under tremendous mental pressures. An investigation focusing on the psychological health status of medical staff in Wuhan during the pandemic shows that most of them had varying degrees of mental health disturbances, which was worse among young women (Kang et al. 2020). Krishnamoorthy et al. (2020) also demonstrated the prevalence of psychological diseases among the public, medical staff and patients under the threat of COVID-19 pandemic. Moreover, transdisciplinary nurses endure higher levels of pressure and more psychological problems than nurses with experience in infectious diseases at the forefront of COVID-19 pandemic (Fan et al. 2020). Therefore, managers need to pay more attention to the vocational and psychological issues of medical staff (Liang et al. 2020). To avoid the occurrence of adverse events, the willingness to contact suspected or confirmed patients of nurses should be respected. Furthermore, a series of protective policies and measures should be implemented, including professional pre-job training, adequate food and drink supplies, reasonable rest periods, moderate leisure activities and timely psychological counselling (Chen et al. 2020).

In daily work, the nurses must help to ensure the safety of the diagnosis and treatment environment, and be good at summing up experiences from daily work to deal with public health events effectively. Simultaneously, they should also let their voices be heard, whether it is sharing experiences or giving advice. Healthcare administrators should pay close attention to the development of pandemic situation, formulate reasonable and effective strategies according to government regulations and the opinions of all parties. All of these are of

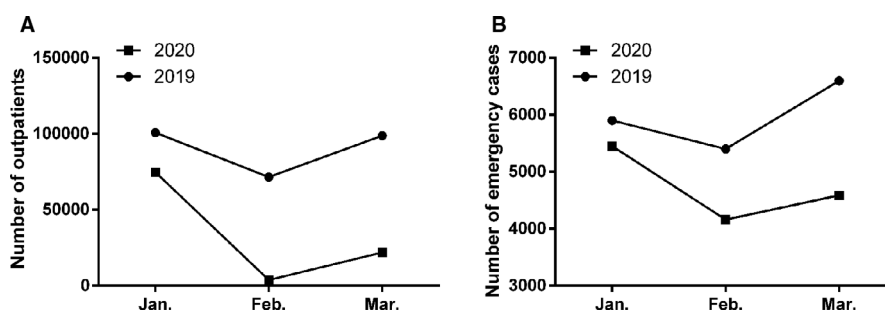


Fig. 1 The decrease of outpatient and emergency visits in three months of 2020 compared with the same period of 2019 in the dental clinic of our hospital. (a) The decrease of outpatient visits. (b) The decrease of emergency visits.

great significance for the prevention and control of COVID-19 and will make enough preparation for future public health events.

### Author contributions

Study design: LLH, JLZ

Data collection and analysis: JLZ, WJY

Drafting of manuscript: JLZ, XJN

Study supervision: WJY, JLZ.

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