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Knowledge, Attitude and Practice Among Various Dental Professionals Regarding Aerosol Control Post Covid-19 – A Questionnaire Study

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Abstract

Introduction: The possible routes of 2019-nCoV transmission are mainly direct contact and droplet transmission. Aerosol transmission is also a possible route of transmission when there is an exposure to high concentrations of aerosols in a relatively closed environment. Routine dental procedures generate aerosols, which pose potential risks to the dental care personnel and patients. Understanding aerosol transmission and its implications in the field of dentistry is essential. In addition to standard precautions, it is necessary to implement certain special precaution during this pandemic. Aerosol generating procedures are an integral part of dentistry and therefore in the given situation of COVID-19 era it is essential to take necessary precautions while treating the patients in a dental office.

Hence, the aim of this KAP survey was to assess the knowledge, attitude and practice of various clinical practitioners regarding aerosol control post COVID-19.

Methodology: A cross sectional study was conducted across various dental clinics and hospitals in Tamil Nadu, India. The questionnaire in english. It was circulated through the digital platform as Google forms. It had 18 questions: 7 in the knowledge component, 7 in attitude component and 4 in Practice component. It took about 7-10 minutes to complete.

Results: Among 207 responses, 42.5% were General Practitioners (BDS), 15% were MDS Practitioners, 18.4% were doing their Post-graduation in Conservative Dentistry & Endodontics, and 24.2% were other Post graduate students. The mean knowledge score was 71%, while mean attitude and practice scores varied between 74% to 88% and were considerably better.

Conclusion: A detailed protocol for dental treatment post COVID-19, considering the economic factors and feasibility, should be formulated, while also upgrading the theoretical knowledge about aerosol cross contamination. This could help the clinicians provide better treatment and also end the patients' apprehension.

Keywords: Aerosol transmission, covid-19, dental treatment protocol, restorative dentistry, awareness

INTRODUCTION

In the year 2019, there was a Pneumonia-like outbreak in Wuhan, China which had unknown etiology. It was said to be transmitted from animals to humans and soon after which there was transmission from human to human. The pathogen was then identified as 2019 Novel Corona virus (2019-nCoV) and the disease was called Corona virus disease 2019 (COVID-19). [1]

Based on the report given by World Health Organization (WHO), as on 8 July 2021, there were

185,821,773confirmed cases globally with 4,017,198 deaths. As the number of confirmed cases continue to rise there is immense pressure on global health, economic development and also social stability.

The possible routes of 2019-nCoV transmission are mainly direct contact and droplet transmission. Aerosol transmission is also a possible route of transmission and there is an exposure to high concentrations of aerosols in a relatively closed environment. Routine dental procedures generate aerosols and pose potential risks to the dental care personnel and patients.[2] Understanding aerosol transmission and its implications in the field of dentistry are essential. In addition to standard precautions, it is necessary to implement certain special precaution during this pandemic.

AEROSOL TRANSMISSION AND ITS IMPLICATION IN DENTISTRY:

When a person coughs, sneezes, laughs, or talks, large (>5 μm diameter) and small (≤5 μm diameter) droplets or aerosols are generated. Larger droplets fall to the ground quickly due to gravity; smaller particles remain suspended in air. On the other hand, small droplets or small particle residues of evaporated droplets have a low settling velocity, so they may remain in the air for a long time. (WHO, 2014).

A study by Kutter et al in 2018, shows that aerosols from highly virulent pathogens like severe acute respiratory syndrome-coronavirus (SARS-CoV) can travel more than six feet.[3] An article by Otter et al in American Journal for infection control says that contaminated surfaces have been found to be a route of transmission of several nosocomial pathogens.[4] Although human corona viruses including SARS-CoV and Middle East respiratory syndrome-coronavirus (MERS-CoV) have, a systemic review concludes that they can persist on a surface for a few days, particularly when suspended in human secretion, and undergo onward transmission.[5] Aerosol generating procedures are an integral part of dentistry and therefore in the given situation of COVID-19 era it is essential to take necessary precautions while treating the patients in a dental office.

The aim of this KAP survey was to assess the knowledge, attitude and practice of various clinical practitioners regarding aerosol control post COVID-19.

MATERIALS AND METHODS

A cross sectional study was conducted across various dental clinics and hospitals in Tamil Nadu, India. A pilot study was conducted among 20 clinicians to assess the feasibility, clarity, comprehensiveness, and acceptability of the study. Later, any changes if required were done. The responses obtained in the pilot study were not included in the main study. Convenience sampling was considered, and sample size was calculated based on a formula by Cochran. [6] Sample size was estimated to be approximately 165.

The study was conducted during May, 2021. It was circulated through google forms of which 42.5% were general practitioners (BDS), 18.4% were post graduates in conservative dentistry, 24.2% were post graduates (Others) and the rest were MDS practitioners. The data was collected from 227 participants and results were analyzed.

STATISTICAL ANALYSIS:

Frequency tabulation was computed using SPSS [Version 21.0] software.

RESULTS

The results are tabulated.

DISCUSSION:

Dental care settings invariably carry the risk of SARS-CoV-2 infection due to the nature of procedures performed.[7] Virus can be transmitted in dental settings through inhalation of airborne viral particles that can remain suspended in the air for long periods. Direct contact with blood, oral fluids, or other patient materials presents a risk. Contact of conjunctival, nasal, or oral mucosa with droplets and aerosols containing virus particles generated from an infected individual can lead to infection. These can be propelled a short distance by coughing and talking without a mask, and indirect contact with contaminated instruments and/or environmental surfaces. Droplet and aerosol transmission of SARS-CoV-2 are the most important concerns in dental clinics and hospitals. Most dental procedures involve the use of high speed air rotors with water cooling; which generate large amounts of aerosol and droplet mixed with patient's saliva and even blood during dental practice. The aerosols are small enough to stay airborne for an extended period before they settle on environmental surfaces or enter the respiratory tract.

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Thus, SARS-CoV-2 has the potential to spread through droplets and aerosols from infected individuals in dental clinics and hospitals. [8] Since the health care workers themselves fall in the high risk group for infection, exposure to them and to the health care settings is best avoided. As per an earlier report in the early stage of the epidemic, on an analysis of hospitalized patients with SARS-CoV-2, 41% were presumed to have been infected in hospital, including 29% health care workers and 12% patients.[9] Aerosols are differentiated based on particle size: splatter (> 50 µm), droplet (≤ 50 µm), and droplet nuclei (≤ 10 µm). In dental settings, 90% of the aerosols produced are extremely small (< 5 µm).[10] Droplets remain suspended in the air until they evaporate, leaving droplet nuclei that contain bacteria related to respiratory infections. Droplet nuclei can contaminate surfaces in a range of three feet and may remain airborne for 30 minutes to two hours.[11] If inhaled, the droplet nuclei can penetrate deep into the respiratory system. Furthermore, the susceptibility of developing an infection is influenced by virulence, dose and pathogenicity of the microorganisms, along with the host's immune response.[12] The risks of dental aerosols can be reduced with the use of high-velocity air evacuation and preprocedural antimicrobial mouthrinses, as well as by flushing waterlines at the beginning of the workday and between each patient, wearing personal protective equipment (PPE), and using air purifications systems.[13] [14] 87.4% said they would use preprocedural mouth rinse.

Although the CDC does not offer specific recommendations for using preprocedural antimicrobial mouthrinses to reduce aerosol exposure, studies show their use for 60 seconds significantly reduces the level of oral microorganisms in the aerosols generated during routine dental procedures.[15] The high-volume evacuator's (HVE) large diameter (> 8 mm) allows for removal of high volumes of air in a short time, which reduces the amount of bioaerosols by up to 90%.[16] The HVE can be challenging to maneuver simultaneously during instrumentation; therefore, many clinicians find the saliva ejector easier to use and prefer this device for removing excess fluids from the oral cavity. From a practice and safety standpoint, it is important to note the opening size of the saliva ejector makes it inadequate for reducing aerosols compared with the HVE or an isolation-and-evacuation device. [17] [18] Standard precautions, as outlined by the CDC, involve the use of PPE. Primary PPE includes donning properly fitting gloves and surgical masks, protective eyewear with solid side shields or face shield, and protective clothing/disposable gowns. This should be worn whenever there is a potential to encounter spray or spatter during patient care, and while disinfecting the treatment area as the bioaerosols remain suspended for 30 minutes to two hours post treatment.[19] 96.1% said they would not do an aerosol generating procedure without a face shield. Aerosol control in confined, poorly ventilated spaces where the air exchange with filtration cannot be successfully applied presents a challenge. Another hurdle is to decrease the indoor concentration of bioaerosols. While some indoor air purification techniques aim solely at reducing aerosol concentrations, others are designed to inactivate viable bioaerosols. Strong evidence demonstrates ventilation in a practice setting can impact the spread of airborne infections.[16] Air cleaning systems such as high-efficiency particulate air (HEPA) filters, gas filter cartridges and electrostatic filters assist in purifying the air in and outside of dental operatories. The HEPA systems direct air through a series of prefilters, which help to continuously catch airborne microorganisms and retain particles as small as 0.3 µm.[20] Ultraviolet germicidal irradiation units, commonly employed in hospital operatories and waiting areas, are successful adjunctive means for eliminating aerosols. The high spectral emission lamps from these units produce photons that expose microorganisms to a short light wavelength (254 nm) that is lethal to a variety of microorganisms.[20]

CONCLUSION AND CLINICAL IMPLICATION

A detailed protocol for dental treatment post COVID-19 considering the economical factors and feasibility should be formulated. Upgrading the theoretical knowledge about aerosol cross contamination by conducting workshops and CDE programs. This could help the clinicians provide better treatment in a safer environment.

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RESULTS:

S.NO	QUESTIONNAIRE	OPTIONS	FREQUENCY	%
1.	Are you aware of the methods to control aerosol in your practice post COVID-19?	a) Yes	175	84.5%
		b) No	32	15.5%
2.	What is the average diameter of an aerosol?	a) 5-50 micron	116	56%
		b) >100 micron	28	13.5%
		c) Not sure	63	30.4%
3.	The dental aerosol remains suspended in the air for less than 1 hour.	a) True	121	58.5%
		b) False	86	41.5%
4.	Easiest way to control aerosol in the practice would be to_____?	a)Use a slow speed micromotor withoutwater spray.	18	8.7%
		b)Keeping the windows and doors open.	19	9.2%
		c)All of the above	139	67.1%
		d)None of the above	31	15%
5.	What can you do to reduce the viral load?	a) Pre-procedural mouth rinse	12	5.8%
		b) Rubber dam	5	2.4%
		c) High volume evacuation	3	1.4%
		d) All of the above	187	90.3%
6.	Do you use pre-procedural mouth rinse?	a) Yes	181	87.4%
		b)No	26	12.6%
7.	If yes, which do you prefer?	a) 1% hydrogen peroxide	28	14%
		b) 0.2% Povidone iodine	70	35%
		c) 0.12% Chlorhexidine	102	51%
8.	Which is the most appropriate gown in preventing contaminated fluid	a) Cotton gowns.	9	4.3%
		b) Disposable fluid resistant gowns.	158	76.3%
		c) Not sure/Under research	40	19.3%

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	transfer?			
9.	Do you think ways of doffing the gown plays a role in cross contamination?	a) Yes b) No c) May be	126 4 77	60.9% 1.9% 37.2%
10.	Which of these do you use post COVID-19?	a) N95 b) FFP3 c) 3 Ply surgical mask	161 11 35	77.8% 5.3% 16.9%
11.	Would you re-use the N95 mask?	a) Yes, after autoclaving b) Yes,after disinfection c) One time use	58 73 76	28% 35.3% 36.7%
12.	High volume evacuator (HVE) filters _____ of aerosol.	a) <70% b) 90-98% c) 100%	86 114 7	41.5% 55.1% 3.4%
13.	How effective is the HVE as compared to the extra oral suction device?	a) Very effective b) Almost equal efficacy c) Not as effective	120 62 25	58% 30% 12.1%
14.	Do you think air purification by HEPA filters are ideal for dental practice?	a) Yes. b) No, because of too much aerosol production in very less time c) Maybe	70 46 91	33.8% 22.2% 44%
15.	A minimum of 6 Air Changes/ Hour (ACH) is required to improve air quality.	a) True b) False	156 51	75.4% 24.6%
16.	Efficacy of Ultraviolet germicidal irradiation depends on _____?	a) Intensity of light b) Duration c) Both (a) & (b)	13 9 185	6.3% 4.3% 89.4%
17.	Would you perform an aerosol generating procedure with only a mask and no face shield?	a) Yes b) No	8 199	3.9% 96.1%

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18.	Do you think fogging (dry/cold/thermal) the dental office is economical and effective?	a) Yes b) No c) May be	60 56 91	29% 27.1% 44%

Table 1: Questions and options along with the frequency of responses by the participants

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