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Review Article

Possible transmission of Covid-19 & precautions in a dental setting: A review

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ABSTRACT

A severe pneumonia outbreak occurred in Wuhan City in late December 2019.

Inhalation of airborne microorganisms that may remain in the air for a long time, direct blood contact, oral fluid or other patient material, connective contact with droplets and nasal or mouth mucosal microorganisms formed or proposed by an infected person transmitting pathogens to the dental environment for a short time. Contacts can also occur in a relatively closed environment where aerosols are exposed to high aerosol levels. Dental practice produces risky dentists and patients with aerosols.

Therefore, the research aims to prevent infections in dental practices from hindering transmission routes between clinics and hospitals. Dentists played a significant role in stopping 2019-ncov transmission. In dental clinics and hospitals, infection control is advised to block routes from person to person.

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1. Introduction

An epidemic of pneumonia had begun in City Wuhan in late December 2019.¹ It spread rapidly to most countries.^{2,3}

The transmission of aerosols is possible by means of communication in a relatively closed environment for high aerosol concentrations.⁴

All appropriate steps should be implemented in this particular period as well as necessary measures.⁵

Inhalation of microorganisms, direct blood contact, oral fluids and other patient material, aerosol interactions created and propelled to an infected person transmitting pathogens to dental contexts.⁴

This review aims to understand the pathogenesis of infection in dental scenario, blocking the road between dental hospitals and clinics.

2. Possible 2019-ncov transmission routes

2.1. Airborne radius

Airborne SARS-CoV is generally known in several literature sections. Studies have shown that aerosols and droplets are generated during dental treatment procedures.

In dental clinics and hospitals, two major issues are the 2019-nCoV droplet and aerosol production. High amounts of aerosol cannot be prevented during dental work with saliva, and even the patient's blood.⁶

A person who coughs, laughs or talks produces large and tiny droplets or aerosols (>5 µm in diameter).⁷

Based on the droplet size, more massive drops quickly fall to the ground, involving near-physical contact between an infected individual and a respondent.

On the other hand, small droplets or small particle traces of evaporated droplets have a low settling velocity, so they may stay in the air for a longer period of time and move further until they can reach the respiratory tract or contaminate surfaces.

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Research has shown that aerosols like SARS-CoV can be highly virulent and pathogenic over 6 feet.⁷

High-speed dental operations can lead to too much heat when frictions occur between teeth and bur.

Without cooling, heat can damage hard dental tissues, causing pulp necrosis. Water coolant (including tooth preparation, oral prophylactics, oral surgery) is widely used in dental surgery.⁸

However, water-coolant can produce aerosols. Bioaerosols, including blood and saliva, grow with oral cavity fluids. Bacteria, fungi, and viruses typically contaminate these bioaerosols. The air may be inhaled by dentists or other patients at the clinic.^{9,10}

2.2. Contact spread

A dentist can consider a potential route to the viral transmission through regular direct or indirect contact with human fluids, patient products, or air-infected dentures.⁶

Furthermore, dental professionals and other patients are likely to have conjunctival, nasal, or oral mucosa contact with droplets and aerosols containing micro-organisms produced by an infected person and propelled by coughing and talking without a mask a short distance.³

To avoid spreading 2019-nCoV, practical techniques are required.

2.3. Contaminated surfaces

Dental operations help develop droplets and aerosol that can contaminate the entire dental surface.¹¹

Furthermore, studies have shown that NCoV remained infectious at room temperature for 2-9 days and persisted 30 percent more effectively at 50 percent relative humidity.¹²

Dental conditions will minimize the prevalence of 2019-nCoV.¹²

3. Take special consideration

3.1. Patient evaluation

Usually, a COVID-19 patient is not recommended to go to dental clinic during the disease's acute febrile phase.

In this case, a dentist should be able to diagnose a patient suspected of 2019-nCoV and not treat the patient in dental centers, but should immediately quarantine and notify the patient, particularly during an infection control department's 2019-nCoV outbreak.

Patient's body temperature is then noted using a contactless thermometer placed on a forehead. Using a questionnaire, patients with possible 2019 nCoV infection will be checked after switching to the chair.

These questions are as follows:

1. Have you over the past 14 days had fever or felt feverish?

2. Have you encountered a sudden onset of respiratory issues, such as cough or breathing difficulties in the last 14 days?
3. Did you fly to China, Hong Kong, Iran, Italy, France, Spain, Germany, Japan, Singapore, South Korea, Taiwan, Vietnam, Thailand or any other COVID19 affected area during the last 14 days?
4. Did you come in touch with a confirmed 2019- nCoV infection patient during the last 14 days?
5. Have you come into touch with people from Wuhan City and its surroundings or with neighborhood people with recent reported fever or respiratory problems over the past 14 days?
6. Are there at least two individuals with reported fever or respiratory problems who have been in close contact with you during the last 14 days?
7. Have you taken part in any conferences, meetings or had near contact with other unknown individuals recently?

If a patient answers all these questions, as 'yes' & body temperature is below 37.3°C and treatment may be delayed for 14 days after diagnosis.

The patient will be advised to take self-quarantine at home and report to the local health department any fever or flu-like syndrome symptoms.

If a patient answers "yes" to all of the screening questions, and the body temperature is no less than 37.3°C, the patient will be quarantined immediately and the dental practitioners will report to the hospital's infection control department or local health department.

If a patient answers "no" to all screening questions and the body temperature of the patient is below 37.3°C, the dentist should treat the patient with extra-protection precautions and should prevent spattering or aerosol-generating procedures.

A COVID-19 Fever Clinic or Expert Clinic requires further medical attention if a patient answers 'no' to all examination questions but may not reach 37.3°C at body temperature.

3.2. Hand hygiene

For 2019-nCoV, dental hand hygiene value has been noted.

If dental practice requires good manual hygiene, hand washing is relatively inadequate and a significant challenge to avoid infection during the 2019-NCov epidemic.

Effective hand hygiene is vital. Hand-washing is particularly important to avoid acute respiratory infections.

Several epidemiological studies have shown that during the SARS epidemic, hand-washing and alcohol-based rubber (ABHR) exposure was successfully reduced.

WHO (2020) claimed ABHR or Handwashing soap and water involved in manual hygiene, and both methods were also useful.

When hands are not soiled, ABHRs are favored; hands are soiled.^{13,14}

The oral practitioners must wash the environment, structure, and oral mucosa, broken skin or wound, blood, body fluid, and part, and excretion before medical review.

Care should be taken to avoid head, mouth, and nose injury of their own.

3.3. Personal protective measures for the dental professionals

There are currently no clear safety guidelines for 2019 dentists in dental centres and clinics, although no dentist confirmed the 2019-nCoV report date.

The epidemic of oral microorganisms primarily radiates into the dentist's face, particularly the inner part of the eyes and the nose. These areas are critical for infection transmission, as airborne droplet infection is a crucial route of dissemination.

3.3.1. Aerosol handling can be a significant obstacle to other risks faced by personal protective equipment (PPE).¹⁵

1. Wearing of a disposable working hat, reusable operating apron (white cover), protective glasses or masks and, if appropriate, disposable latex or nitrile gloves.^{16,17}
2. Secondary protection (advanced dental specialist protection); Wearing head cap, disposable surgical mask, safety goggles, face shield, and working clothes (white coat) with outdoor disposable insulating clothes or surgical clothing, and disposable latex gloves.
3. Tertiary protection (increased safety when suspected or confirmed 2019-nCoV infection patients are treated) and personal safety checks are required in the unlikely event of the disease, including unknown patients treated for 2019-nCoV dentistry.

In the context of emergency dental treatment, suspected COVID-19 cases, including EU FFP3 inhalers compliant with EU 149 standard (EN149) should be used.

3.4. Mouthrinse before dental procedures

Pre procedural mouth rinse is one of the most effective methods of reducing microorganisms to oral aerosol ratio.¹⁸

The common practice of reducing oral bacteria is by using preoperative mouth rinses.

However, as outlined in the PRC's Diagnosis and Treatment of Novel Coronavirus Pneumonia National Health Commission, chlorhexidine, commonly used as mouth rinses for dental use, fails to kill 2019 nCoV as reported.¹⁹

As the 2019 nCoV is prone to oxidation, oral rinse, including possible 2019-nCoV transportation such as 1%

peroxide or 0.2% povidone, is recommended for pre-procedural oral rinse containing oxidants.

If rubber barrier cannot be used, preoperative mouth rinse should be most effective.¹⁸

3.5. Rubber dam isolation

A primary barrier protection for aerosols for dental procedures, includes rubber dam, which helps in preventing contaminants from respiratory secretion.²⁰

The application of the rubber dam in cavity preparation ensures that micro-organism spread is significantly reduced by 90%.

When using a rubber dam, extra high-volume suction for aerosol and spatter along with standard suction should be used during the procedures. This also requires a particular four-hand method.²¹

Although the separation from rubber dams is often not available, hand-held instruments such as carisolv and hand scalers should be often used to limit aerosol production.

One downside to using the rubber dam is that it is not feasible in procedures involving subgingival instrumentation, such as subgingival restoration and preparation of the subgingival crown margins.

3.6. Clinic disinfection

Clinics and public environments should take appropriate and thorough disinfection steps. Post appropriate instructions at the waiting room door. Ensure that when coughing or sneezing patients cover their nose and mouth, dispose their used tissue in the bin, maintaining facial hygiene.

Patients should be seated in comfortable, ventilated waiting rooms. Proper ventilation at 60L / s per patient in natural ventilation rooms should be maintained.²²

The patients should be seated at a distance of at least 1m away from each other.

As indicated by WHO (2016), equipment such as sleeves and blood pressure heaters with 70 % ethyl alcohol should be washed and disinfected.²³

3.6.1. Respiratory hygiene & cough etiquettes

Patients should be asked to cover nose and mouth while coughing/sneezing; Patients should be given tissues and no-touch receptacles to discard used tissue, along with face masks to coughing patients.

Dispose of the used tissues and masks, and after contact with respiratory secretions perform hand hygiene.

To ensure a high level of protection during aerosol operations, dental workers should use an N95 respirator rather than a facemask.

3.7. Removal/filter of contaminated air

The two most widely used machines are cheap HVE filters and expensive HEPA filters to remove/filter polluted air.

HVE: a suction device capable of removing up to 2.83 m³ of air per minute. Dental aerosols are better removed, shaping and reducing emissions efficiently by 90%.²⁴ However, the tool should be held at a reasonable distance (approx. 6–15 mm).

One drawback of the HVE is that without a dental assistant, clinicians can face difficulties using one hand to operate it. On the market there are updated HVEs which address this problem.

HEPA filter: It is an air filtration system that eliminates 0.3 μm of particulate matter by 99.97%. One downside is that if stored microorganisms multiply and spread to filtered air, the filter may become a bacteria source.^{25,26}

3.8. Environmental surface disinfection

Droplets containing harmful pathogens may be deposited on surfaces around them during aerosol-generating procedures. A review of 22 studies showed that on inanimate surfaces, human coronavirus such as SARS and MERS would last up to 9d.

However, surface disinfection can deactivate them within one minute. Surface disinfectants contain 62%–71% ethanol, 0.5% hydrogen peroxide, and 0.1% hypochlorite. Operating surfaces must be disinfected after treating each patient.

4. Conclusion

Dentists are often at high risk of being exposed to infectious diseases.

A greater understanding of the transmission of aerosols and their presence in dentistry will help us recognise and rectify neglect in everyday dental practice.

In addition to the usual precautions, additional measures may be introduced to avoid disease transmission from asymptomatic carriers. Such special precautions will not only help monitor COVID-19 spread but also act as a guide to other respiratory diseases. Additional steps may be taken to avoid asymptomatic carriers with sufficient disease-borne precautions. Such special precautions will monitor COVID19 and other respiratory diseases.

5. Conflicts of interest

All authors declare no conflicts of interest pertaining to the stated work.

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None.

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