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1. Grossman E, et al (1986) J Perio Res; Supplement: 33-43.
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CoViD : 20 – 20 Bulletin

Turning Barrier into Opportunity !!!



Dear Colleagues,

Warm greetings from International Journal of Advanced Dental Sciences. The Corona Virus (CoViD-19) outbreak has been devastating, globally. With the casualties rising, worrying press conferences, small businesses shuttering for the foreseeable and an over-extended health services, there's not been a lot of positive news to come out of the pandemic creating a barrier and disturbing our normal life to a larger extent. However I take this opportunity of converting this barrier into an opportunity by releasing our first special issue (Supplement 1) with theme – '**CoViD:20-20 Bulletin**'.

In India, the first confirmed CoViD positive case was reported on 30th January 2020 and on 11th March 2020, the World health Organisation declared CoViD as pandemic disease. I am also confident that we all together as health care workers, with our constructive efforts will be able to eradicate CoViD infection by December 2020 either through a vaccine or a medicine that cures. I pray to almighty that the CoViD infection that reported in India in early 2020s would be defeated by the end of year 2020, hence the theme – '**CoViD : 20-20**'.

I really feel proud to come out with this bulletin on CoViD infection wherein we have compiled 20 manuscripts (keeping the theme CoViD : 20-20 in mind) updating us on the evolution, history, epidemiology, pathogenesis, transmission, clinical features, diagnosis, possible prevention and management and also various guidelines from standard organisations for CoViD infection control. I am sure these manuscripts will satisfy your research based curiosity regarding CoViD infection.

I would like to thank our beloved Dean and honorary editor **Dr. Vivek Pakhmode** for supporting us in bringing out this issue. I thank all the **authors** who have contributed their manuscripts for this special issue. I would also like to express my sincere gratitude to our **reviewers** in lending a huge support in the making of this special issue inspite of busy CoViD duty schedule and PG exams preparations. I would also extend my thanks to all my **associate editors** for their kind support. Special thanks to Dr. Viral Maru for all the hard work and tireless efforts he has put into making this bulletin. I would also like to acknowledge the creative genius of **Mr. Ashish Jalamkar** in conceptualising the cover design of this special issue.

I would also like to thank all my readers for supporting us in release of the first issue of this journal in January 2020 which was a huge success. Looking forward to similar success with this special issue too.

Dr. Dimple S. Padawe
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CoViD - 19/CORONA Spread: A New Perspective



This article is written on 11th June 2020; almost three months into the Indian scenario of CoViD 19 pandemic, and over two months of the lockdown. This article is an attempt to look at some measurements related to CoViD 19 disease in India, and the 'fear' the disease led to, in Indian people. It also has some suggestions for thinking differently in the approach for future.

Disease measurements:

How is the spread of the disease estimated in India? In some countries, they screened everyone. In India, this seemed impossible due to the sheer size of the population. In India, the system screened people with a certain history of possible contact. Imagine a pyramid (Figure 1). Death numbers and 'diagnosed positive' are in the top two layers below which will lie all exposed including the asymptomatic carriers, exposed but not infected individuals or those in the incubation period (hence not detected). Since screening in India was / is based on travel history (earlier) and immediate contact tracing and symptoms (now), there is no system in place to estimate the ones in the lowest layer.

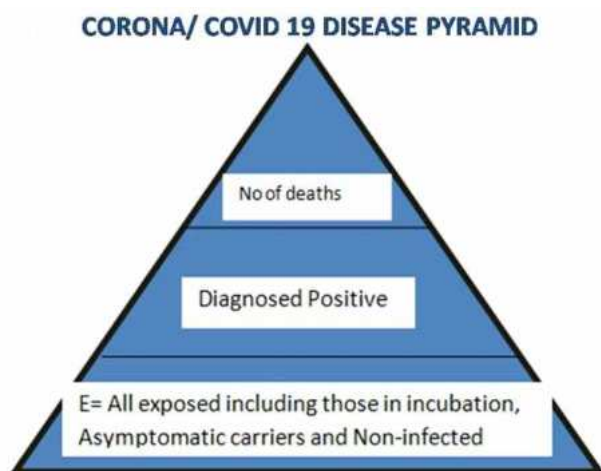


Figure 1: CoViD 19 Disease spread pyramid

Nobody knows the number of exposed people (E) in India. Testing of contacts / symptomatic patients does not necessarily trace those who remained asymptomatic or non-diseased even after the exposure.

In Sweden, where lockdown was not implemented, the following data have emerged: In a paper published in Lancet by Johan Giesecke on 5th May 2020, it was mentioned that: “PCR testing and some straightforward assumptions indicate that, as of April 29, 2020, more than half a million people in Stockholm county, Sweden, which is about 20-25% of the population, have been infected. 98-99% of these people are probably unaware or uncertain of having had the infection; they either had symptoms that were severe, but not severe enough for them to go to a hospital and get tested, or no symptoms at all.”¹

Thus, they now know their E (more or less). Unless we know the E in India, the fatality rate quoted as of about 3% with diagnosed positive as the denominator is eyewash!

According to Giesecke, the real epidemic is invisible. The disease spreads despite the lockdown (through the subclinically exposed ones and carriers), or cases peak after lockdown ceases. He predicts the fatality rate to be around 0.1%. Even if all cases are eliminated; unless all borders are sealed, and the trade and travel is stopped, the disease will come back.²

In a personal communication, Nobel Laureate re Michael Levitt (Stanford University).wrote that Europe's CoViD -19 Excess Deaths plateaued at 153,006, only 15% more than 2017/18 Flu season with same age range counts (Figure 2). This similarity has been noted before most notably by Dr. Antony Fauci and others in New England Medical Journal.³

Year	Comment	Total Deaths	Age Ranges			
			<65	65-74	75-84	85+
2020	Week 08 -19 COVID19	153,006	7.9%	12.8%	31.5%	47.9%
2017	Wk. 49 - Wk. 52 Influenza	21,972	NA	NA	NA	NA
2018	Wk. 01 - Wk. 16 Influenza	111,226	8.1%	12.3%	24.7%	54.9%
2017/18	17,Wk.49-18,Wk.16 Influenza	133,198	8.1%	12.3%	24.7%	54.9%

In the EuroMOMO region, COVID19 in 2020 has led to 19,808 (153,006-133,198) more Excess Deaths than Influenza caused in the 2017/18 Flu Season (15%). This is for a population of 250,000,000.

Figure 2: Michael Levitt (18 May 2020) comparing CoViD 19 in 2020 to Influenza in 2017/18 (reproduced with permission)

Fear and mass hysteria associated with CoViD-19 leading to collateral damage:

In a famous book "Black Box Thinking: The Surprising Truth About Success" (Author: Matthew Syed) there is a chapter on "Scared straight"- a programme once used in the USA to scare people (juvenile first time criminals) against doing crimes. The book highlights the research (a systematic review with meta-analysis by Campbell Collaboration in 2002) how this approach of scaring people not only failed but backfired as those "scared" individuals later did more crimes.⁴

Is fear protective? Did people obey the lockdown due to fear?

Fear must have played some part in people's observance of the lockdown and following hygiene measures. But the lockdown is followed because a majority of people respect law, have some discipline, have reasonable health literacy and trust leadership (due to the hero-worshipping nature and of course, effective speeches by Indian PM and CMs). Also, many have/ had resources to sustain for a certain period.

Inducing fear and keeping people scared may also have a detrimental effect. Facts should be stated as facts. No glorification required. TV media creates and have been giving news stories in a sensational manner on a fiery red background with huge ball-like corona viruses dancing...! Scary videos shown again and again to attract attention (or raise the channel TRP)! There is no control over social media-spread of scary messages... All may lead to psychological unrest, status anxiety, and unhealthy social behaviours.

Mass hysteria in India led to the social taboo against the diseased, doctors, communities, cities, employers, etc. It caused disbelief and panic attacks amongst people. Coupled with financial uncertainties, a huge section of people took extreme steps like walking back home more than 1000 kilometers in 40 degree Celsius temperature; sleeping at times on railway tracks at night. The affected numbers of migrants and poor labourers could be much higher than the CoViD positive patients. Also, their problems are much more complicated. On 9th May 2020, there were about 60,000 positive cases in India (with about 1900 deaths) whereas about 500,000 laboureres were held up only in one state i.e. Maharashtra; without much resources left.

People like me, sitting in the quiet and same homes, could 'choose to fear' about getting contracted. Those wandering on the street were not fearless. They were homeless, jobless and penniless. For them even the fear was not a choice they could afford...Their casualties could possibly outnumber the CoViD deaths. Most of these are healthy adults (often quoted as our demographic dividend) who could possibly, survive the disease as well as revive the economy.

This fear (psychosis) during the lockdown and the collateral damage could have been controlled; but is now beyond that stage. **Now, doctors are scared to keep clinics open due to the fear of the building getting sealed if anyone (of the patients or them) is detected positive and subsequent social stigmatization. Many doctors are facing staff problems, lack of material supplies and high**

costs of protective consumables. People with the disease are unwilling to disclose their disease status due to the fear and may die due to late reporting or unreported.

"We have to live with the disease":

Everyone is now worried about the disease. Some cannot afford to be fearful and have already set out...People can't and don't behave as soldiers. That should not be expected of them. They should be made to realize what is necessary to know (with no glorification of the facts).

Until when can we continue not stepping out of the house and not work? Can we sustain it until the vaccine is available? We will have to face what is inevitable, positively... There are people of all ages who never got the disease even after an exposure, or became alright after contracting it. We have to live with the disease; just like I may get dengue or malaria and I may die... Just like I may die in a road mishap... OR SURVIVE. **Let me compare CoViD 19 and other diseases; who is the real killer in India?**

A report: "Official statistics suggest there were 1.7 million cases of TB in 2017, and it killed 56,277 people, numbers regarded by experts to be gross underestimates. These numbers suggest that TB had a case fatality rate of 3.2% in 2017, meaning that it was comparably fatal to CoViD-19 (albeit with longer incubation period and much slower spread). Also, about 670 people died everyday due to travel accidents. Only 22% deaths in India are medically certified (in which the reason is stated); thus all the figures are understated." (Fact-check may be necessary.)⁵

The point is that Indian healthcare system always fell short in the preparedness needed to deal with TB and other staggering infectious diseases (despite drugs and vaccines being available for most); and did not upgrade it adequately ever to the desired level for the challenges of dengue, malaria, diarrhea, tetanus, rabies, etc. Now the focus being only one disease, and for the numbers witnessed so far, the system upgradation looks surprisingly different. I am counting on the good changes it will bring; hopefully, sustainably and for all diseases. But will CoViD 19 continue to be a bigger threat/killer? That remains to be seen.

We need not let the fear decide what we need to do all the time...We must take due care (hand hygiene, distancing and masks), work and not stay scared.

Emotional Vs Scientific Argument:

There are two arguments. One 'emotional' and other

'scientific'. Both arguments look at the death rate, differently. Emotional argument considers the numerator (death numbers). The scientific argument looks at the numerator as well as a denominator (exposed people or people at risk).

Emotional argument says: what if I, my parents, my kids, my staff get CoViD -19; better stay at home and support the lockdown. The scientific argument says that the majority of the population will get it sooner or later (through the so called invisible spread) and remain healthy; some will die despite the lockdown; the possibility of someone dying is between 1/1000 or 8/1000, different in different populations. Practice preventive measures, protect and treat the ones at risk.

Both are good arguments. however, the emotions seem to have a clear edge over the science w.r.t. what is practiced ; be it the media reporting or government strategy. Even the measurements of the disease so far have 'death numbers' (and number of detected positive cases) as the focus and there is no system in place to measure the all 'exposed' (through sampling) and group them using index ages, risks (based on comorbidities), etc. (I am talking in Indian context.)

Science tells us to come to terms with the facts. It tells us its limitations. Denial of science is dangerous. The acceptance of the same may help us prepare better. Emotional arguments may create insecurity, fear and social unrest.

An appeal to people on the basis of emotions led to some benefits in terms of observing the lockdown initially but the fear psychosis and panic that we see now are the huge outcomes of emotional thinking; due to seeing the ever-increasing number of deaths and 'failures' (when people were told that staying home could win the battle and now they know that winning the battle is impossible; they doubt this approach now and feel dejected due to their own and overall failure in controlling the disease).

What fueled the 'emotional' approach?

1. Referring to CoViD19 as "KHATARNAK" MAHAMARI ("deadly" pandemic) right from the beginning without knowing / predicting how many would die in India in the first month / until a million tests done. All global figures were shown on TV all the time which was enough to scare everyone from the word go. Three months into the Indian scenario, we know the epidemic in India is a lot different in the scientific facts and figures (shape of curve, Ro, deaths per million, doubling rate, etc.). But the fear psychosis, thanks to initial reports, only established and increased in the meanwhile.

2. Media showed (and is still showing) fiery red screens and huge ball like viruses. Reporters scream in threatening voices and give huge attention to details that were not 'controlled' (example: hydroxychloroquine- it soon became unavailable due to panic-buying by common people even without prescriptions; thanks to reports everywhere and highlighted importance given to the USA buying from).

3. It started with referring to common people as soldiers and warriors; expecting them to behave in a disciplined manner; suggesting them that they prioritize health over everything else (when they had neither the experience to do so nor seen their leaders or governments doing so ever) - all challenged their emotions. Yes. For the first month, it resulted in great observance of the lockdown. Later, they found it difficult to come to terms with.

4. Relative lack of concern towards the socioeconomic impact until the problem became neck-deep. Only after lakhs of labourers set out to reach homes and hundreds got killed or died on the way! Until the Shramik trains started and 20 lakh crore package got announced, there was no respite. The last two things helped/ will help people in many ways but not for reducing the fear/ panic.

5. Very miniscule mass-counselling by the leaders. Either because they couldn't change their own stand (to avoid the fear of looking bad) or they themselves couldn't come out of their own emotions. WE SHALL WIN THIS WAR... was told to people. It was never told or taught; WHAT IF WE DON'T WIN IT? WHAT IF WE HAVE TO LIVE WITH THIS ENEMY?

What are the common man's real emotions- fear, insecurity (of their families), uncertainties of the jobs and future, etc? Challenging emotions all the time may sometimes bring out courage and positivity; but may also lead to disappointment and depression, on other occasions.

Ray of hope:

The Lancet paper by Johan Giesecke on 5th May 2020 concludes that

- The disease is inevitable.
- Lockdown only delays but does not stop spread.
- Treatment of infected high risk people should be the focus.

While stating and projecting death figures in India, we need demography based figures like the people at risk of

death below 18, between 18-55, 55-80 and >80 years (such index age groups are identified and used for many other diseases). Also, we need to estimate the E numbers, somehow.

The three main risk factors (in India) from whatever data we have so far are: Preexisting comorbidities, extreme age, and hypoxia. Therefore, we need a practical 'targeted population' or a 'high risk approach' and not an unsustainable and expensive 'whole population' approach such as the lockdown. The 'whole population' approach not only has economic implications but also deprives healthy and low risk individuals from living the normal life. These individuals WILL a) contribute to herd immunity (yes, slowly and over a period of time), and b) build economy that will make possible expenditure on the healthcare of the old and at risk, too. Will that be at the cost of many lives? This remains to be seen (and hard to know unless we know the E). All these years, we spoke of young age as a demographic dividend that India has! When are we going to encash on that? After the unfortunate young and middle age people die of hunger?

In a recent report from the Indian Council of Medical Research (ICMR) based on antibody testing of samples, it is stated that up to 30% individuals in the hotspot areas could be infected. This confirms that the invisible disease spread is rampant and happens despite the lockdown. It also means that the disease could be/ could be becoming less threatening to most people.⁶

In yet another announcement from an official of WHO, it is stated that the asymptomatic carriers leading to transmission of CoViD 19 is 'very rare'; however, the statement was later amended saying that much is unknown. However, it may indicate that the disease spread may not happen rapidly upon lifting the lockdown if people avoid contact mainly with symptomatic individuals⁷

Within the first two weeks of June, we are witnessing relaxations in the lockdown measures. This, too, will help break open the mental lockdown first. Indians are known for being resilience and though it would take time for complete recovery, the journey towards it has begun.

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Conflicts of interest

There are no conflicts interest.

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Contents

SHORT COMMUNICATION

LIFE BEYOND CoViD -19 and Dentistry !!!

Dr. Vivek Pakhmode 01

ORIGINAL RESEARCH

Assessment of emotional and mental health status of undergraduate students of Dental College of Mumbai during nationwide lockdown due to CoViD -19 – A cross sectional study

Dr. Dimple Padawe, Dr. Vandana Pandey Tripathi, Riya Patel, Hiranmayee Ravindra Patil,
Tejashree Shivaji Walnuj, Darshan B Khairnar 02

Knowledge, attitude and practice of dentists towards management of patients during CoViD-19 lockdown

Dr. Farhin A Katge, Dr. Shantanu S Deshpande, Dr. Parin V Bhanushali, Dr. Nikhil V Bhanushali,
Dr. Manohar S Poojari, Dr. Devendra P Patil 09

Fear Factor of Dental Surgeons Working During CoViD 19 Pandemic - Cross Sectional Pilot Survey

Dr. Hemant Baonerkar 20

REVIEW ARTICLE

Rise and Become Wise Over CoVid-19

Dr. Shreyas H. Gupte, Dr. Tejashri S Gupte, Dr. Rinku Kalra, Dr. Thomson M D Cruz 24

CoViD-19 and Public Health Dentistry

Dr. Amit Kumar, Dr. Bhumika Kamal Badiyani 29

CoViD 19 - Let's Fight Back, The Practical Way

Dr Sunali Khanna, Dr Prita Dhaimade, Dr Sharvari Khedkar 33

Role of Dentist Revisited in CoViD19 - An Overview

Dr. Easwaran Ramaswami, Dr. Nimma Vijayalaxmi, Dr. Sonali Kadam, Dr. Shraddha C. Jugade,
Dr. Jimit Desai, Dr. Reshma Saju 38

Oral Health Care During The CoViD-19 Outbreak- An Overview

Dr. Richa Kapoor Miglani 43

A Stitch in Time Saves Nine

Dr. Arpeet Atmaram Krantkar, Dr. Praneeta Kamble 45

Saliva: Its Role In CoViD-19 Diagnosis And Preventive Measures

Dr Khatija Memon, Dr Vivek Hegde, Dr Hussain Mookhtiar, Dr Mohsin Shaikh, Rahul Koppaka 51

Contents

CoViD-19 and Saliva – A Diagnostic Challenge

Dr. Revati Shailesh Deshmukh, Dr. Priya Nimish Deo 58

A help in need is never small indeed- Dentists Performing Swab Collection for CoViD-19

Dr. Vaishnavi R. Chodankar, Dr. Vaibhav A. Karemore, Dr. Mangesh B. Phadnaik, Dr. Ripunjay K. Tripathi 63

Dental aerosols in the spread of CoViD-19

Dr. Swetha Subramanian, Dr. Shreemogana Shelvan 68

Pediatric dentistry and non pharmacological behavior guidance in CoViD-19 era

Dr. Ashveeta Shetty, Dr. Pooja Balgi, Dr. Sanmati Pol 75

Prosthetic Treatment Consideration Post CoViD -19

Dr. Rathin D Das 79

FACE SHIELDS –A simple economical solution

Dr. Pavana Kamath 88

Pulse Oximeter and its role in management of Hypoxia

Dr. Sonali Kadam, Dr. Aditee Kadam, Dr. Chitralekha Kalambe, Dr. Easwaran Ramaswami,
Dr. Rohini Bhosale, Dr. Pranoti Kausadikar 91

How dentists can manage their finances in the post CoViD -19 scenario ??? - Part I

Dr Bhavdeep Singh Ahuja 96

How dentists can manage their finances in the post CoViD -19 scenario ??? - Part II

Dr Bhavdeep Singh Ahuja 102

CoViD - 19 and Dentistry : The Financial Implications For The Practicing Dentist

Dr. Akshay Rathi 108

LIFE BEYOND CoViD -19 and Dentistry !!!

I am very happy for this special issue on 'CoViD : 20-20 Bulletin', from our esteemed institution's prestigious journal. I really appreciate and congratulate Dr Dimple Padawe mam along with her editorial team and research society of Government Dental College and Hospital, Mumbai.

The entire world is facing unprecedented pandemic of CoViD -19. Dentistry is worst hit by this pandemic, as aerosol generation is always present in most of the routine dental procedures. Before CoViD-19, dentistry was passing through lame stages. More and more young dentist were getting graduated with limited professional avenues. During CoViD -19 the situation has become worst. Hence, I feel that this is the right time to explore different areas of dentistry. In the previous issue also I had emphasized on it.

Evolution of human is one of the fascinating area of scientific research. Paleontologist mostly find jaws and teeth during fossil excavations. Teeth are unique among organs by allowing direct comparison between extant and fossilized specimens formed million years apart. Teeth by their postmortem persistent, depict their genetically inherited patterns, and through their evolutionary history more accurately than other organs.

Apart from genetic evidence, significant information has been obtained about the nature of diet, and thereby indirectly, the cultural and evolutionary status. Fossilized dental calculus, entrapping pollen pytolith and silica bodies from plants reveals composition of food eaten two million years ago. Electron spin resonance uranium series isotope analysis, infrared luminescence dating, DNA analysis are some of the advanced technologies used in paleodentistry.

To explore new avenues in dentistry, we need to encourage research in paleodentistry, stem cell and genetic dentistry, sport dentistry, forensic dentistry, geriatric dentistry to keep our noble profession not only alive but keep it vibrant.

We can start allotting such new topics to new postgraduate students for their library dissertation.

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Assessment of emotional and mental health status of undergraduate students of Dental College of Mumbai during nationwide lockdown due to CoViD -19 – A cross sectional study

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Abstract

Aim : To assess the emotional and mental health status of under graduate students of dental college during nationwide lockdown due to CoViD -19.

Method : A total of 352 dental students completed the questionnaire based survey. Descriptive statistics have been used in the study to analyze the findings. Mean and standard deviation and proportion have been used to estimate the results of the study.

Result: The survey reported a mixed and negative effect on emotional and mental health status of dental students respectively during lockdown.

Conclusion: The emotional and mental health of students should be carefully monitored during this crisis. The students need special attention because of their higher psychological distress.

Key Words : CoViD -19 lockdown, Dental students, Emotion, Mental health.

Introduction

Originating in Wuhan, China in December 2019, CoViD -19 is a novel disease which spread to many countries across the world in the last few months.^{1,2} The CoViD -19 pandemic has enforced the world into a health and economic disaster. Different countries have established different forms of protocols, disturbing numerous ordinary routines and affecting work, free movement, trade and in particular, education.

Since the CoViD-19 outbreak was so rapid and devastating, the Government of India ordered a nationwide lockdown on 24th March 2020, limiting movement of the entire 1.3 billion population as a preventive measure. This lockdown continued till 31st May, 2020.³ Most of the dental colleges in India had discontinued clinical practices except for emergencies, while others conducted social distancing in their laboratory and preclinical simulation activities.

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Simulation of mannequins is often difficult for those colleges that do not have the option to teach online considering time, manpower and technology required for instructions. Virtual reality devices and haptic technologies are not portable and thus difficult to use at this time.⁴

It should be noted that during the CoViD -19 pandemic, students may suffer from depression and be negatively affected by the fear of being infected with the virus. Therefore, the need for counseling services and psychological help would increase following CoViD -19 pandemic. A recent publication highlighted the thoughts of the dean of the dental school at Queen Mary University in London about the CoVid -19 outbreak and his approach to managing it.⁵

Inevitably, dental students were anxious due to high viral exposure to frontline medical personnel involved in disease incidences and deaths, especially of doctors and medical students. The high volume of patients has put many dental students and the dental team at high risks.⁵ PubMed literature search did not yield any study performed to evaluate the mental state of dental students during lockdown in India. Hence the present study was conducted to assess the emotional and mental health status of dental students of

prestigious Government Dental College and Hospital, Mumbai during nationwide lockdown.

Method

The present Web-based cross-sectional study was conducted using a survey instrument to obtain responses from dental undergraduate students from 25th May, 9.00 am to 31st May 2020, 9.00am IST. The eligibility criteria for participants included – dental undergraduate students studying in Government Dental College and Hospital, Mumbai. A 15-item survey instrument was developed using WHO course materials on emerging respiratory viruses, including CoViD-19 infection⁶. The survey covered the domains of dental students demographics and general characteristics, emotional status and mental health status during nationwide lockdown. The developed draft survey instrument was distributed to ten randomly selected students to assess its readability and validity before pretesting among 20 randomly selected other dental students for clarity, relevance, and acceptability. Refinements were made as required to facilitate better comprehension and to organize the questions before the final survey was distributed to the study population.

Content of study tool

An online semi structured questionnaire was developed by using google form, with a consent form appended to it. The link of the questionnaire was send through emails, WhatsApp and other social media[Facebook, Twitter, Youtube, Snapchat] to the contacts of the participants. On receiving and clicking the link the participants got auto directed to the information about the study and informed consent. After they accepted to take the survey they filled up the demographic details. Then a set of several questions appeared sequentially, which participants were to answer. The demographic variables included name [optional] age, gender, residential location, and year of undergraduate course. The survey had two sections – 1] assessment of emotional status and 2] assessing mental health status of dental students containing seven and eight multiple choice questions respectively. Each question had 3 options and the participants were expected to select any one of them.

Ethical considerations

The institutional ethics committee reviewed and approved the present study. Confidentiality of the survey participant's information was maintained throughout the study by making the participants' information anonymous

and asking the participants to provide honest answers. Eligible dental student's participation in this survey was voluntary and was not compensated. The study was conducted following the Checklist for Reporting Results of Internet E-Surveys (CHERRIES) guidelines.⁶

Statistical Analysis

Descriptive statistics have been used in the study to analyze the findings. Mean and standard deviation and proportion have been used to estimate the results of the study.

Results

A total of 352 dental students from various years of undergraduate course had participated and completed questionnaire based survey on assessment of emotion and mental health status of dental students during nationwide lockdown. 68.6% and 31.4% of responders were females and males respectively. The mean age of participants was 21.6 ± 0.9 years. In the present survey 22.2%, 25.9%, 25.6% and 26.4% dental students belonged to 1st, 2nd, 3rd and final year of undergraduate course. The distribution of all the participants across Maharashtra in percentage is represented [**Figure I**] with 92.1% students residing in Maharashtra, whereas 7.9% students resided outside Maharashtra. The results regarding emotions [**Figure II**] and mental health status [**Figure III**] of dental students during nationwide lockdown is represented.

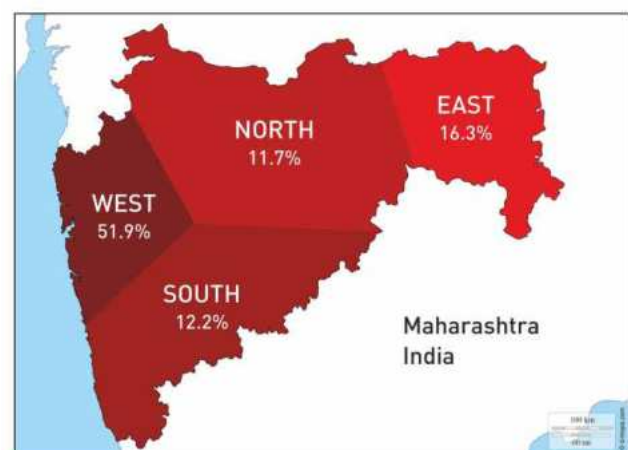


Figure I : The distribution of all the participants across Maharashtra.

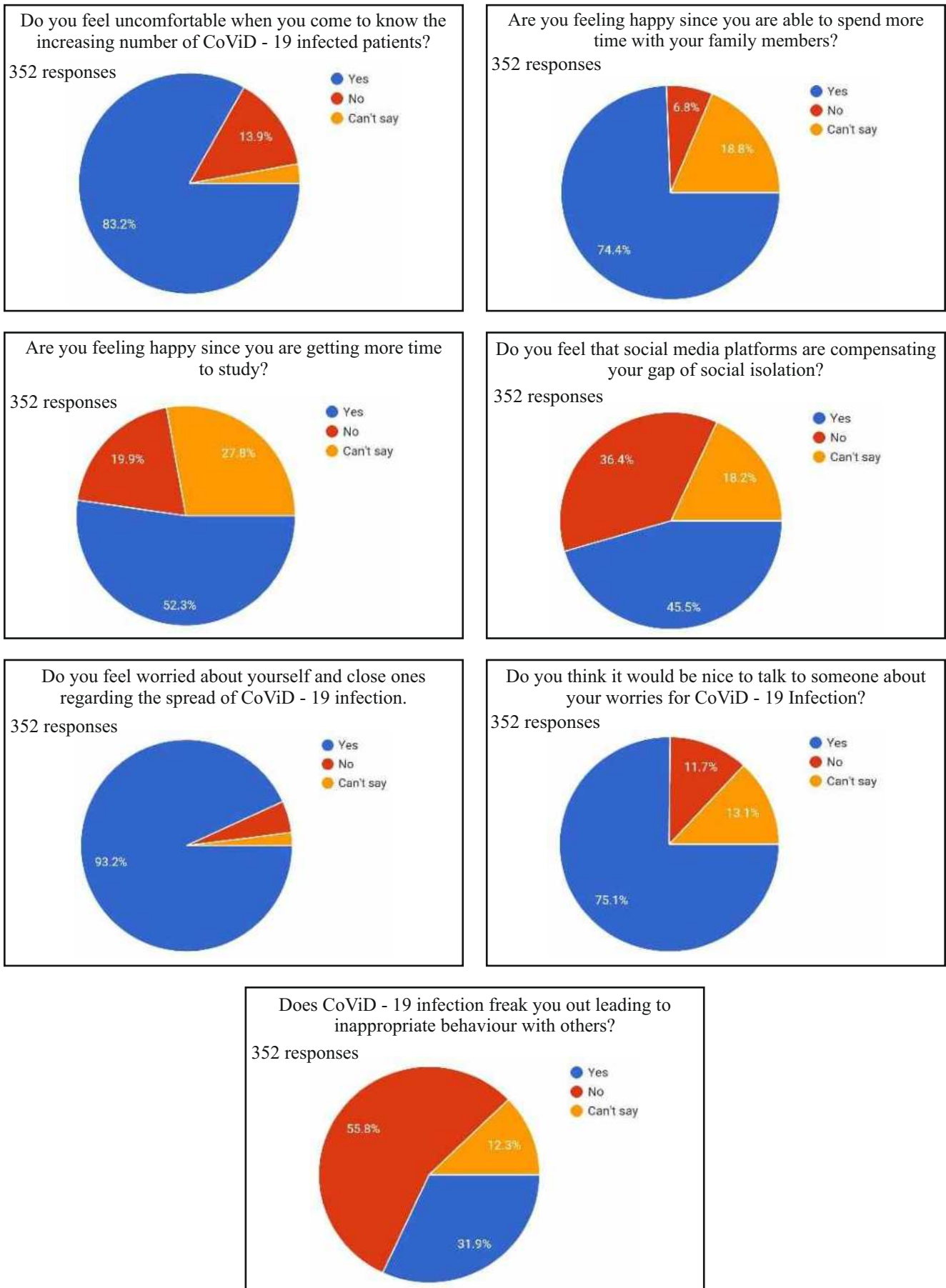


Figure II : Assessment of emotional status of dental students during nationwide lockdown.

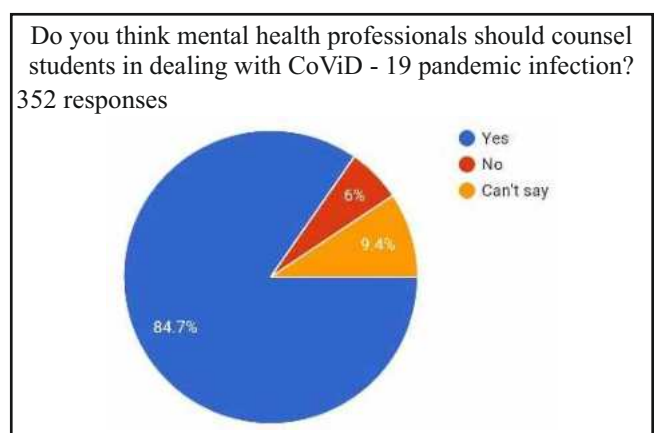
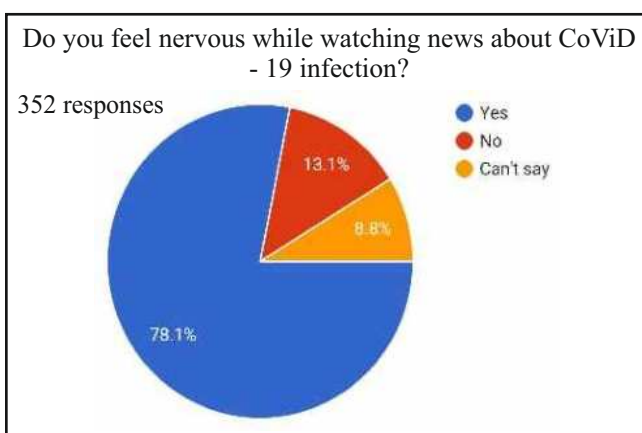
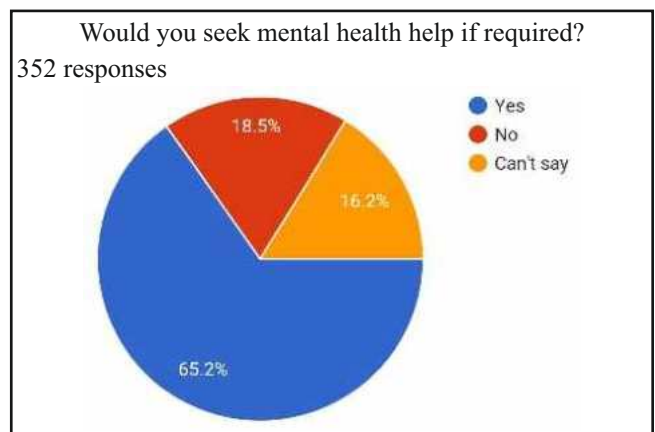
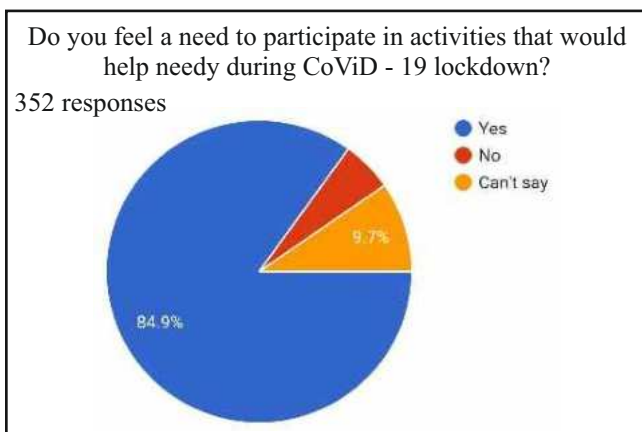
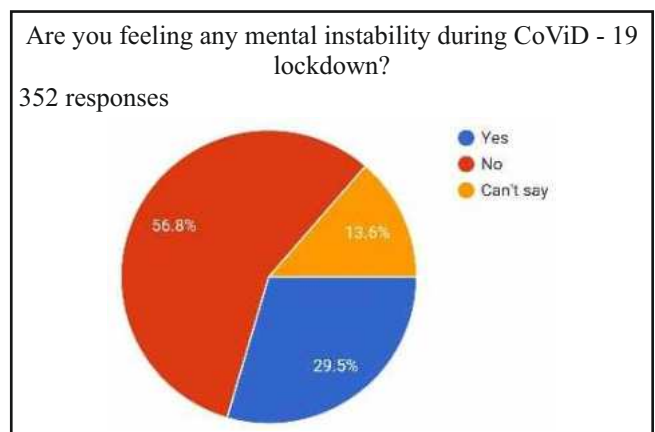
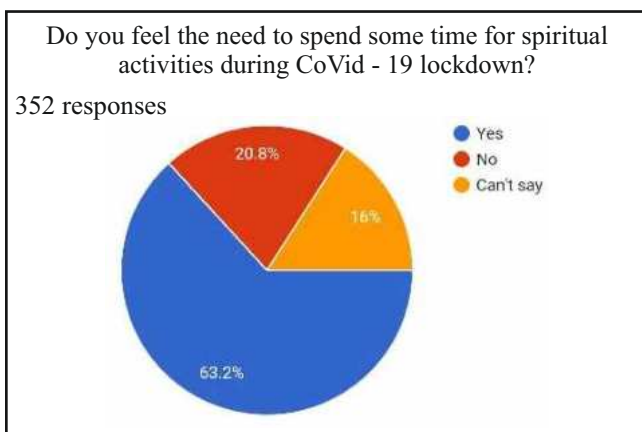
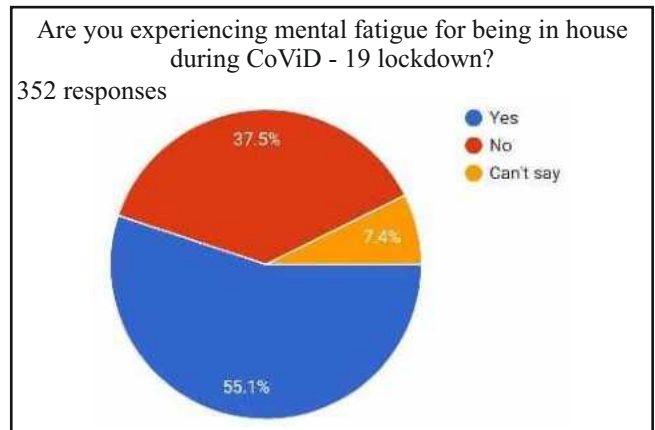
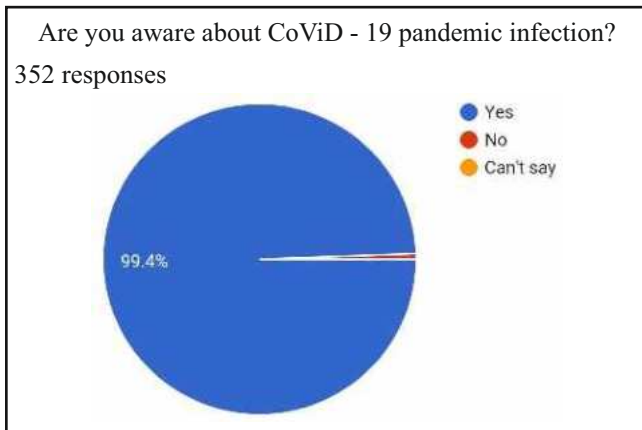


Figure III : Assessment of mental health status of dental students during nationwide lockdown .

Discussion

With the global development of the CoronaVirus disease outbreak, the psychological issues which accompany this pandemic have rapidly compounded its public health burden. Emerging research assessing the mental health implications of CoViD -19 has identified a heightened prevalence of moderate to severe self reported depressive and anxious symptomatology among the general public, reflecting the widespread effects of uncertainty and health related fears. However, further research that investigates beyond the population level is required to understand the individualized disruption of lives and routines as a result of CoViD -19, and its associated psychological impacts.^{4,7}

For college students, heightened levels of psychological distress and downstream negative academic consequences are prevalent under normal circumstances. As a result of physical distancing measures implemented in response to CoViD -19, tertiary education institutions have shifted to an emergency online learning format, which would be expected to further exacerbate academic stressors for students. Based on insights from research examining the impact of academic disruptions on students, it is reasonable to venture the students may experienced reduced motivation towards studies, increased pressure to learn independently, abandonment of daily routines, and potentially higher rates of dropout as direct consequences of these measures. Thus, by increasing academic stressors in a population with heightened pre existing stress levels and a potentially reduced ability to rely on typical coping strategies- such as family who themselves may be experiencing heightened distress – the CoViD -19 pandemic has placed an unprecedented mental health burden on students, which urgently requires further examination and immediate intervention.⁷ Hence the present study was conducted to assess the emotional status and mental health of undergraduate students of premiere institute dental college in Mumbai.

The present study reported that 99.4% students were aware about CoViD -19 pandemic. 74.4% and 52.3% students felt happy since they got the opportunity to spend more time with their family members and more time to study respectively due to lockdown. However 78.1% felt nervous while watching news about CoViD -19 infection. 83.2% students felt uncomfortable when they came to know the ever increasing number of CoViD -19 patients. 45.5% students experienced that social media platforms were compensating their gap of social isolation. 93.2% students felt worried about themselves and close ones with respect to spread of infection.

From this preliminary data we can conclude that the students had a mixed emotional response during nationwide lockdown due to CoViD -19 pandemic.

55.1% students experienced mental fatigue for being in house during lockdown. 29.5% students suffered from mental instability during lockdown. 31.9% students felt freak out due to CoViD -19 scenario leading to inappropriate behavior with others. From this findings we can conclude that the students mental health had a negative effect during lockdown. This could be possible reason as to why 84.7% students thought that mental health professionals should counsel the students during this period. 65.2% students felt the need to seek help for mental health. 75.1% students felt positive after talking to someone about worries for CoViD -19 infection. 84.9% and 63.2% of students felt a need to participate in events that would help needy and spiritual activities respectively to feel positive during this period.

A study conducted by Paula G and associates suggested that mental health from university students and employees should be carefully monitored during this crisis.⁸ Usama R and her associates reported that the students and health care workers need special attention because of their higher psychological distress.⁹

PubMed search yielded five papers (correspondence, n = 2; commentary, n = 3) that have directly addressed the use of specific strategies to deliver mental health care to students affected by the CoViD-19 pandemic.¹⁰⁻¹⁴ In addition, a study by Banerjee and associates from India has discussed the importance of psychiatrists during the CoViD-19 pandemic in general terms. This study identified six important roles for the psychiatrist: a) education of the public about the common psychological effects of a pandemic, b) motivating the public to adopt strategies for disease prevention and health promotion, c) integrating their services with available health care, d) teaching problem-solving strategies to cope with the current crisis, e) empowering patients with CoViD-19 and their caregivers, and f) provision of mental health care to healthcare workers.¹⁵

With reference to more specific therapeutic strategies, proposals include the development of teams of specialists qualified to address emotional distress; the training of community health personnel in basic aspects of mental health care; the use of online surveys to assess the scope of mental health problems; the development of online materials for mental health education; the provision of online counselling and self-help services; the use of structured letters as a form of asynchronous telepsychiatry consultation; the

development of synchronous telemedicine services for diagnostic purposes as well as counselling; and the need to make online mental health services accessible to students. Such strategies offer the hope of providing mental health services in an easily accessible manner without any increase in infection risk. However, they depend crucially on the availability of trained manpower and infrastructure, and it is not known to what extent these approaches will be accepted by the students.¹⁶⁻¹⁹

The present survey used WHO training material to develop a validated questionnaire. The developed questionnaire was pilot tested, and closed-ended questions were limited, to reduce information bias. Despite the findings introduced here, it is important to stress that the present survey had limitations, including the relatively moderate response rate, which resulted in a smaller than expected sample size. This could have been caused by the short period of data collection. Moreover, this pandemic has caused many to be busy with watching the news and taking care of personal affairs. This means that those who were active on social media during the short period of data collection were the only ones that had the chance to participate in the study. This could have resulted in selection bias which prevents the ability to generalize our results. In addition, the data presented in this study are self-reported and partly dependent on the participant's honesty and recall ability; thus, they may be subjected to recall bias.

Conclusion

The present study concludes that the students experienced mixed emotional response during the lockdown. The mental health of the students was negatively affected during this period.

As the number of students affected by this pandemic continues to increase, the psychiatric profession – particularly in Asian countries – faces both a challenge and an opportunity; the challenge of addressing the numerous barriers and limitations but also the opportunity to implement those suggestions or recommendations which are feasible at a local or regional level. The long-term mental health impact of CoViD-19 may take weeks or months to become fully apparent, and managing this impact requires concerted effort not just from psychiatrists but from the health care system at large.

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Nil.

Conflicts of interest

There are no conflicts of interest

Acknowledgment

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Knowledge, attitude and practice of dentists towards management of patients during CoViD-19 lockdown

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Abstract

Background: Novel Corona Virus Disease (CoViD-19) is a pandemic which has affected the entire world. In order to curtail it, the Indian government had implemented a nationwide lockdown. However, the dental emergencies of the patients needed to be addressed even during this lockdown.

Aims: To evaluate the knowledge, attitude and practice of dentists towards management of patients during CoViD-19 lockdown.

Methods and Material: A cross sectional survey was conducted amongst dentists in Mumbai. 308 dentists completed a self-administered, structured questionnaire comprising of 14 questions. These included demographic data, the knowledge of dentists about CoViD-19, their attitude and practice towards management of patients during the lockdown. Descriptive statistics ($P < 0.05$) and chi square test was applied.

Results: The result of study showed that all the dentists who worked as both clinicians and academicians (100%) were aware about the latest guidelines about patient management during CoViD-19. About 77.3% of the dentists preferred to keep their clinics shut and practice teledentistry. The results were statistically significant when compared across various specialties. ($P < 0.05$)

Conclusion: The knowledge of dentists about the various guidelines for patient management during CoViD-19 lockdown was adequate. The dental fraternity was well equipped to render emergency oral health care to patients amidst the lockdown.

Key Words: CoViD-19, Dentists, Knowledge, Attitude, Practice.

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Introduction

By the end of 2019, a pneumonia outbreak with unknown etiology occurred in Wuhan, China wherein majority of the cases were linked to a seafood market suggesting it was transmitted from animals to humans. Soon the count escalated and human to human transmission was observed¹. One month later, scientists isolated a novel coronavirus that was Severe Acute Respiratory Syndrome CoronaVirus 2 (SARS-CoV-2) other than SARS-CoV, MERS-CoV, avian influenza, influenza, and other common respiratory viruses^{2,3}. Concerning the outbreak of SARS-CoV-2, WHO declared the disease as a Public Health Emergency of International Concern (PHEIC), and it was named CoViD-19⁴. The World Health Organization (WHO) declared coronavirus disease as a pandemic on March 11, 2020⁵. As of May 11, 2020, 67152 cases had been detected in India with approximately 2206 deaths⁶.

The transmission routes, treatments and outcomes of

CoViD-19 has received much research attention recently. It was observed that the mode of transmission is through contact and in the form of droplets⁷. According to Occupational Safety and Health Administration (OSHA), dental health care professionals were placed in very high exposure risk category as dentists work in close proximity to the patient's oral cavity⁸. The literature shows that many dental procedures produce aerosols and droplets that are contaminated with bacteria, viruses, and blood, and have the potential to spread infections to dental personnel and other people in the dental office⁹. The health authorities of some cities in India had ordered the dental institutions to suspend general non-emergency dental treatment while providing only emergency dental services.

Dental health care professionals were updated regarding infection control and were asked to follow the protocols recommended by the relevant authorities to protect themselves and their patients against infections. In times of this pandemic, many of the dentists practiced teledentistry, wherein signs and symptoms of patients were assessed on the telephonic conversation and then decision was made whether the patient needs immediate care in a dental clinic or the treatment could be delayed by prescribing suitable antibiotics and analgesics. The American Dental Association (ADA) provided information that helped to decide what constitutes a dental emergency, however a professional judgment was made by the dentist to determine the patient's need for urgent or emergency care¹⁰.

The dentists have faced a challenge to manage dental emergencies in times of this pandemic with various practice restrictions amidst different guidelines. Hence, this study was aimed to evaluate the knowledge, attitude and practice of dentists towards management of patients during CoViD-19 lockdown.

Materials and Methods

This survey was conducted at a dental hospital and teaching institute in Navi Mumbai. The Institutional Ethics Committee (IEC) reviewed and approved the study. The survey was prepared in the form of a google form and was sent to dentists in Mumbai. The period of the survey was 20th April – 27th April, 2020, and a total of 308 responders completed the survey. Consent was obtained from all participants in this study.

The self-administered questionnaire consisted of 4 demographic questions and 10 questions based on

knowledge, attitude and practice of dentists towards management of patients during CoViD-19 lockdown. Convenient sampling method was used for data collection. The google forms were sent to the dentists via various social media platforms and emails. This was done because due to lockdown, only those dentists who were in contact with the authors could be included in the study. Sub-groups were classified on the basis of qualification, speciality, years of practice (<5 years, 5-10 years and >10 years) and type of practice (Private practice, faculty and both). The reliability and validity of the questionnaire was assessed prior to the study. The content validity of the questionnaire was evaluated by experts from all specialities of dentistry. The face validity was performed, wherein the form was sent to 25 responders to evaluate the response. The same form was again sent to the same responders after 10 days and their consistency was evaluated using the Cronbach's alpha test. Based on the results of this pilot study, sample size was calculated using the formula:

$$n = z^2 pd / d^2$$

$z = 1.96$ at 95% confidence level.

$p =$ awareness about CoViD-19 as determined from the pilot study = 73%

$q = 100 - p$

$d =$ allowable error = 5%

The minimum sample size was determined to be 303. However, during the time period of the study 308 responses were received. After receiving these responses, the google form link was deactivated, since we reached our estimated sample size. The data was entered into excel spreadsheet and analysed using SPSS version 15 (SPSS Inc. Chicago, IL, USA). The descriptive statistics were used to describe the knowledge, attitude and practices of dentists. Chi-square test was applied to know the association of knowledge, attitude and practices with qualification, years of experience, type of practice and speciality. The confidence level and level of significance was fixed at 95% and 5% respectively

Results

The association of knowledge, attitude and practices of dentists towards management of patients during CoViD-19 with their qualification, years of experience and type of practice are described in Table no. I, II and III. According to the results of the survey, almost all the dentists who worked as academicians and clinicians both were aware about the

Table I: Association of knowledge, attitude and practices of dentists towards management of patients during CoViD -19 with their qualification.

Questions	BDS		MDS		Chi square value	P Value
	Yes (%)	No (%)	Yes (%)	No (%)		
Aware of any guidelines	98.3	6.7	94.5	5.5	0.156	0.693
Undergone any online training	33.3	66.7	32.6	67.4	0.17	0.897
Received calls from patients	86.7	13.3	87.2	12.8	0.13	0.908
Travel history taken	93.3	6.7	94.0	6.0	0.54	0.816
Filling of CoViD-19 Questionnaire	61.1	38.9	67.9	32.1	1.303	0.254
Aware of guidelines for prescription of ibuprofen	64.41	35.6	67.9	32.1	0.341	0.559

Table II: Association of knowledge, attitude and practices of dentists towards management of patients during CoViD -19 with their years of experience.

Questions	< 5 years		5-10 years		> 10 years		Chi square value	P Value
	Yes (%)	No (%)	Yes (%)	No (%)	Yes (%)	No (%)		
Aware of any guidelines	95.8	4.2	88.9	11.1	95.7	4.3	4.772	0.189
Undergone any online training	35.0	65.0	22.9	70.8	31.5	68.5	2.853	0.415
Received calls from patients	85.3	14.7	91.7	8.3	85.9	14.1	2.001	0.572
Travel history taken	95.1	4.9	94.4	5.6	91.3	8.7	1.528	0.676
Filling of CoViD-19 Questionnaire	67.1	32.9	68.1	31.9	63.0	37.0	2.513	0.473
Aware of guidelines for prescription of ibuprofen	66.4	33.6	63.9	36.1	69.6	30.4	1.098	0.777

Table III: Association of knowledge, attitude and practices of dentists towards management of patients during CoViD -19 with their type of practice.

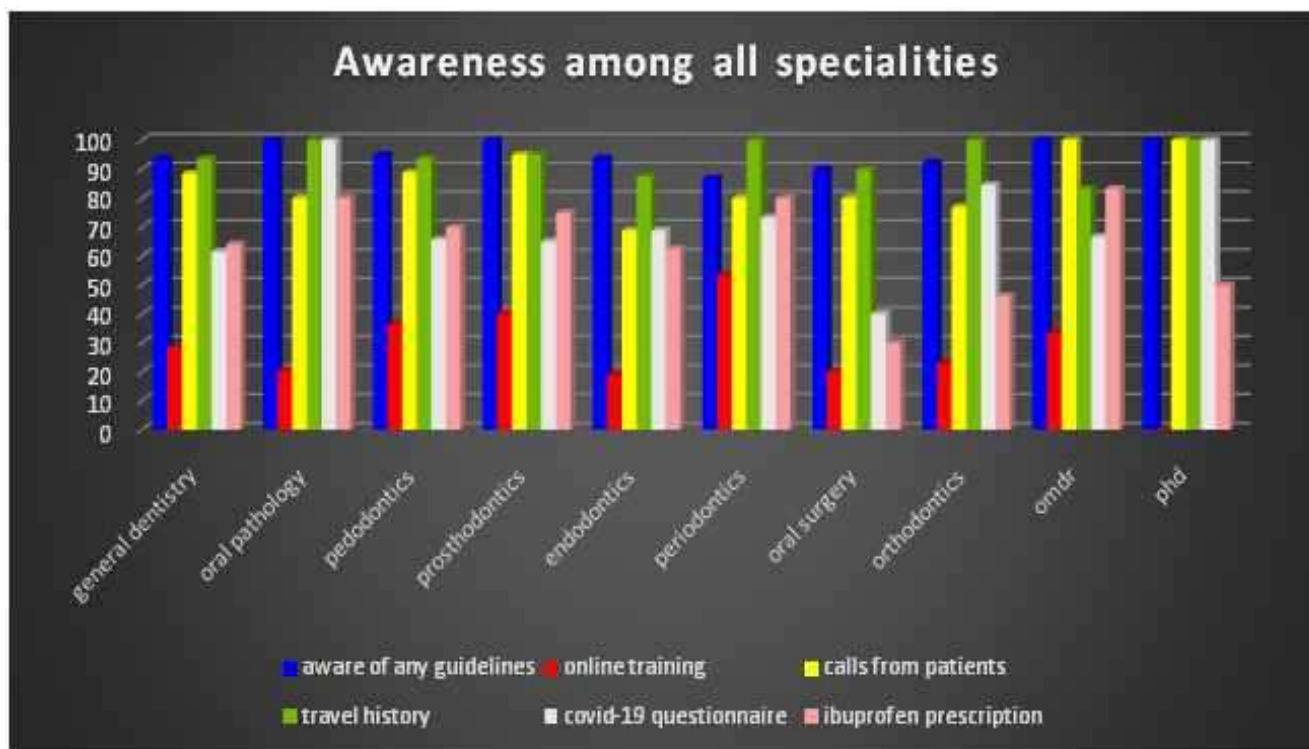
Questions	Private practice		Faculty		Both		Chi square value	P Value
	Yes (%)	No (%)	Yes (%)	No (%)	Yes (%)	No (%)		
Aware of any guidelines	93.0	7.0	87.5	12.5	100.0	0.00	7.779	0.051
Undergone any online training	29.5	70.5	37.5	62.5	40.5	59.5	4.297	0.231
Received calls from patients	91.5	8.5	56.3	43.8	82.9	10.8	33.097	0.000
Travel history taken	95.5	4.5	87.5	12.5	91.9	8.1	3.791	0.285
Filling of CoViD-19 Questionnaire	62.5	37.5	56.3	43.8	79.7	20.3	8.879	0.031
Aware of guidelines for prescription of ibuprofen	65.0	35.0	68.8	31.3	71.6	28.4	1.378	0.711

guidelines for CoViD-19 (100%), irrespective of their qualification and years of experience. When it came to obtain an online training, the dentists showed similar results irrespective of their qualification, years of experience and type of practice. Clinicians received more calls from the patients (91.5%) showing a statistically significant results as compared to academicians or those who are both clinicians and academicians, irrespective of their qualification and years of experience. ($P < 0.05$). There was not much difference amongst the dentists when it came to recoding the travel history of the patient in terms of their qualification, years of experience and type of practice. The dentists who

worked as academicians and clinicians were much particular in getting the CoViD-19 questionnaire filled by the patients (79.7%) irrespective of their qualification and years of experience. These results showed a statistical significance ($p < 0.05$). Almost all the dentists were aware about the ibuprofen prescription guidelines irrespective of their qualification, years of experience and type of practice respectively.

The association of knowledge, attitude and practices of dentists towards management of patients during CoViD -19 with their speciality is depicted in **Figure I**.

Figure I: Association of knowledge, attitude and practices of dentists towards management of patients during CoViD -19 with their speciality.



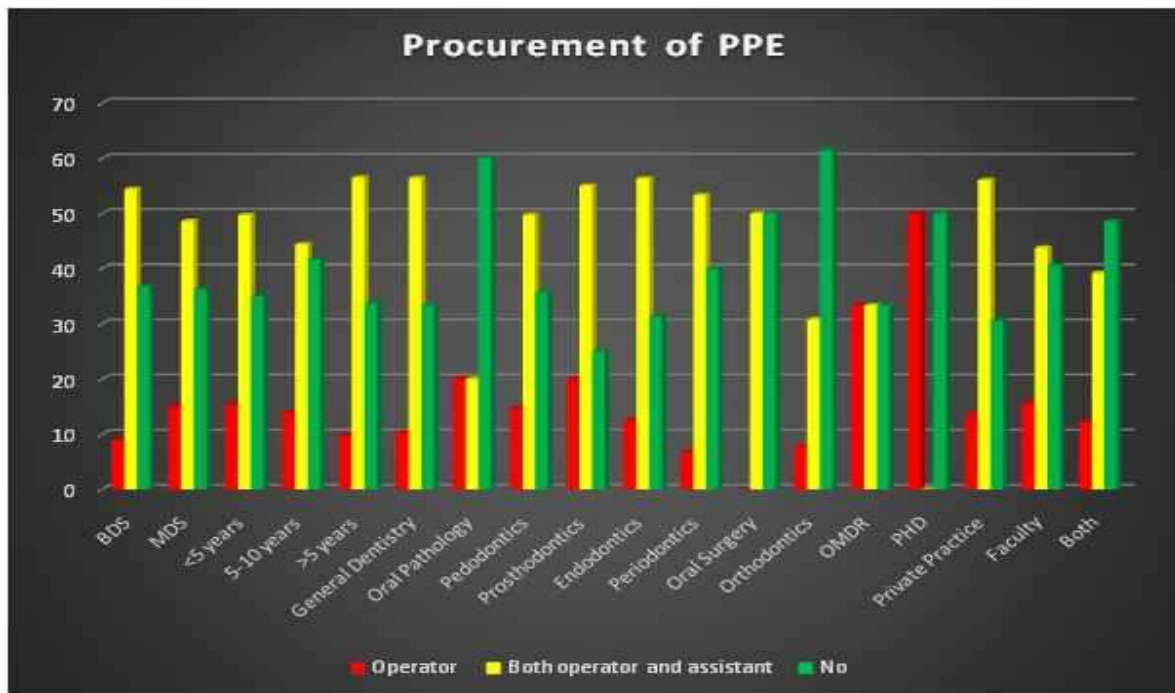
Question	General Dentistry		Oral Pathology		Pedodontics		Prosthodontics		Endodontics		Periodontics		Oral Surgery		Orthodontics		OMDR		PHD
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	
5	93.6	6.4	100	0	94.4	5.6	100	0	93.8	6.3	86.7	13.3	90	10	92.3	7.7	100	0	100
6	28.2	71.8	20	80	36.4	63.6	40	60	18.8	81.3	53.3	46.7	20	80	23.1	76.9	33.3	66.7	0
7	88.5	11.5	80	20	88.8	11.2	95	5	68.8	31.3	80	20	80	20	76.9	23.1	100	0	100
9	93.6	6.4	100	0	93.7	6.3	95	5	87.5	12.5	100	0	90	10	100	0	83.3	16.7	100
11	61.5	38.5	100	0	65.7	34.3	65	35	68.8	31.3	73.3	26.7	40	60	84.6	15.4	66.7	33.3	100
13	64.1	64.1	80	20	69.9	30.1	75	25	62.5	37.5	80	20	30	70	46.2	53.8	83.3	16.7	50

Almost all the specialities including the general dentists were aware about the guidelines for CoViD-19 patient management (93.6%), obtained an online training (28.2%), have taken proper travel history (93.6%%) and filled the CoViD-19 questionnaire (61.5%), received calls from the patients (88.5%) and were well aware about the ibuprofen guidelines (64.1%). There was no significance difference

seen in terms of any speciality. ($P > 0.05$).

The association of knowledge, attitude and practices of dentists towards procurement of PPE's with their qualification, years of practice, type of practice and various specialities is depicted in **Figure II**.

Figure II: Association of knowledge of dentists towards procurement of PPE's with their qualification, years of practice, type of practice and various specialities.



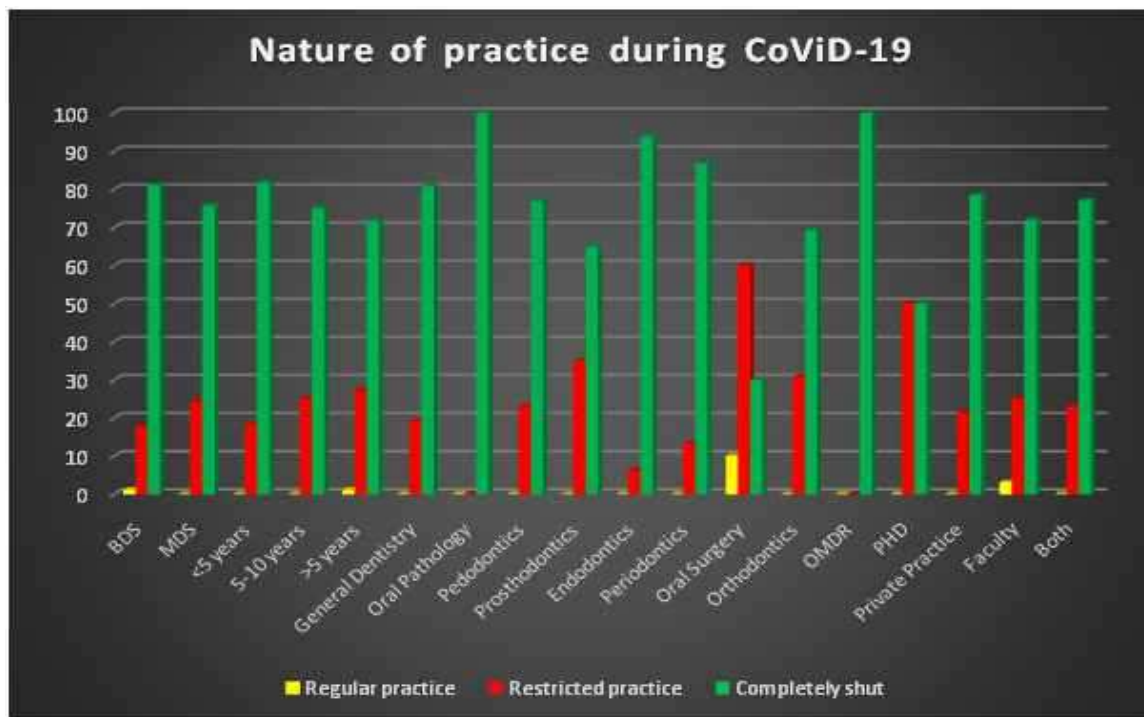
	Operator (%)	Both operator and assistant (%)	No (%)	Chi Square test	P value
BDS	8.9	54.4	36.7	2.301	0.317
MDS	15.1	48.6	36.2		
<5 years	15.4	49.7	35.0	5.114	0.529
5-10 years	13.9	44.4	41.7		
>5 years	9.8	56.5	33.7		
General Dentistry	10.3	56.4	33.3	16.388	0.566
Oral Pathology	20.0	20.0	60.0		
Pedodontics	14.7	49.7	35.7		
Prosthodontics	20	55	25		
Endodontics	12.5	56.3	31.3		
Periodontics	6.7	53.3	40		
Oral Surgery	0.0	50.0	50.0		
Orthodontics	7.7	30.8	61.5		
OMDR	33.3	33.3	33.3		
PHD	50.0	0.0	50.0		
Private Practice	13.5	56.0	30.5	12.208	0.057
Faculty	15.6	43.8	40.6		
Both	12.2	39.2	48.6		

About 50.3% procured the PPE's for both operator and assistant whereas 13.3% procured them only for the operator. No significant differences were seen amongst the dentist towards procurement of PPE's irrespective of their qualification, years of practice, nature of practice and

various specialities. (P>0.05)

The association of knowledge of dentists towards nature of practice during CoViD-19 with their qualification, years of practice, type of practice and various specialities is depicted in **Figure III**.

Figure III: Association of knowledge of dentists towards nature of practice during CoViD-19 with their qualification, years of practice, type of practice and various specialities.

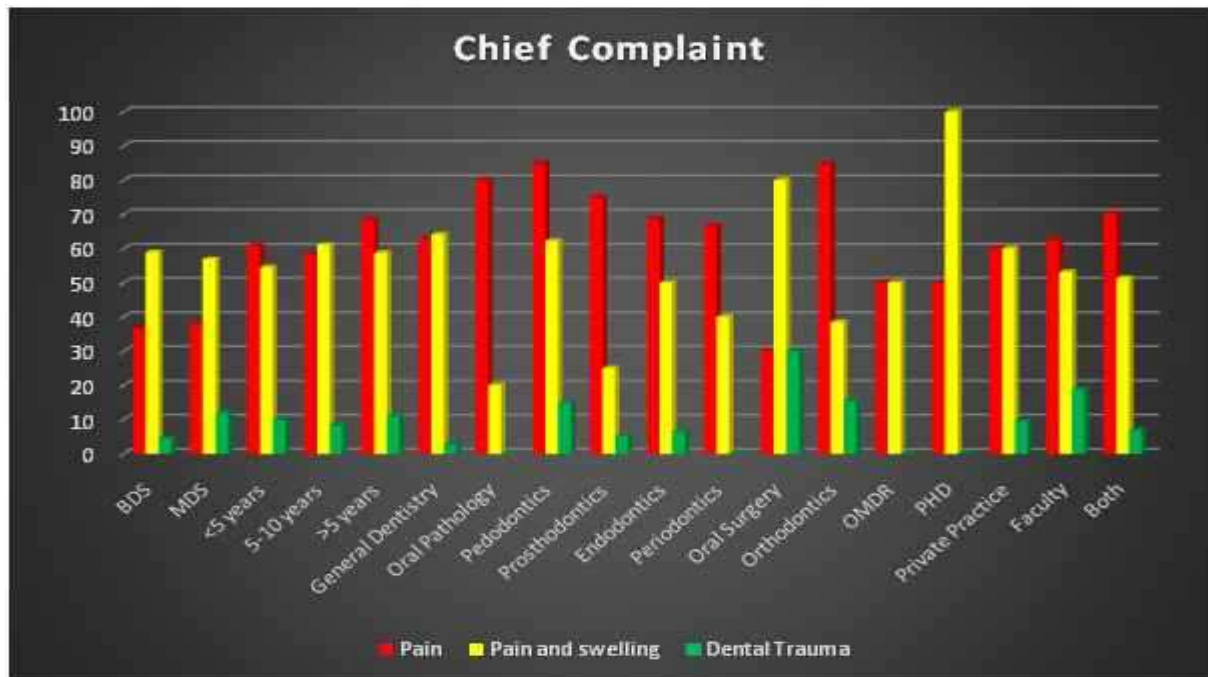


	Regular practice (%)	Restricted practice (%)	Completely shut (%)	Chi Square test	P value
BDS	1.11	7.8	81.1	3.879	0.144
MDS	0.0	24.3	75.7		
<5 years	0.0	18.2	81.8		
5-10 years	0.0	25.0	75.0	5.723	0.455
>5 years	1.1	27.2	71.7		
General Dentistry	0.0	19.2	80.8		
Oral Pathology	0.0	0.0	100.0	49.048	0.000
Pedodontics	0.0	23.1	76.9		
Prosthodontics	0.0	35.0	65.0		
Endodontics	0.0	6.3	93.8		
Periodontics	0.0	13.3	86.7		
Oral Surgery	10.0	60.0	30.0		
Orthodontics	0.0	30.8	69.2		
OMDR	0.0	0.0	100.0		
PHD	0.0	50.0	50.0		
Private Practice	0.0	21.5	78.5		
Faculty	3.1	25.0	71.9	9.838	0.132
Both	0.0	23.0	77.0		

Almost all the dentist preferred to have a completely shut practice (77.3%) irrespective of their qualification, years of practice, type of practice and various specialities. The results were statistically significant when compared across various specialities. (p<0.05)

The association of knowledge, attitude and practices of dentists towards chief complaint of patients during CoViD-19 with their qualification, years of practice, type of practice and various specialities is depicted in **Figure IV**.

Figure IV: Association of knowledge of dentists towards chief complaint of patients during CoViD-19 with their qualification, years of practice, type of practice and various specialities.



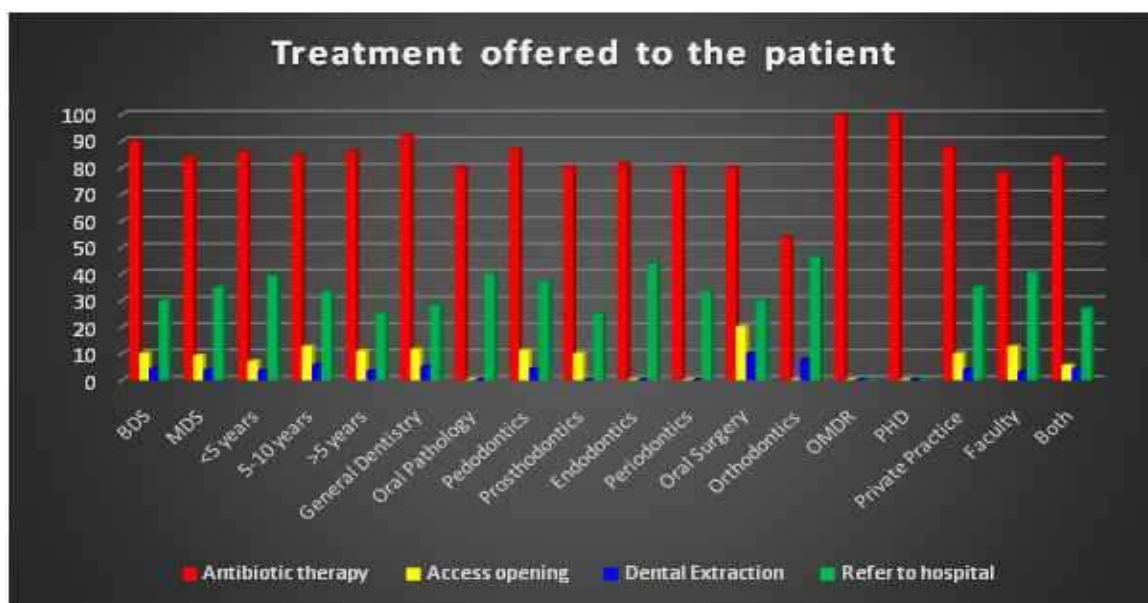
	Pain (%)	P value	Pain and swelling (%)	P value	Dental Trauma (%)	P value
BDS	36.7	0.817	58.9	0.746	4.4	0.044
MDS	38.1		56.9		11.9	
<5 years	60.8	0.288	54.5	0.640	9.8	0.939
5-10 years	58.3		61.1		8.3	
>5 years	68.5		58.7		10.9	
General Dentistry	62.8	0.299	64.1	0.009	2.6	0.042
Oral Pathology	80.0		20.0		0.0	
Pedodontics	85		62.2		14.7	
Prosthodontics	75		25.0		5.0	
Endodontics	68.8		50.0		6.3	
Periodontics	66.7		40.0		0.0	
Oral Surgery	30		80.0		30.0	
Orthodontics	84.6		38.5		15.4	
OMDR	50.0		50.0		0.0	
PHD	50.0		100.0		0.0	
Private Practice	60.0	0.124	60.0	0.33	69.5	0.269
Faculty	62.5		53.1		18.8	
Both	70.3		51.4		6.8	

Most of the dentists received the complaint of pain and swelling and dental trauma. These results showed statistically significant results when compared across specialities with endodontists (50%) and general dentist (64.1%) having maximum complaints of pain and swelling ($p < 0.05$) and oral surgeons (30%) receiving maximum

complaints of dental trauma ($p < 0.05$).

The association of knowledge, attitude and practices of dentists towards treatment offered to the patients during CoViD-19 with their qualification, years of practice, type of practice and various specialities is depicted in **Figure V**

Figure V: Association of knowledge, attitude and practices of dentists towards treatment offered to the patients during CoViD-19 with their qualification, years of practice, type of practice and various specialities



	Antibiotic therapy (%)	P value	Access opening (%)	P value	Dental Extraction (%)	P value	Refer to hospital (%)	P value
BDS	90.0	0.167	10.0	0.821	4.4	0.749	30.0	0.411
MDS	83.9		9.2		3.7		34.9	
<5 years	86.0	0.971	7.0	0.548	3.5	0.866	39.2	0.136
5-10 years	84.7		12.5		5.6		33.3	
>5 years	85.9		10.9		3.3		25.0	
General Dentistry	92.3	0.055	11.5	0.516	5.1	0.880	28.2	0.502
Oral Pathology	80.0		0.0		0.0		40.0	
Pedodontics	86.7		11.2		4.2		37.1	
Prosthodontics	80.0		10.0		0.0		25.0	
Endodontics	81.3		0.0		0.0		43.8	
Periodontics	80.0		0.0		0.0		33.3	
Oral Surgery	80.0		20.0		10.0		30.0	
Orthodontics	53.8		0.0		7.7		46.2	
OMDR	100.0		0.0		0.0		0.0	
PHD	100.0		0.0		0.0		0.0	
Private Practice	87.5	0.460	10.0	0.127	4.03	0.986	35.0	0.343
Faculty	78.1		12.5		3.1		40.6	
Both	83.8		5.4		4.1		27.0	

Majority of the dentists (85.7%) prescribed antibiotic therapy to the patients irrespective of their qualification, years of practice, type of practice and various specialities. The next most preferred treatment was to refer the patient to a hospital setup (33.4%). Rarely an emergency access opening (9.4%) or a dental extraction was performed (3.9%). These results were not statistically significant. ($p > 0.05$)

Discussion

The entire world is facing the effect of novel Corona Disease (CoViD-19). Due to the human to human transmission of the virus, India adopted a nationwide lockdown. This lockdown had completely restricted the movements of citizens within the country. Most of the industries, local transports were shut affecting both the public and private sector.

As stated in the 6th Edition of CoViD-19 Treatment Regimen (Trial Implementation) published by the National Health Commission of the People's Republic of China (2020), the possible routes of CoViD-19 transmission were mainly direct contact and droplet transmission. Aerosol transmission was also a possible route of transmission when there was 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 patients¹. In virtue of it, majority of the dental clinics and dental institutions were either shut or following only emergency dental care during these times.

The questionnaire used basic demographic data of the respondents to assess their knowledge based on their qualification, speciality and years of experience in the dental field. The nature of their practice influenced their ability to assess the severity of the situation from a clinician's and an academician's point of view. The dentists who were attached to academics showed better awareness about the latest guidelines and were more updated about the current trends of dentistry amidst the CoViD-19.

Several guidelines had been introduced by various dental associations during the period of CoViD-19. The dentists who were both academicians and clinicians were aware of all the latest guidelines (100%) as compared to only clinicians (93%) and only academicians (87.5%). This could be attributed to their close association with the current literature and updated knowledge of latest modifications in them.

The World Health Organization (WHO) had online

courses for dentist to manage patients in this crisis of pandemic¹¹. Even in India, the government had asked the dentist to undergo training for CoViD-19 patient management¹². It included basic information about the virus transmission and personal hygiene in times of lockdown. The dentists were also instructed about the donning and doffing of the Personal Protective Equipment (PPE) by the healthcare professionals. All the dentists irrespective of their qualification, experience or specialty had to undertake this training. Almost 94.2% of the respondents had received this online training.

During the times of lockdown, majority of the communication with the patients happened on the telephone. Clinicians (91.5%) received more phone calls from their patients in times of lockdown irrespective of their qualification, experience or specialty as compared to academicians (56.3%). This may be because at a private clinic it is possible for the patient to directly consult the dentist by telephone whereas at dental college and hospitals, the process of contacting the doctors is difficult.

Endodontic infections can cause serious pain¹³, and endodontic emergencies are considered to be an important category of dental emergencies¹⁴. The most common complaints that were conveyed to the dentist during the lockdown was pain, swelling and dental trauma. Mostly the pain and swelling complaints were reported to the endodontists (50%) and general dentists (64.1%) and the complaint of dental trauma was mainly reported to the oral surgeon (30%). This could be attributed to their respective dental specialty. Endodontists were more well versed to handle problems of pain and swelling whereas handling dental trauma cases efficiently could be done by oral surgeons.

According to the instructions given by the government, a detailed travel history needed to be recorded by the dentist prior to initiation of any treatment, preferably over the telephonic conversation itself. If the patient had a history of air travel from any of the CoViD-19 zones, performing dental treatment of such patient could be very risky. This was followed by all the dentists whether they were general dentists (93.3%) or specialty dentists (94%).

During the times of lockdown 77.3% of the dentists had completely shut their practice and followed only teledentistry. About 22.4% of the dentists were following a restricted dental practice handling only emergency dental treatments. Also, even though strict guidelines given by the

government and various dental institutions, 0.3% of dentists were still following a regular dental practice.

A CoViD-19 questionnaire had to be filled by the patient prior to commencement of any kind of dental treatment. This questionnaire contained questions as follows: (1) Do you have fever or have experienced fever within the past 14 days? (2) Have you experienced a recent onset of respiratory problems, such as a cough or difficulty in breathing within the past 14 days? (3) Have you, within the past 14 days, travelled to countries with documented (SARS)-CoV-2 transmission? Or have you come into contact with people who have travelled to these countries? (4) Have you come into contact with a patient with confirmed (SARS)-CoV-2 infection within the past 14 days? (5) Are there people with documented experience of fever or respiratory problems within the last 14 days having close contact with you? (7) Have you recently participated in any gathering, meetings, or had close contact with many unacquainted people?¹⁵ It helped the dentist to gauge the amount of risk involved in treating such patients. Almost 65.9% dentists irrespective of their qualifications or specialty had asked the patient to fill this questionnaire.

Treating patients with dental emergencies was a major concern to the dentists. Majority of dentists (85.7%) preferred to prescribe antibiotics and analgesics to their patients. This helped to improve the pain and discomfort. If the symptoms still persisted, the next line of treatment would be to perform an emergency access opening (9.4%) or dental extractions (3.9%). Some dentists also referred the patients to a hospital setup (33.4%) rather than performing the dental treatment themselves.

There was an article in Lancet respiratory medicine about the prescription of ibuprofen during the times of CoViD-19. It stated that ibuprofen led to precipitation of the CoViD-19 symptoms in patients with diabetes and hypertension¹⁶. Following this, even Indian Council of Medical Research (ICMR) had advised paracetamol to be the safest analgesic to be prescribed during times of CoViD-19¹⁷. So, majority of the dentist (66.9%) who were aware of these guidelines used alternative medicines in place of ibuprofen.

Awareness of the use of Personal Protective Equipment (PPE) for suspected/confirmed CoViD-19 cases was high among all groups of healthcare professionals. The CDC has provided Interim Infection Prevention and Control Recommendations for patients with suspected or confirmed CoronaVirus Disease 2019 (CoViD-19) in Healthcare

Settings for PPE¹⁸. A Facemask/N95 respirator should be used while performing any type of interaction with the patient in the operatory. The N95 respirator was preferred over face mask when performing aerosol-generating procedures. The used masks needed to be discarded properly and meticulous hand hygiene performed. A clean gown with goggles or disposable face shield and clean sterile gloves were recommended upon entry to the operatory. Almost all the dentists were aware about these guidelines wherein 50.3% dentists had ordered the PPE's for both the operator and their assistants.

Limitations

This being a preliminary investigation a convenient sample from only one city was chosen. There was difference amongst the various group sizes (less number of BDS as compared to MDS). Moreover, the lockdown guidelines, number of cases in a respective area, practice guidelines etc. vary from place to place and thus, this study has limited generalizability amongst various dentists in the country.

Recommendation

It is recommended that the dental governing bodies like Indian Dental Association (IDA), Dental Council of India (DCI), make it compulsory for dentists to acquire practical training along with webinars to manage the patients post the CoViD-19 pandemic. It is recommended to prioritize the most critical dental services and provide care minimizing the harm to patients from delaying care as well as to the personnel from potential exposure to CoViD-19.

Conclusion

This study shows that majority of the dentists were well aware about the various guidelines issued by different authorities to manage dental patients during the lockdown period. The dental fraternity was well equipped to manage the emergencies during this pandemic of CoViD-19.

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Nil.

Conflicts of interest

There are no conflicts of interest

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Fear Factor of Dental Surgeons Working During CoViD 19 Pandemic - Cross Sectional Pilot Survey

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Abstract

Background: The CoViD - 19 pandemic started from Wuhan, China and spread worldwide. Its first case in India was reported on 30th Jan 2020. We are now aware of its deadliest clinical presentation to physical health. As its definitive treatment is yet not available, fear, stress anxiety disturbs our mental health. Due to its psychological impact, this cross-sectional survey was design to identify the fear among dental surgeons in India.

Method: From 21st to 30th June an online survey was conducted using online questionnaire form among dental surgeons. Data was collected and analyzed for fear factor identification.

Result: Total 173 responses were collected, between age group of 25 to 65 yrs.

Conclusion: According to the present survey, Dental surgeons experienced fear working during CoViD - 19 pandemic and they will work fearlessly with availability of its vaccine and definitive treatment.

Key Words : Key words – CoViD -19, Indian dental surgeons, Fear, Stress, Anxiety, Pilot study.

Introduction

The CoViD - 19 pandemic situation is creating lot of anxiety and fear worldwide. Worldwide more than 10 million cases have been reported until now, and number of cases are increasing day by day. Spread of this viral disease is via salivary droplets of infected patient, so doctors working in head and neck region are at maximum risk.¹ Medical professionals other than Dental surgeons, Maxillofacial surgeons, Otolaryngologist, Pulmonologist, General Anesthetists are comparably safer. Today Dental surgeons are at highest risk as we do all procedure in oral cavity involving saliva. The aim of this survey study was to identify the fear among dentists working during this CoViD 19 pandemic.^{2,3}

Methodology:

The survey was framed with questionnaire of 25 questions. The survey was conducted among dentists group on social media like what's app, Facebook, Google mail etc. Total 173 responses were collected and their responses were analyzed for statistical analysis.^{2,3,4}

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Questionnaire:

- 1) Name
- 2) Age Group
- 3) Gender
- 4) Education
- 5) Address
- 6) Currently you are working regularly?
- 7) what kind of procedures you are offering to your patients?
- 8) Do you have fear working During Covid 19 Pandemic?
- 9) Reason of Fear?
- 10) You are become anxious While watching news regarding covid 19?
- 11) Sleep disturbances present due to covid 19 fear?
- 12) Grade your fear between 0 to 10
- 13) Similar Covid 19 fear present in your family members?
- 14) Other Difficulty you have encountered due to Covid situation
- 15) is it required to upgrade our clinics to safe practice?
- 16) is this upgrading will help you to reduce fear of getting Covid 19?
- 17) Using PPE kit while working makes me safe?
- 18) Is it our profession is at highest risk in future?
- 19) have you taken Covid 19 Insurance cover?
- 20) are you facing Financial constraints?
- 21) Are you thinking of change in profession?
- 22) Is it truly required to get fear of Covid 19?
- 23) if no why no ? if yes why yes ? Give Reason
- 24) How to overcome covid19 fear?
- 25) what will you make fearless from Covid 19?

Table no I : Questionnaire Format used for Survey

Total 173 responses were collected from Dental surgeons across India, between the age group of 25 years to 65 years. Out of 173 dentists, 65.9 % were between age group of 25 to 30 years, 17.9% between 36 to 45 years, 12.1 % between 46 to 55 years and 4.1 % between age group of 56-65yares old. Gender wise 58.4 % were male dentists and 41.6% female dentists included. [Fig no I] Education wise 56.1% were BDS Doctors, 41 % MDS Doctors and 2.9% other doctors had participated. On working situation, only 51.4 % doctors were currently working. Out of these 48% dentists were attending only emergency procedures, 14.5 % dentists were doing only OPD, 19.7% dentists were not working at all and only 17.9% dentists provided all dental treatments. [Fig no II]

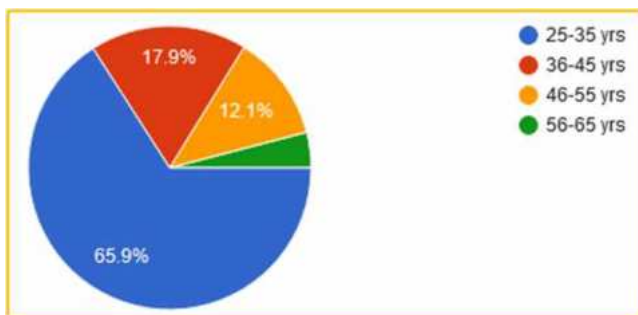


Fig I : Age Group Distribution of survey participants.

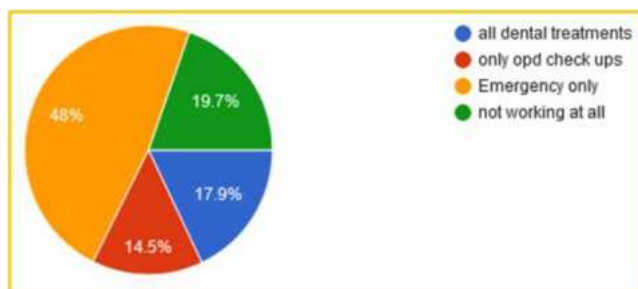


Fig II : Different kind of procedures Dental Surgeons are offering in CoViD-19 situation.

For fear and anxiety identification when they were asked, do they have fear working during CoViD - 19 pandemic, 152 out of 173 (87.9%) said they experienced fear. Grading of their fear between 0 to 10 showed, out of 173, 70 (40.5%) dental surgeons had fear between grade 3-5, 49(28.3%) hadfear between grade 6 to 8, 14 (8.1%) had fear between grade 9 to 10 and 40 (23.1%) had less fear between grade 0 to 2. Total 127 (73.4%) doctors out of 173 said their family member had similar fear of CoViD- 19 situation. [Fig no : IV] Survey result showed that, 137 (79.2%) dentists had fear due to possibility of their family members getting infected because of them, 76(43.9%) Dentists had fear of getting CoViD- 19 disease, 25 (14.5%) had fear of death, 57(32.9%) dentists had fear of not getting hospital bed for

treatment if infected, 45 (26%) had fear because of no definitive treatment availability and 18 (10.4%) experienced no fear.[Fig no IV].With respect to anxiety, 63% dental surgeons said they have increased anxiety while watching or reading news on CoViD- 19. Sleep disturbances in 15.6% dentists were reported due to CoViD - 19.

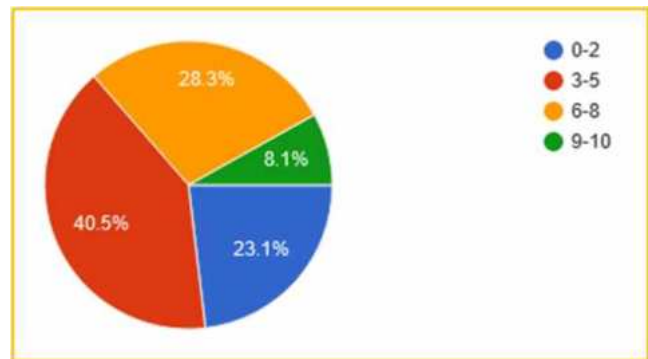


Fig III : Fear Grade between 0 to 10 of Participants in pie chart.

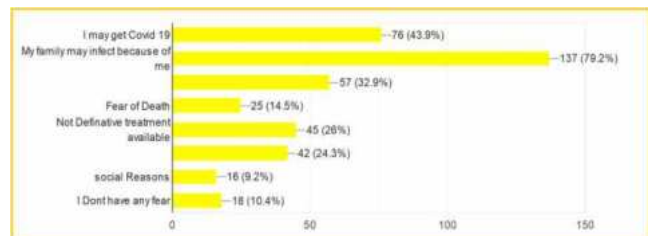


Fig IV : Graphical Presentation for reason of fear among dental surgeons in our survey.

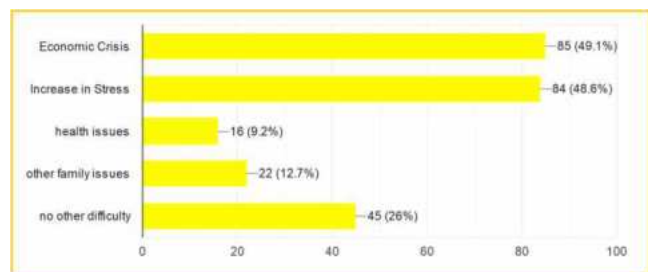


Fig V : Other Difficulty Dental surgeons encountered due to CoViD-19 situation.

Survey result showed that, dental surgeons were facing other problems also like economic crisis - 49.1 % dentists, high mental stress - 48% dentists, family issues - 12.7% and health issues - 9.2% dentists. [Fig no VI] On question of safe upgraded practices, 98.3% dental surgeons agreed that clinic upgradation is required. [Fig no VI] After upgradation of safety equipment, 41.6% dentists assumed that it will help in reducing their fear whereas 11.6% dentists did not feel the same. Only 42.8% dentists agreed on feeling safe while practicing with PPE kit. 40(23.1 %) dentists out of 173 had taken CoViD insurance cover.

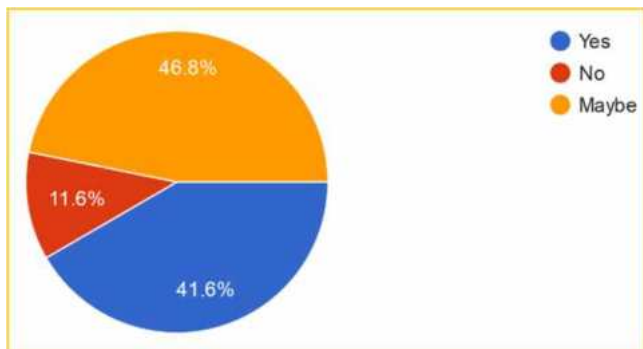


Fig VI : Response for Clinical upgrading will help you to reduce fear of getting CoViD-19.

According to this survey result, 63% dental surgeons were facing financial constraints. [Fig no VII] 85.5 % agreed that their profession will be at highest risk in future, and 7.5% dentists were thinking to change their profession. 114 (65.9%) dentists out of 173 thought that it is obvious to get fear of CoViD -19 with common reasoning being self-protection. [Fig no VIII]

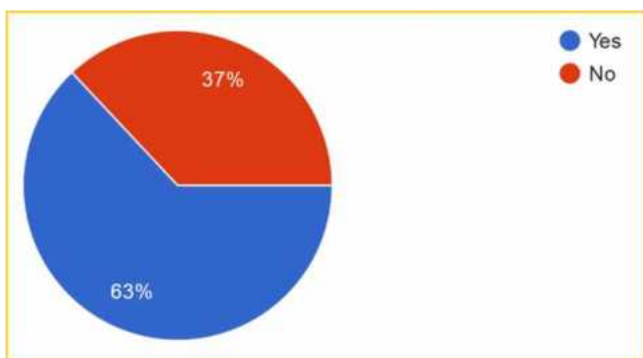


Fig VII : Result for dental surgeons facing Financial constraints.

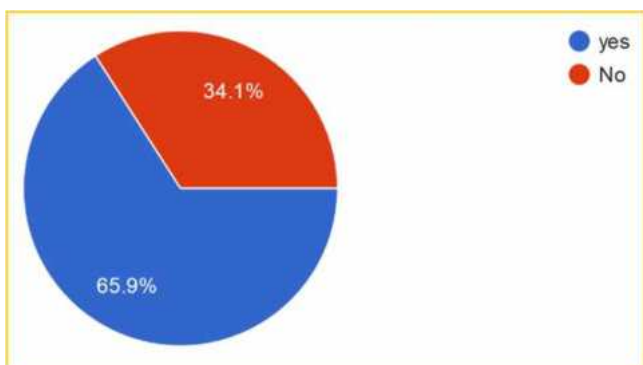


Fig VIII : Dental Surgeons on CoViD-19 is fearful situation in survey.

Discussion

The current survey was conducted to assess the psychological impact of CoViD -19 among Indian dental surgeons. As the disease progresses in India with daily new death, it's obvious to develop fear and anxiety because of it.

The finding of this surveys helps us to analyze reasons and root cause of fear among dental surgeons. This survey was also helpful for finding solutions and treatment for other researchers. World Health Organization has also advised healthcare workers to look after their mental health during CoViD -19 pandemic.^{3,5} This survey reports 87.9% doctors had some kind of fear working during CoViD -19 pandemic.

Ahamed M A et al in their study where in a total of 669 participants from 30 different countries across the world had responded reported that 78% of doctors from 30 countries reported to be anxious and scared by the devastating effects of CoViD-19. A large number of dentists (90%) were aware of recent changes in the treatment protocols. However, execution of amended treatment protocol was recorded as 61%. Despite having a high standard of knowledge and practice, dental practitioners around the globe are in a state of anxiety and fear while working in their respective fields due to the CoViD-19 pandemic. A number of dental surgeons have either modified their services according to guidelines for emergency treatment only or closed down practices for an uncertain period of time.²

Rafael R.M. et al in their study reported an early evidence of three major impacts of this pandemic on dentistry in Brazil: increasing inequalities due to coverage differences between public and private networks; adoption of new clinical routines, which are associated with an economic burden; and associations of regional CoViD-19 incidence and mortality with fear of contracting the disease at work⁶

In accordance with other studies the present study also reveals that, there is presence of fear in mind while working in dental clinics due to pandemic situation in India among dental surgeons. Dental surgeons also have fear of CoViD-19 infection getting transferred to their families because of them. Most of dentists have restricted their clinical work to emergency procedures. They have also adapted new safety guidelines for there clinics. According to our survey, the descriptive data on how to overcome this fear suggests practicing most precautions, maintain respiratory hygiene, Meditation, Yoga and prophylactic medication. Survey results also suggested that maximum dental surgeons assuming availability of definitive treatment and vaccination will only make them to start fearless practice again. As there was many limitations to this cross-sectional survey study, we recommend to do similar large sample size study to confirm the results of the present study.^{3,4,5} Despite the limitations , this

study provides the first of its kind cross-sectional data on actual level of psychological impact among Indian dental surgeons (Fear Factor) and how mental health of people is affected during a pandemic of this nature.

Conclusion:

The present survey concludes that there is sustainable amount of fear among Indian dental surgeons that needs to be addressed appropriately.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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Rise and Become Wise Over CoVid-19

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Abstract

Outbreak of Severe Acute Respiratory Syndrome - CoronaVirus 2 (SARS-CoV-2) disease (CoViD-19) in China has been brought to global attention and declared a pandemic by the World Health Organization (WHO) on March 11, 2020. The advancements in scientific research since the pandemic of Severe Acute Respiratory Syndrome (SARS) between 2002 to 2003 and the Middle East Respiratory Syndrome (MERS) in 2012 have helped in understanding of the epidemiology and pathogenesis of SARS-CoV-2 and has accelerated the development of therapeutics to treat viral infection. The snowballing effect of CoViD-19 and non-availability of vaccine, has not only put tremendous pressure on global healthcare systems but also has an adverse socioeconomic and psychological impact. Therefore, to provide a comprehensive summary to public health authorities and potential readers, we detail the present understanding of CoViD-19 and introduce the current state of development measures in this narrative.

Key Words : SARS-CoV-2; CoViD-19; Epidemiology; Pathogenesis; Therapeutics; Outbreak; CoronaVirus.

Introduction

Six months into the pandemic; literature, internet, media is flooded and gurgling with information and knowledge about the Contagion; SARS CoViD-19. Is just knowledge good enough? In our opinion, it's about time for us to rise, be wise and apply the knowledge to our daily routine and clinical practice.

Till date a number of protocols have been made by the governing bodies and health care authorities. As clinicians, just like we require to update our knowledge and clinical skills, it is important for us to keep ourselves abreast to the changing policies and protocols, as the emerging picture of the contagion and its transmission dynamics change according to the geographic location, weather and season.

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Following the available evidence based concepts, let us together; outsmart the virus before it outsmarts us.

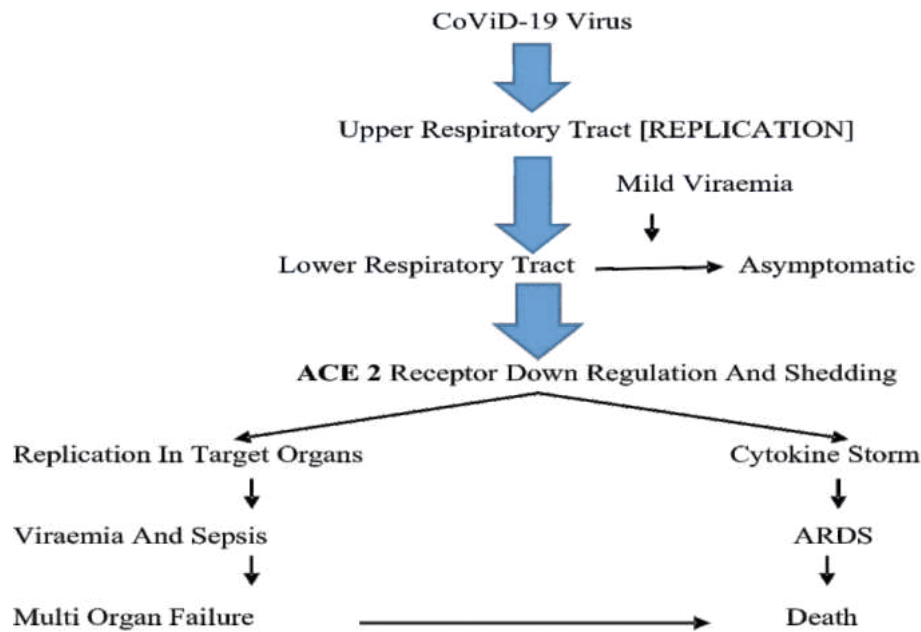
Epidemiology

Symptomatic CoViD-19 patients are the main source of infection. Asymptomatically infected patients, who show no signs or symptoms of respiratory infection also shed the virus and are potential source of infection.¹ Additionally, a positive RT-PCR test have been seen in samples taken from patients who have recovered.² In other words, asymptotically infected patients in incubation or recovered from CoViD-19 may pose serious threats for infection prevention and control. About 10% of the infected/carrier cases can approximately affect 80% population.³

Postulated pathogenesis

SARS virus, like CoViD-19 cannot infect humans unless they undergo recombination or mutation in a host animal and it is ascertained that for CoViD-19 the animal species was a Pangolin. CoViD-19 enters the body through the ACE 2 receptor gates and these receptors are distributed in the nasopharyngeal mucosa, gastrointestinal lining, heart, liver and kidneys.⁴⁻¹³

Figure I : Postulated pathogenesis of CoViD -19



No one knows for sure as to what viral load it takes to infect an individual but recent studies published in a journal Nature, researchers were unable to culture live CoViD-19 virus if a patient's throat swab or a millilitre of sputum contained less than one million copies of viral RNA, so extrapolating this study something above this number would be required for infectivity; writes Clemens Wendtner, Department Head Of Infectious Diseases And Tropical Medicine at Maxmilian University Of Munich.³

Table I : Clinical features of CoViD -19

SIGNS AND SYMPTOMS		BLOOD PICTURE	CT PICTURE
More Common	Less Common		
<ul style="list-style-type: none"> • Fever 98% • Sore Throat Without Fever 76% • Fatigue and Myalgia 44% • Dyspnea 50% • Anosmia 	<ul style="list-style-type: none"> • Cough with Sputum 28% • Headache 8% • Diarrhea and Vomiting 3% • Loss of taste 	<ul style="list-style-type: none"> • Lymphocytopenia 65% • Increase in C-reactive protien 	<ul style="list-style-type: none"> • Bilateral Lobular involvement of the lungs with ground glass appearance.

Detection of virus

Diagnostic tests based on detection of viral sequence by RT- PCR are available. Problem with nucleic acid tests done earlier are their false negatives. Today rapid viral nucleic acid diagnostic test with nucleic acid test papers are available for rapid detection of the virus within three minutes.²

Prolonged exposure

John Brooks, CDCP Chief Medical Officer for CoViD-19 response defines this as 15 mins or more of unprotected contact with someone who is at a distance of less than 6 feet. But this is only a rule of thumb it would only be wise enough for us to understand the fact that time less than 15 mins of exposure may still be deleterious with some person sneezing on the face or with someone in intimate contact with respiratory droplets, for example; Anaesthetist, Dentists and

Dental specialities which are involved in aerosol generated procedures.³

Attack rate

It is the percentage of people who were infected in a specific place and at a specific time. Thus more the crowded space more will be the exposure and hence higher will be the attack rate of virus. Transmission Dynamics could play a role in disease transmission in altered settings like congested rooms, gatherings, congested wards, ICU set ups, hospitals or health care set ups where multiple dental chairs are functioning to treat patients at a time, seminar rooms, conference rooms etc where the attack rate will be high.³

Potential therapeutics

The best option is definitely a vaccine for CoViD-19

virus, which is still under trail. Symptomatic treatment strategies recommended for clinical practice include antiviral drugs like ribavirin¹⁴, lopinavir¹⁵, nelfinavir¹⁶, remdesivir¹⁷ and broad spectrum antivirals like arbidol¹⁸. Cholroquine which interferes with ACE 2- Receptor binding has also been implicated.^{19,20} Convalescent plasma has also been recommended. Gobally, the responsibilities, roles and rights of primary healthcare workers have taken a paradigm shift after the outbreak.

General rule of thumb will be; Forewarned Is Forearmed, so know your risk and avoid them. The following general guidelines have been adopted from WHO, CDC's and Indian MoHFW infection prevention and control protocol.

Figure II : Safe dental practice

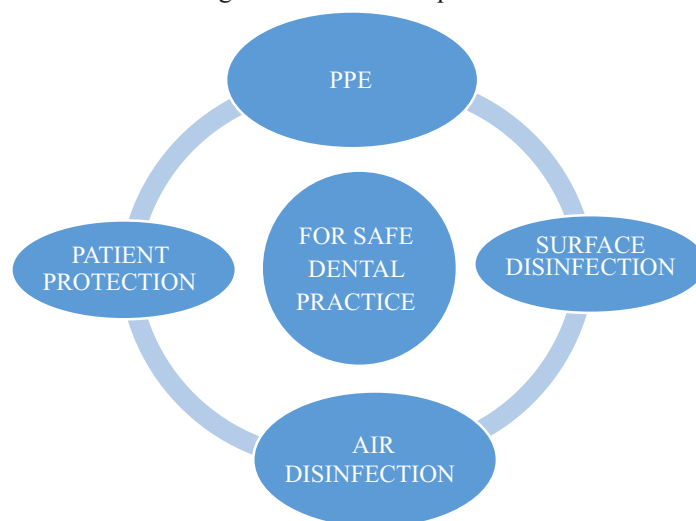


Table II : Essentials in clinical practice²¹

Personal Protection Equipment (PPE)	Patient Protection	Surface Disinfectants	Air Disinfection
<ul style="list-style-type: none"> • Scrubs • PPE suit • Head caps and shoe cover • N95 or Respiratory masks • Face shield 	<ul style="list-style-type: none"> • Betadine mouthwash 2% w/v • Disposable Bib • Hand sanitization • Relevant History 	<ul style="list-style-type: none"> • Alcohols (60-90%) including Ethanol/ Isoproponol • Hydrogen peroxide 3-6% • Sodium hypochlorite 1% • Peracetic acid 0.2–0.35% • Glutraldehyde 2% 	<ul style="list-style-type: none"> • Well ventilated rooms • Negative pressure rooms/exhaust fans • Hepa filters (h14) • Air curtains for unidirectional air flow • UV light chambers/ towers • Fogging or fumigation

Strengthen your immunity:

In the battle between the humans and microbes; immunity has always played a pivotal role. There was never a substitute for a healthy immune system and the current pandemic has reemphasized its importance. Vitamins and trace elements are essential for the normal functioning of the immune system. For a viral disease like CoViD-19, where no pharmacological strategies for prevention or treatment are presently available and where the exact time of the ending of the alarming situation is unknown, nutritional strategies for enhancing immunity should be harnessed. In the current global context it is difficult to obtain a balanced and varied diet. Therefore, achieving recommended amounts of calories

and micronutrient will be a challenge and elective micronutrient supplements, trace elements and vitamins may be beneficial especially for vulnerable populations such as the geriatric group.²²

Psychological impact:

It is pivotal, that we clinicians too do not ignore the psychological impact that the outbreak has on individuals and the society, which is often the limiting factor to overcome the crisis. Psychological ramifications can have prolonged effects even after the pandemic has ended. This outbreak has highlighted the fragility of mental resilience and the need for the provision of coordinated psychological intervention. Only by strengthening our psychological perspective can we

continue to fight this long-drawn battle and succeed in future.²³⁻²⁵

Conclusion:

Change is inevitable, as Heraclitus who once said “The Only Constant In Life Is Change”. Let us rise, be wise, apply all the knowledge prudently and wisely to our dental practice. Now that we have accepted the new normal and have raised our standards of infection control; let us continue with our new established standards, taking our profession to newer heights serving our society with finest and quality dental care.

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Conflicts of interest

There are no conflicts of interest.

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CoViD-19 and Public Health Dentistry

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Abstract

A novel human CoronaVirus initially referred to as the Wuhan CoronaVirus (CoV), currently designated as Severe Acute Respiratory Syndrome (SARS)- CoV-2, is responsible for the latest pandemic that is affecting human health and economy across the world. On 30 January 2020, the WHO declared the Chinese outbreak of CoViD-19 to be a Public Health Emergency of International Concern because of its rampant spread, thus posing a high risk to countries with vulnerable health systems. During dental practice, blood and saliva can be scattered. Accordingly, dental practice can be a potential risk for dental staff, and there is a high risk of cross-infection. This article addresses all information collected to date on the virus, in accordance with the guidelines of international health care institutions, and provides a comprehensive protocol for managing possible exposure to patients or those suspected of having CoronaVirus.

Key Words : CoViD-19, Public health dentistry, CoronaVirus, Dental staff, Outbreak.

Introduction

Several epidemics (such as H1N1, H5N1, avian influenza, Ebola, SARS, Zika, and Nipah) have affected India and other countries in the past, which were successfully tackled with appropriate research. The emergence of novel human pathogens and re-emergence of several diseases are of particular concern. A novel human CoronaVirus initially referred to as the Wuhan CoronaVirus (CoV), currently designated as Severe Acute Respiratory Syndrome (SARS)-CoV-2, is responsible for the latest pandemic that is affecting human health and economy across the world.¹ On 30 January 2020, the WHO declared the Chinese outbreak of CoViD-19 to be a Public Health Emergency of International Concern because of its rampant spread, thus posing a high risk to countries with vulnerable health systems. According to the WHO situation report (14 May 2020) update on CoViD-19, there have been more than 42,48,389 reported cases and 2,94,046 deaths worldwide.² By imposing a nationwide lockdown, India has curtailed the spread of this virus to a certain extent; however, the total number of reported cases has crossed 17,54,117 with approximately 37,415 deaths and these numbers continue to rise. Given the widespread

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transmission of SARS-CoV-2, healthcare providers are at an increased risk of contracting the infection and becoming potential carriers of the disease.³ According to Occupational Safety and Health Administration (OSHA), Dental Health Care Personnel (DHCP) are placed in very high exposure risk category as dentists work in close proximity to the patient's oral cavity.⁴ Also, dental procedures involve the use of rotary instruments such as handpieces and scalers, which generate aerosols. Thus, a greater understanding of the structure of the virus, modes of transmission, clinical features, and testing methods is needed that can help to form protocols for dental practices to identify cases and prevent further spread of infection to the patients and DHCP.⁵

What Is CoViD-19?

Viral Etiology

According to recent research, similar to SARS-CoV and Middle East Respiratory Syndrome CoronaVirus (MERS-CoV), SARS-CoV-2 is zoonotic, with Chinese horseshoe bats (*Rhinolophus sinicus*) being the most probable origin and pangolins as the most likely intermediate host.⁶

Epidemiologic Characteristics

Mode of Transmission: Based on findings of genetic and epidemiologic research, it appears that the CoViD-19 outbreak started with a single animal-to-human transmission, followed by sustained human-to-human spread. It is now believed that its interpersonal transmission occurs mainly via

respiratory droplets and contact transmission. In addition, there may be risk of fecal-oral transmission, as researchers have identified SARS-CoV-2 in the stool of patients from China and the United States.⁷ However, whether SARS-CoV-2 can be spread through aerosols or vertical transmission (from mothers to their newborns) is yet to be confirmed.

Source of Transmission: Although patients with symptomatic CoViD-19 have been the main source of transmission, recent observations suggest that asymptomatic patients and patients in their incubation period are also carriers of SARS-CoV-2. This epidemiologic feature of CoViD-19 has made its control extremely challenging, as it is difficult to identify and quarantine these patients in time, which can result in an accumulation of SARS-CoV-2 in communities.⁸ In addition, it remains to be proved whether patients in the recovering phase are a potential source of transmission.

Incubation Period: The incubation period of CoViD-19 has been estimated at 5 to 6 days on average, but there is evidence that it could be as long as 14 days, which is now the commonly adopted duration for medical observation and quarantine of (potentially) exposed persons.⁹

Fatality Rate: According to current data, the fatality rate (cumulative deaths divided by cumulative cases) of CoViD-19 is 0.39% to 4.05%, depending on different regions of China, which is lower than that of SARS (severe acute respiratory syndrome; $\approx 10\%$) and MERS (Middle East respiratory syndrome; $\approx 34\%$) (Malik et al. 2020) and higher than that of seasonal influenza (0.01% to 0.17%) according to data for 2010 to 2017 from the US Centres for Disease Control and Prevention (2020).¹⁰

Clinical Manifestations

The majority of patients with CoViD-19 represent relatively mild cases. According to recent studies and data from the National Health Commission of China (2020b), the proportion of severe cases among all patients with CoViD-19 in China was around 15% to 25%. The majority of patients experienced fever and dry cough, while some also had shortness of breath, fatigue, and other atypical symptoms, such as muscle pain, confusion, headache, sore throat, diarrhoea, and vomiting.¹¹ Among patients who underwent chest Computed Tomography (CT), most showed bilateral pneumonia, with ground-glass opacity and bilateral patchy shadows being the most common patterns. Among hospitalized patients in Wuhan, around one-fourth to one-

third developed serious complications, such as acute respiratory distress syndrome, arrhythmia, and shock, and were therefore transferred to the intensive care unit. In general, older age and the existence of underlying comorbidities (e.g., diabetes, hypertension, and cardiovascular disease) were associated with poorer prognosis.^{12,13}

Diagnosis and Treatment

The diagnosis of CoViD-19 can be based on a combination of epidemiologic information (e.g., a history of travel to or residence in affected region 14 days prior to symptom onset), clinical symptoms, CT imaging findings, and laboratory tests (e.g., Reverse Transcriptase Polymerase Chain Reaction [RT-PCR] tests on respiratory tract specimens) according to standards of the WHO (2020a). It should be mentioned that a single negative RT-PCR test result from suspected patients does not exclude infection.¹⁴ Clinically, we should be alert of patients with an epidemiologic history, CoViD-19-related symptoms, and/or positive CT imaging results. So far, there has been no evidence from randomized controlled trials to recommend any specific anti-nCoV treatment, so the management of CoViD-19 has been largely supportive (WHO 2020a). Currently, the approach to CoViD-19 is to control the source of infection; use infection prevention and control measures to lower the risk of transmission; and provide early diagnosis, isolation, and supportive care for affected patients.¹⁵

Dental Setup

DHCP (dentists, dental hygienists, dental assistants, and receptionists) need to update their knowledge and skills regarding infection control and follow the protocols recommended by the relevant authorities to protect themselves and their patients against infections. An attempt should be made to telephone triage all patients in need of dental care.¹⁶ Teledentistry can be of great assistance in the current pandemic situation. Newer technologies have not only enhanced the quality of management of dental patients but have also made possible their partial or complete management at distances of kilometres away from healthcare centres or dental clinics. The entire process of networking, sharing digital information, distant consultations, workup, and analysis is dealt with by a segment of the science of telemedicine concerned with dentistry known as "Teledentistry".¹⁷ Based on the patients' signs and symptoms, a decision should be made to determine whether the patient

needs to be seen in the dental clinic. Appropriate pharmaceuticals and detailed home care instructions should be provided by means of Teledentistry in situations where dental treatment can be delayed.

After a decision has been made that the patient needs to visit the dental clinic, the next step should be to evaluate the patients for signs and symptoms of CoViD-19 infection to determine in which clinical setting they should be seen. According to Centres for Disease Control and Prevention (CDC) guidance, patients with active CoViD-19 infection should not be seen in dental settings and should be referred for emergency care where appropriate transmission-based precautions are available.¹⁸

A detailed history should be obtained from the patients by requesting them to fill the screening form for CoViD-19 infection which should include the following questions: (1) Do you have fever or have experienced fever within the past 14 days? (2) Have you experienced a recent onset of respiratory problems, such as a cough or difficulty in breathing within the past 14 days? (3) Have you, within the past 14 days, travelled to countries with documented (SARS)-CoV-2 transmission? Or have you come into contact with people who have travelled to these countries? (4) Have you come into contact with a patient with confirmed (SARS)-CoV-2 infection within the past 14 days? (5) Are there people with documented experience of fever or respiratory problems within the last 14 days having close contact with you? (7) Have you recently participated in any gathering, meetings, or had close contact with many unacquainted people? Upon patient's arrival, the body temperature of the patient should be measured using a contact-free forehead thermometer.^{19,20} The ability to test patients who need dental care for SARS-CoV-2 is to be considered in order to restart dentistry in a sustainable way. Tests can be a strong tool to mitigate risks for patients and oral healthcare workers too.

Because CoronaViruses lose their viability significantly after 72 hours, many organizations have promoted a rotation and reuse strategy. It involves acquiring a set number of N95 masks (at least 5 as per the CDC), and rotate their use each day, allowing them to dry for long enough that the virus is no longer viable. However, N95 respirators used during aerosol generating procedures or those contaminated with blood, respiratory or nasal secretions, or other bodily fluids from patients should be discarded.²¹ Fumigation is not practical for dental operator; however, measures such as mopping the floor with 1% sodium hypochlorite and disinfecting waterlines with 0.01% sodium hypochlorite can help reduce

the risk of cross infection²⁶. All biomedical waste pertaining to patient care should be carefully disposed from time to time through an authorized biomedical disposal agency.²²

Teledentistry as a form of Telehealth provides a pragmatic approach to assess and record the oral health status postoperatively and hence improve the overall delivery of oral care.²⁸ The dentist can monitor the treatment out-comes using mobile photography ensuring patient confidentiality and also provide educational videos regarding maintenance of oral hygiene for the benefit of the patient. With a paradigm shift in dental care practice in progress during the current pandemic situation, Teledentistry holds the prospects to attend the treatment needs of the patients without confrontation. It not only eliminates any chance of exposure to the virus but also decreases the service cost and helps in patient education and most importantly social distancing can be maintained. Teledentistry has changed the outlook of dentistry and never has it gained a stronger foothold in the practice as it probably holds during these times. So, it becomes imperative that the DHCP embrace this fundamental tool and apply it to its full potential.²³⁻²⁵

Conclusion

Following the announcement of the disease outbreak by international or local authorities, dentists can play a significant role in disrupting the transmission chain, thereby reducing the incidence of disease by simply postponing all non-emergency dental care for all patients. Dental professionals must be fully aware of 2019-nCoV spreading modalities, how to identify patients with this infection, and, most importantly, self-protection considerations. The effect of chlorhexidine, which is commonly used for pre-procedural mouth washing in dental practice, has not yet been demonstrated to be capable of eliminating 2019-nCoV. However, the prescription of oxidative agents containing mouth rinses such as 1% hydrogen peroxide or 0.2% povidone is recommended. A higher rate of virus exposure because of occupational commitments in health care workers is considered a key factor associated with the increased risk of infection.

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Conflicts of interest

There are no conflicts of interest

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CoViD 19 - Let's Fight Back , The Practical Way

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Abstract

Laws of nature are such that no living being can foretell the ups and downs of life and the unexpected challenges that it throws up every now and then. Each event has its own implications which cannot be prevented. It is human nature to get excited or emotional since it is not possible to remain unconcerned. Therefore, it is ideal to be mentally conditioned to fight back. And excellent health provides high level of immunity, clear thinking and mental balance. Oral hygiene helps in maintaining strong teeth which in turn help in chewing food properly and digesting it well. This pandemic has caused a shift in the consciousness of people. We have emerged as a stronger value based and less consumer based society. Our focus on holistic health in harmony with nature is the need of the hour.

Key Words : CoViD-19, Dental Professionals, Dental Considerations.

Introduction

The dawn of 2020 was welcomed with a lot of gusto as each new calendar year is welcomed. We all hoped and prayed that the New Year will bring peace and prosperity to all human beings. However in less than twenty days it had dawned upon the world that 2020 was a totally different year. But as professionals and intellectuals we cannot give up and should look for hitherto unknown opportunities and fully utilize them for the benefit of not only patients but also for economic growth and financial sustainability. We cannot afford to look back in despair.

There is gloom all over that the incurable CoViD -19 is taking lives of the rich and poor alike. Moreover, the World Health Organization predicts that the worst is yet to happen as economic growth melts and distress signals become alarming. We should appreciate that even after the end of the pandemic, epidemics will continue to occur.

The Public health institutions must be in a position to counter such challenges. There is a need to strengthen the public health infrastructure. It is advisable to map the facilities all over the country and first priority should be to intensify coverage, increase the bed strength, number of pathology laboratories and blood banks in remote, inaccessible areas predominantly inhabited by the

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underprivileged and marginalised sections of society. This includes old age homes, orphanages and facilities for the differently abled for betterment of an inclusive civil society.

The public health infrastructure needs to be strengthened not only in metros but also in rural areas and tribal and inaccessible areas. We need to target primary health care centers at grass root level. Therefore, a long term strategy needs to be evolved with emphasis on the economy as finance is a major constraint.

The health system capacity building includes infrastructure creation, training of personnel and research. Trained workforce i.e. medical and paramedical staff and healthcare workers need to be deployed in great numbers. It is advisable to map facilities all over the country and the first priority should be to intensify coverage, increase bed strength, number of pathological laboratories and blood banks particularly in interior areas. In emergencies, facilities cannot be created overnight and this is the most serious challenge of 2020, which should be converted into an opportunity.

New opportunities like new isolation and quarantine centers, Personal Protection Equipment, mask & gloves manufacture, special digestive food, psychiatry personnel, care givers to the elderly and the especially abled are growing fields today. The Indian national policy for older persons recommends utilization of active and skilled older persons to reduce old age dependency and enhance their self-esteem. Financial sustain ability of constantly improving standards of

living need to be borne in the mind. Diagnostics and therapeutics from the public health perspective warrants further investigation. Challenges and opportunities of e-learning in 2020 need to be addressed from the students perspective.

Waste management is one of the most important sanitary barriers to prevent dissemination of illness. Wholehearted efforts should be made to prevent environmental degradation. There is an urgent need of proper post-usual disposal, treatment of discarded plastic gears as also solid & liquid waste management to safeguard the environment. We should aim to surge ahead towards economic growth with full prevention of the disease spread in equilibrium with our environment.

CoViD-19 and Dental professionals

The novel β -CoronaVirus aka SARS-COV -2, that was first identified on December 8, 2019 in Wuhan, Hubei¹ province evolved rapidly from a cluster of cases near a wet market to a pandemic infecting 1,666,766 individuals and causing over 100,000 deaths world-wide.²

Although the pneumonia like epidemic originated in a market selling seafood and live animals in China, at present, cases have been reported in almost every county all over the globe; with Europe and North America emerging as epicenters of the outbreak. The WHO named the viral pneumonia as “Corona Virus Disease (CoViD - 19)” on 11th February 2020³ and later declared the CoViD-19 outbreak a pandemic on March 11, 2020.⁴

The SARS-COV-2 is the seventh member of the Corona Virus family that affects humans. Common clinical features on the infection include fever, malaise, cough, sore throat, shortness of breath, myalgia, fatigue, respiratory distress and abnormal chest X-ray.^{5,6} Severe cases may present with acute respiratory distress, haemoptysis, septic shock, renal failure and death.⁷

Although it is not confirmed at the moment, it is suggested that the bat *Rhinolophus affinis* from Yunnan Province, China, may be a natural host to the virus. This came to light after the genome nucleotide sequence identity between a CoronaVirus (BatCoV RaTG13) detected in the bat and 2019-nCoV was 96.2%. However, the minor variances may also suggest that there are one or more intermediate hosts between the bat and human unknown to us yet.⁸ The virus has been reported in the respiratory secretions, saliva and a small extent in conjunctival fluid⁹ and even fecal matter of known cases.¹⁰

However viral load seems to be highest in nasopharyngeal and oral secretions. Much like the other members of the CoronaVirus family, known to cause severe respiratory diseases; namely the Severe Acute Respiratory Syndrome(SARS) and Middle East Respiratory Syndrome (MERS), SARS-COV -2 is transmitted primarily through direct and indirect contact with patient's respiratory droplets and infected fomites.¹¹

Why are dental offices at risks ?

Dental healthcare professions and staff are at a consistently high risk of contracting the infection due to the face to face communication, direct contact to saliva and other body fluids and handling of infected sharp instruments in the office.¹² In addition to this, most modern dental procedures involve the use of high speed drills or ultrasonic instruments that generate a massive amount of aerosols and droplets interspersed with patient saliva and/or blood.¹³

Previous studies have shown that pathogenic organisms in these small aerosols can remain suspended in the air for long and inhalation of such droplets can spread infectious diseases.^{13,14} Infectious agents can also land on inanimate objects. Current studies indicate that SARS-CoV-2 behaves much like the other Corona Viruses and persists in aerosols for hours and on surfaces up to days (depending on the inoculum shed).¹⁵

Therefore contaminated surfaces like paperwork and equipment that is handled by multiple personnel in the healthcare setting can become potential sources for spread of CoViD-19. With all these facts in mind, the dental operatory and dental offices can harbor the infection especially given the knowledge that most individuals present mild symptoms with varying incubation periods of 1 to 14 days and that even asymptomatic infected individuals can spread the virus.^{16,17}

Dental considerations

1. Remote Screening, Consultation and Pharmacotherapy.

Considering the guidelines of individual country/ state or city, it is advisable to delay all non-essential scheduled procedures. It may be necessary to communicate to patients over telephone/video if a patient contacts for treatment over dental emergencies. It is important to keep in mind that the risk of nosocomially acquired infection to a staff member or even to healthy patients cannot be disregarded and hence symptomatic treatment with pharmacotherapy using appropriate drugs (analgesics and

antibiotics) though a valid online prescription must be the considered primary solution. It is advisable to also note the patient's medical and dental history along with any current prescriptions and known drug allergies prior to pharmacotherapy. Secondly, information regarding fever, myalgia, cough etc. other common symptoms and a brief travel history must be recorded since any cases with suspicious symptoms can be referred to appropriate CoViD-19 Testing facilities prior to a in person sitting in the dental office if necessary. CDC Guidelines for suspected cases*.

2. Handling patients in the Dental Office

Dental treatment in person in the dental office may be necessary in case of emergencies like severe dento-alveolar trauma, space infections and swellings that do not improve with pharmacotherapy alone. Every patient must be regarded as potentially infected as the incubation period of the virus can range upto 21 days and asymptomatic carriers can still shed the virus. Social distancing rules must be maintained in the waiting room of the dental office. When a person sneezes or coughs, the infected droplets can spread upto 6 feet around them. To added to this the statistics that an average person touches their face upto 23 times per hour, most instances involving the mucous membranes makes it important to educate both staff and patients regarding respiratory and hand hygiene.

A detailed case history must be recorded with special emphasis to recent travel history, presence of any flu like symptoms, any reported CoViD test results, history of isolation/quarantine or direct/close contact to anyone with such histories.

3. Dental treatment

Every patient should be considered potentially infected and treated with universal precautions. Follow standard protocol and CDC guidelines for donning, removing and discarding Personal Protective Equipment (PPE). Meticulous reinforcement of hand hygiene and proper hand washing by all staff involved is important. Only equipment that is necessary and to be used must be kept inside the dental operatory. If possible, only single use disposable dental diagnostic tools must be utilized. Procedures must be carried out in well ventilated rooms.

Since the SARS-COV-2 is susceptible to common disinfectants, a pre-procedure mouth rinse with 0.2% povidone iodine can reduce the intra-oral viral load

considerably. The patient's face area that may be touched by the operator during a procedure can be painted with surgical povidone iodine paint or iso-propyl alcohol.

All non-surgical procedures must be carried out under rubber dam as this can drastically reduce the accidental expose of the operator to any respiratory droplet incase the patient gags/ coughs etc during the procedure. Extra-oral radiographs are preferred over intra-oral peri-apical radiographs if absolutely necessary for treatment. This is primarily advised to avoid the gag/cough reflex that is sometimes elicited during intra-oral radiography.

All instruments that produce aerosols such as the high speed hand drill and ultrasonic instruments must be avoided. Use of Carisolv and other physical caries softening agents along with hand instruments is preferred. It has been suggested that a high speed vacuum along with introducing mucosa friendly disinfectants to the water jet can reduce the amount of infected aerosols produced.

The hand piece utilized must be fitted with an anti-retraction valve to prevent backflow of any infected fluids. Post procedure, all PPE and disposable equipment must be discarded separately into specialized and marked medical waste disposal bags with the gooseneck ligation prior to appropriate waste management.

Educating the dental staff and patients will allow the dentists to take informed decisions to better serve those in need of dental care in such times.

Stigmatization

The word xenophobia is derived from the Greek xenos, meaning "stranger" or "foreigner", and phobos, meaning "fear"¹⁸ is the fear or hatred of that which is perceived to be foreign or strange. It is considered as a human instinct by many which eventually outgrows with development of tolerance. However, the steps taken during a pandemic such as self-isolation or social distancing may lead to justification of the fear of unknown. When a disease is novel and the cure is uncertain this phobia may find deeper roots in a society.

Social stigma associated with infectious diseases is evident in the recent past with diseases such as HIV AIDS, SARS etc.¹⁹ Cogan et al²⁰ have stated that diseases are stigmatized under four circumstances

- When the cause of disease is considered as fault of patient

- The disease is terminal and/or degenerative
- Disease is contagious and detrimental
- Disease is physically apparent.

To add to this associating the name of a disease with a country further alienates the nationals of that particular country. In a time where we consider ourselves as global citizens this can be demeaning and discriminatory, fuelling racism in society. Hostile behaviour toward a certain nationality then becomes justified under the garb of protecting one's own community.

Depression, loneliness and other such mental disorders have crept their way into the urban lives. The novel corona disease has significantly burdened the cities as compared to villages. Social stigma of disease not only leads to psychological disorders such as feeling of exclusion, loneliness but it has grave consequences on the public health sector. It leads to suspected patients not reporting to the hospitals, hiding medical history or travel history or any such relevant history and thus exposing a massive population to the infection. It adds to the burden of health care systems as identifying the population at risk becomes a mega task. The infected individuals remain devoid of medical care as they do not seek any help and thus become more vulnerable. This increases the disease morbidity and mortality leading to increased panic in the society. This becomes a vicious cycle. In the future even after recovering from the disease, such patients may have reduced employment opportunities due to lack of acceptance in the society.²¹

Stigmatization can substantially increase the suffering of persons with the disease. Persons with or at risk for the disease may avoid seeking health care, making it much harder for public health authorities to control the disease. Professionals and volunteers working in the field may also become stigmatized, leading to higher rates of stress and burnout. Perhaps it is impossible for the health care workers themselves to launch large anti-stigma programs: what, however, they should and can do is to examine their own behaviour and activity to ensure that they do not contribute to stigmatization and consequent discrimination.²² Finally, stigmatization may generate considerable economic losses if people avoid groups or geographic areas associated with the disease. The government guidelines raise awareness amongst the general public and thus allay the fear of such diseases.²³ In a healthcare set up, counselling the patient and assuring them that adequate precautions are being taken by the doctors and the staff will help in providing treatment.

Conclusion

Scientists and doctors are fired by the scientific spirit of enquiry. They are better equipped to find solutions to problems, challenges and use innovation for an integrated approach to problem solving. We as health care professionals know that we are in for a long haul and we are seeing a big spurt in cases in cities like Mumbai. The lockdown has been reinforced in varying measures. So the situation continues to be grim though being managed effectively by the concerned authorities. It also means that the provisions of the Disaster Management Act (2005), Epidemic Diseases Act (1897), Code of Criminal Procedure (1973) and other relevant guidelines will remain in force. In the last 120 days guidelines have been prescribed by the Ministry of Home Affairs, Government of India on lockdown related issues and UNLOCK. The Ministry of Health & Family Welfare issued guidelines on the medical aspects and management and control of CoViD-19.

Planned immunity building is the need of the hour, it does not happen overnight and needs concerted efforts. Moreover, there is not much known about the toxicity or threshold exposure, therefore it is necessary to take certain blanket precautions for all, like wearing multi-layered masks and for the vulnerable population that is children below ten years of age and senior citizens above sixty years of age. A balanced diet with adequate micronutrients, sunlight, ventilation, regular exercise and good mental health are the key to boosting immunity and lung health.

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Conflicts of interest

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Role of Dentist Revisited in CoViD19 - An Overview

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Abstract

Since CoViD-19 was declared a pandemic by the World Health Organization, it was associated with a high fatality rate and high rate of transmission. The dentists were then instructed by regulatory authorities to stop providing treatment to dental patients except those who have emergency complaints. This was mainly for protection of dental healthcare personnel, their families, contacts, and their patients from the transmission of virus, and also to preserve the much-needed supplies of Personal Protective Equipment (PPE). Present scenario demands that dentists should also be updated on how this pandemic is related to their profession in order to be well oriented and prepared. This overview will address several issues concerned with the CoViD-19 pandemic that directly relate to dental practice in terms of prevention, orofacial clinical manifestations and importantly revisiting the role of dentist.

Key Words : CoViD -19, Dentist, Oral manifestations.

Introduction

Number of epidemics have affected India and other countries in the past, to name a few H1N1, H5N1, avian influenza, Ebola, SARS, Zika, Nipah and others which were successfully tackled¹. A novel human CoronaVirus initially referred to as the Wuhan CoronaVirus(CoV), currently designated as Severe Acute Respiratory Syndrome (SARS)-CoV-2, is responsible for the latest pandemic that is affecting human health and economy across the world². By imposing a nationwide lockdown, India has curtailed the spread of this virus to a certain extent; however, the total number of reported cases continued to rise³.

Following the announcement of pandemic by authorities, dental professionals were left with only option of curtailing their practices which were considered to be high risk. But now in this present scenario where living with this present conditions is need of the hour, thus dental professionals must be fully aware of infection spreading modalities, how to identify patients with this infection, and most importantly,

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self-protection considerations. At the same time, we would also like to raise an argument on importance of including dentists in the intensive care unit multiprofessional team to improve oral health in critical patients, not only CoViD-19 patients, but also, to contribute to evidence-based and decision-making in managing infectious diseases.

Discussion:

Two factors that were considered for making dental profession high risk: all procedures are obviously performed in the mouth with direct contact with saliva and the exposure to aerosols produced by rotatory instruments. Many articles have been published regarding to the spread of the virus and the role that saliva plays in its transmission and diagnosis⁴. Despite all of the precautions taken, it is almost impossible to reduce droplet and aerosol production to zero during dental procedures⁵. Therefore, it can be deduced that CoronaVirus is capable of transmitting through dental practice; this transmission can be from patients to clinic staff or other patients at the clinic⁶. Research has shown that CoronaViruses can remain on metal, glass, and plastic surfaces for several days and can actively maintain their virulence at room temperature from 2 hours up to 9 days. As surfaces in dental clinics serve as venues for droplets and

aerosol mixed with patient's saliva and/ or blood, they can effectively help spread infection. It is also reported in the literature that their activity at 50% humidity was significantly higher than 30% so a dry and clean dental environment will play a significant role in preventing transmission this infection⁶.

The novel virus:

Much is spoken about the causative organism the CoronaVirus, which are a large family of viruses that may cause severe illnesses, such as Severe Acute Respiratory Syndrome (SARS) and Middle East Respiratory Syndrome (MERS). These viruses are common in animals with the potential of transmission to humans. They are composed of an envelope, a lipid layer, and single-stranded large RNA. The name "Corona" ("crown" in latin) is attributed to the spherical shape and surface projections⁷. Four subfamilies have been identified: alpha-, beta, gamma-, and delta-CoronaViruses. Beta-CoronaViruses seem to originate from mammals, namely bats; it was found that the genome sequence of SARS-CoV-2, the virus responsible for CoViD-19, is >90% identical to a bat CoronaVirus RaTG13. In fact, bats represent a natural reservoir for a wide variety of CoronaViruses including SARS-CoV-like and MERS-CoV-like viruses. SARS-CoV-2 is closely related to the SARS-CoV virus, and it belongs to the B lineage of the beta-CoronaViruses, which are known to cause severe disease and fatalities⁷.

Identifying patients with this infection:

The most common signs and symptoms of this infection include cough, headache, sore throat, hyposmia, hypogeusia, diarrhoea, dyspnoea and pneumonia⁸. Some oral manifestations have been observed in patients with Corona Virus Disease 2019 (CoViD-19)⁸. However, there is still a question about whether these lesions are due to CoronaVirus infection or secondary manifestations resulting from the patient's systemic condition. Current research shows that CoronaVirus damage to respiratory and other organs could be related to the distribution of Angiotensin-Converting Enzyme 2 (ACE2) receptors in the human system⁹. Therefore, cells with ACE2 receptor distribution may become host cells for the virus and further cause inflammatory reactions in related organs and tissues, such as the tongue mucosa and salivary glands.

In spite of present progressive research, a safe pharmacological agent against CoViD-19 yet to be found, and the potential drugs in use are related to several adverse

reactions, including oral lesions¹⁰. Oral manifestations include opportunistic fungal infections, recurrent oral Herpes Simplex Virus (HSV-1) infection, unspecific oral ulcerations, fixed drug eruptions, dysgeusia, xerostomia linked to decreased salivary flow, gingivitis and periodontitis¹⁰. Self-protection considerations: Instructions that all practitioners in the field of dental care, including dentists, assistants, and others, should consider when treating patients or those suspected of having CoronaVirus given by CDC, ADA and DCI guidelines which are updated from time to time for our usage. A simple algorithm utilized for the protocol adopted for treatment of dental patient is presented in the [Figure I]⁶.

Management protocol:

As per the information provided by American Dental Association (ADA) a detailed protocol that helps to decide what constitutes a dental emergency [Figure II]¹¹ however, dentists should use their professional judgment in determining a patient's need for urgent or emergency care are described¹¹. After a decision has been made that the patient needs to visit the dental clinic, the next step should be to evaluate the patients for signs and symptoms of CoViD-19 infection to determine in which clinical setting they should be seen. According to Centers for Disease Control and Prevention (CDC) guidance, patients with active CoViD-19 infection should not be seen in dental settings and should be referred for emergency care where appropriate transmission-based precautions are available¹².

Role of dentist revisited:

A health care worker like dental professional whose role cannot be denied in the diagnosis and management of oral lesions in this suspected or diagnosed patient of CoViD - 19, their importance of including multiprofessional team to improve oral health in critical patients, not only CoViD-19 patients, but also in other infectious diseases needs attention and appraisal.

Oral lesions are sparsely reported in the literature which cannot differ saying that oral lesions are not reported. The reasons for absence of sufficient scientific evidence reporting oral lesions may be due to the confinement situation, lack of access to test therefore diagnosis confirmation, and the fact that most dentists, as a result of the high risk contagion, have been out of the health system. Nevertheless, telemedicine has been a useful tool to establish triage and primary diagnosis avoiding personal attendance during the peak of infection.

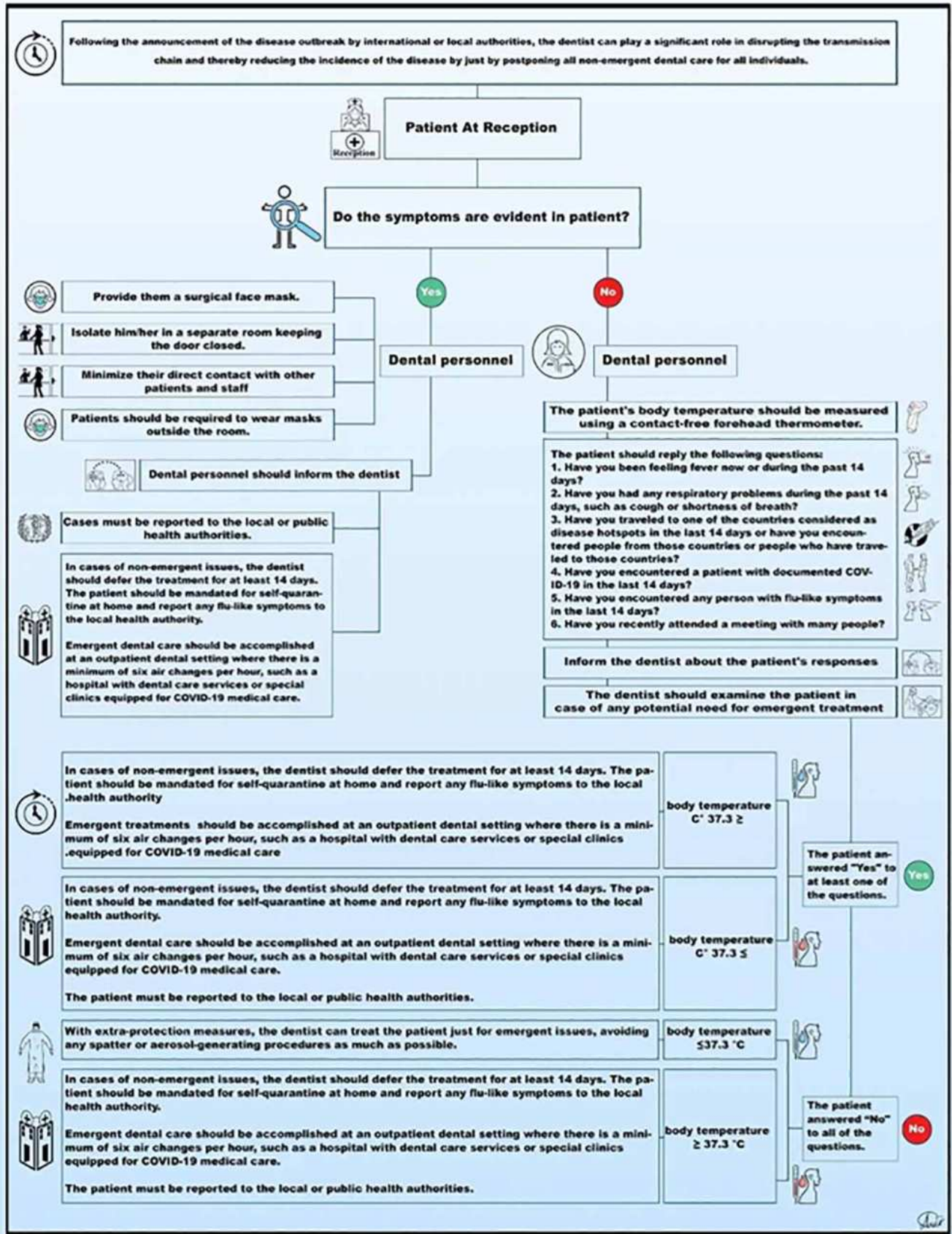


FIGURE I : Protocol for treatment of dental patient during CoViD 19 pandemic.⁶

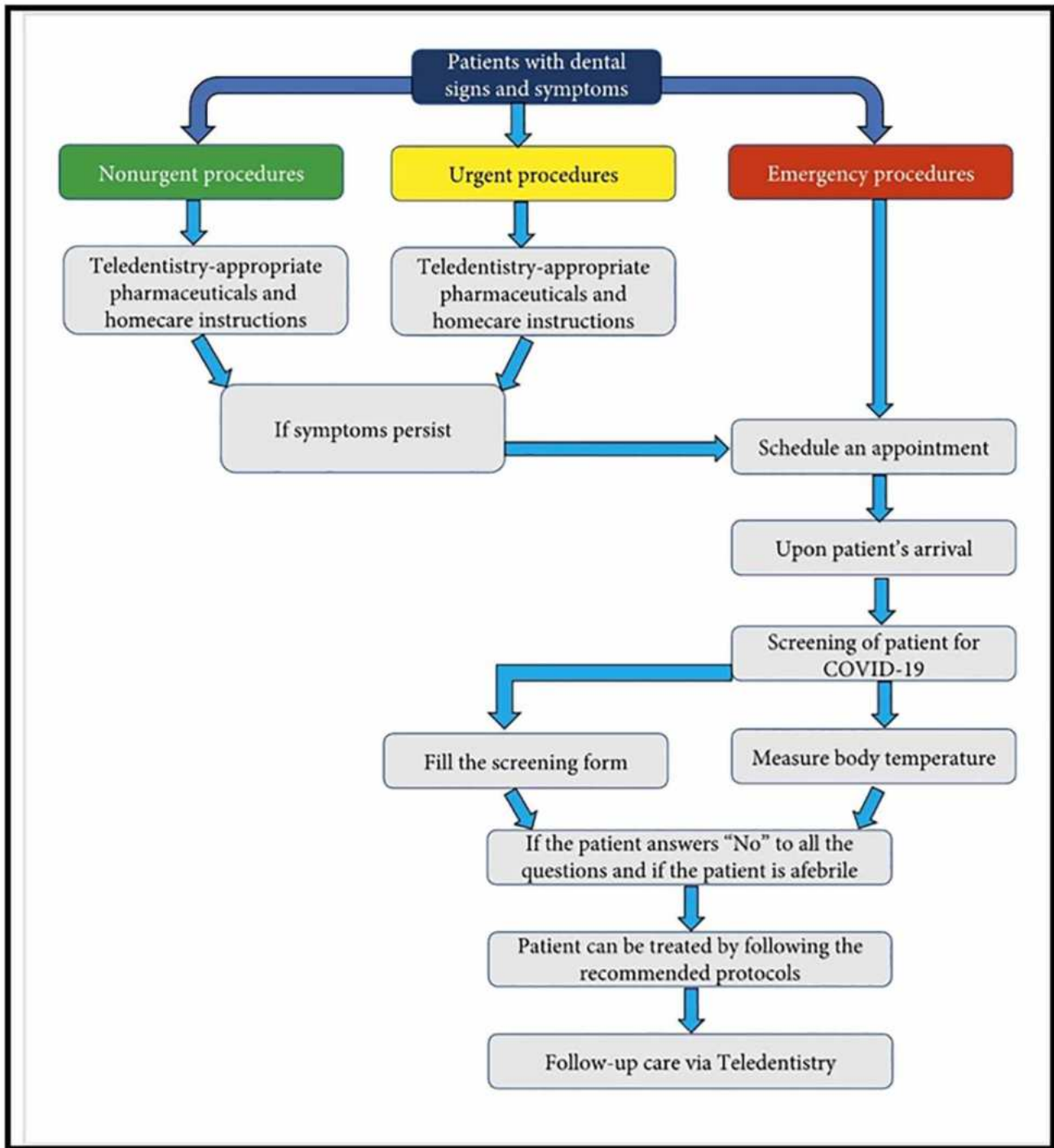


FIGURE II : Management of dental patient.¹¹

It is important to consider that an exhaustive intraoral examination should be performed in patients that were diagnosed with CoViD-19 in order to find any oral manifestation that might be related. Dentists should be aware of this symptom since they may encounter patients with taste abnormalities in the form of dysgeusia, ulcerations and others. This is particularly important because these symptoms may precede the onset of respiratory diagnostic

manifestations of the disease¹³. However, reporting of this symptom should be interpreted with caution which needs expertise in this field.

Conclusion:

This overview opines about dentist as health care worker shares an equal responsibility and has abilities which should be explored and make us able in dealing with this difficult situation, pandemic of CoViD 19.

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Conflicts of interest

There are no conflicts of interest

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Oral Health Care During The CoViD-19 Outbreak- An Overview

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Abstract

CoronaVirus disease 2019, also called CoViD-19, is the largest infectious disease to rapidly develop worldwide. This situation has affected dental practices tremendously. The aim of this review is to understand the role of the oral cavity in the possible transmission of disease, precautions that can be taken to prevent cross transmission through dental offices and the role of dentists in exploring the symptoms of the disease.

Key Words : CoViD-19, Dentistry, Pandemic.

Introduction

Corona Virus Disease 2019 (CoViD-19), first reported in China in December 2019 is caused by the Severe Acute Respiratory Syndrome CoronaVirus 2 (SARS-CoV-2) and has currently spread rapidly across the globe. Rapid transmission of the disease and exponential increase in number of confirmed cases—coupled with evolving but limited information about the transmission, prevention, diagnosis, treatment, and prognosis of the disease have caused much anxiety and confusion in the dental community and affected the delivery of dental procedures.

The aim of this article is to provide a timely evidence based review about the impact of CoViD-19 on the dental care and the role of dentists in identifying potential cases.

Basic structure of SARS-CoV-2

SARS-CoV-2 is an enveloped positive stranded RNA virus, which is a betaCoronaVirus within the Nidovirales order of viruses.¹ The host-derived membrane is studded with glycoprotein spikes and surrounds the RNA genome. The spike protein projects through the viral envelope and mediates ACE2 receptor binding and fusion with the host cell membrane.²

Transmission of Infection

SARS-CoV-2 has been found to be transmitted from bat to human via an intermediate host, such as a pangolin³ in a wet market in Wuhan, China. Human-to-human transmission is most frequently through direct or indirect contact with virus-laden respiratory droplets discharged from infected individuals while coughing and sneezing.⁴

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SARS-CoV-2 transmission may also occur indirectly, when a person comes into contact with fomites, such as the hand or clothes of an infected patient or the door handles, counter surfaces, dining utensils, and other objects touched, used, or soiled by respiratory droplets from an infected patient. It is believed that SARS-CoV-2 cannot penetrate the keratin layer of intact human skin but may enter human body through mucosal surfaces when contaminated hands touch the mouth, noses, and eyes.⁵

Role of oral cavity in transmission of infection-

High viral loads have been found in the oropharynx of infected patients, as well as in the asymptomatic subjects. This could suggest that the oral cavity may directly play a role in the potential transmission of SARS-CoV-2. The SARS-CoV-2 cellular entry receptor ACE2 was found in various oral mucosal tissues, especially in the tongue and floor of the mouth.⁶ ACE2-positive cells were also detected in buccal and gingival epithelial cells. The presence of ACE2 receptors in oral tissues suggests that it is biologically plausible for the oral cavity to be the initial site of entry for SARS-CoV-2.⁵

Loss of taste (ageusia) has been seen as an early symptom of the disease even before self reported fever. Loss of taste as an early symptom of CoViD-19 before fever and other symptoms occur lends support to the hypothesis that oral cavity, particularly tongue mucosa, might be an initial site of infection by SARS-CoV-2.

Protection of patients and staff in dental offices

Since the oral cavity plays an important role in the transmission of the disease, dental professionals and their staff are at risk of inoculation of themselves, their dental assistants, other office staff members, and reinoculation of the patients.

Since dental treatments generate aerosols, fitted N95 respirators, full face shields, and basic clinical PPE (including eye protection) are required, and approved disinfection procedures should be performed immediately after every procedure. Pre procedure mouthrinses are also important in reducing the viral load, though they may not completely eliminate the viral infection. Patients should be instructed to use 1% povidone-iodine or 1.5% hydrogen peroxide mouth rinses for 1 min before the procedure, and a rubber dam should be used to reduce saliva contamination and aerosol generation during the procedure. After the procedure, all exposed surfaces of the operatory, including chairs, desks, cabinets, and door handles, should be cleaned with 0.1% sodium hypochlorite. Though these steps are all helpful in reducing the risks of nosocomial infections in dental offices, adequate hand washing with soap between patients and after touching any nonsterile objects remains the most effective way to prevent the transmission of CoViD-19.⁵

All biomedical waste pertaining to patient care should be carefully disposed from time to time through an authorized biomedical disposal agency.⁷ Mopping the floor with 1% sodium hypochlorite and disinfecting waterlines with 0.01% sodium hypochlorite can help reduce the risk of cross infection.

Future Implications

Dental professionals should take this opportunity to develop new ways to detect the presence of the virus through salivary tests. It is also important to increase research efforts in aerosol control in dental offices, learn more about the use of respirators and N95 masks and concepts about fumigation and negative pressure rooms.

The dental fraternity could play an important role in identifying asymptomatic cases and this could help isolating them from the others and prevent the massive spread of infection.

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Conflicts of interest

There are no conflicts of interest.

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A Stitch in Time Saves Nine

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Abstract

The novel CoronaVirus, CoViD-19 (SARS-CoV-2) has recently created a worldwide pandemic. With a death rate that is accelerating, the disease has been declared a global emergency. According to the OSHA, Dental Healthcare Providers (DHCPs) are classified as 'very high risk'. For this reason, the Personal Protective Equipment (PPE) requirements for DHCPs have been modified to include the wearing of impermeable gowns, goggles or face shields and N95 or better respirators in addition to standard precautions. There is evidence that the use of PPE does reduce rates of disease transmission and protects staff. It is essential that staff understands the purpose of PPE and its role as part of a system to reduce disease transmission from patients to staff and other patients. It is equally important that staff uses it appropriately to preserve what may be limited stocks, to ensure there is sufficient supply for necessary use throughout the epidemic surge.

Key Words: CoViD-19, PPE, Hand Hygiene, N-95, Dentistry in CoViD.

Introduction

The novel CoronaVirus, CoViD-19 (SARS-CoV-2) has recently created a worldwide pandemic. With a death rate that is accelerating, the disease has been declared a global emergency.¹ CoViD-19 is predominantly caused by contact or droplet transmission attributed to relatively large respiratory particles which are subject to gravitational forces and travel up to approximately one metre away from the patient. Airborne transmission may occur if patient's respiratory activity or medical procedures generate respiratory aerosols. Personal Protective Equipment is an important component, but it constitutes only one part of a system protecting staff and other patients from CoViD-19 cross-infection. Appropriate use of protective gear significantly reduces risk of viral transmission. Personal Protective Equipment should logically be matched to the potential mode of viral transmission occurring during patient care – contact, droplet, or airborne. The initial viral load is thought to be a predictor of severity as is the case with influenza.² There is a poorer prognosis in patient with CoViD-19 who have a prolonged virus shedding.³ Healthcare professionals are at a higher risk of catching the disease due to their exposure to higher viral

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loads.⁴ It is also known that if the virus is aerosolised then it becomes more infectious to healthcare staff.⁵ If a healthcare worker is exposed to a higher viral load, especially in aerosolised rather than droplet form, then their outcome may be significantly worse. Airborne transmission occurs when smaller respiratory particles (generally <5 µm) circulate in the air for prolonged periods. Viral particles are absorbed via the respiratory mucosa and potentially across the conjunctivae. Particles smaller than 10 µm are most likely to penetrate deeply into the lung and cause infection.⁶

In this context, the Occupational Safety and Health Administration (OSHA) within the Department of Labour, USA, has developed an occupational risk pyramid which defines the risk of healthcare providers based on exposure. According to the OSHA, Dental Healthcare Providers (DHCPs) are classified as 'very high risk'. For this reason, the Personal Protective Equipment (PPE) requirements for DHCPs have been modified to include the wearing of impermeable gowns, goggles or face shields and N95 or better respirators in addition to standard precautions.

Infection control strategies in dental set-ups:

Dentists should employ the following strategies to prevent the contraction and further spread of CoViD-19.

1) Screening of patients-

Evaluation of the patient for any CoViD-19 associated symptoms and signs is an important practice to be carried out by all the dentists before starting any dental procedure. It is

essential to maintain a record of all the people who visited the dental clinic and dental institution. Dental institutions and hospitals should have separate room / corners for screening of suspected cases of CoViD-19.

The following questionnaire can be used in dental clinics and institutions for early recognition of the CoViD-19 affected patients.

- 1) Do you have fever and/or chills? Yes/No
- 2) Are you having cough and/or nasal congestion? Yes/No
- 3) Are you experiencing fatigue or muscular pain? Yes/No
- 4) Are you experiencing shortness of breath? Yes/No
- 5) Are you experiencing a sore throat? Yes/No
- 6) Are you experiencing headaches? Yes/No
- 7) Are you experiencing nausea or vomiting? Yes/No
- 8) Are you having diarrhoea? Yes/No
- 9) Have you travelled outside India lately? Yes/No
If yes, where.....
- 10) Have you travelled within India lately? Yes/No
If yes, where.....
- 11) Have you recently participated in any gathering, meetings, or had close contact with many unacquainted people? Yes/No
- 12) Did you come in contact with people who have recently travelled abroad or to the cities where CoViD-19 suspects were found? Yes/No
- 13) Did you come in contact with people who have / had flu like symptoms in past 2-3 weeks? Yes/No
- 14) Have you got yourself checked/screened for corona virus disease? Yes/No
- 15) Were you kept in quarantine in the recent past? Yes/No
If yes, then was it self-isolation or in the hospital?.....

If the patient replies “yes” to any one or more of the above mentioned questions he/she should be provided with a medical mask(triple layer) ; if not having ; and should be asked to cover his/her face with mask and should immediately be referred to a nearby designated hospital which is well equipped with the isolation facilities.

Following proper hand hygiene

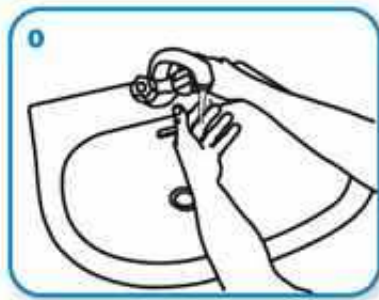
Maintenance of hand hygiene is of great importance in protection techniques. All the members of the dental team must adapt the habit of following the hand hygiene.

Technique of hand washing

- Rings, bracelets and watches, ideally should be not be worn and should be removed before starting the surgical hand scrub.
- Debris from underneath of the fingernails should also be removed by using a nail cleaner under running water.
- While decontaminating hands with an alcohol-based hand rub, the product has to be applied upon palm of one hand and then both the hands have to be rubbed together, covering all surfaces of hands and fingers, until the hands are dry. Manufacturer's recommendations should be followed regarding the volume of product to be use.
- When washing hands with soap and water, hands should first be made wet with water. Then the handwashing product should be applied onto the palms as per the recommendations of the manufacturer. Later, hands should be rubbed together vigorously for at least 20 seconds, ensuring that all the surfaces of the hands and fingers are covered with lather. After final rinsing of hands with water, hands should be dried thoroughly with a disposable towel. A towel/tissue should be used to turn off the faucet.
- Use of hot water for hand washing should be avoided, because repeated exposure to hot water might increase the risk of dermatitis.
- Liquid, bar or powdered forms of plain soap are acceptable when washing hands with a non-antimicrobial soap and water. It is advisable to use soap racks when using bar soaps.
- Multiple-use cloth towels of the roll or hanging type are not recommended for use in health-care settings. Proper technique of hand sanitization is showed in Fig I.

We should note that the use of hand-wash and sanitizer should be judicious as excessive use can cause skin problems like redness, roughness , itching etc.

Figure I: Hand hygiene



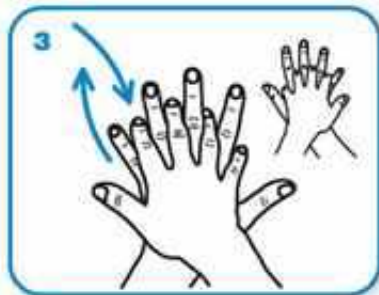
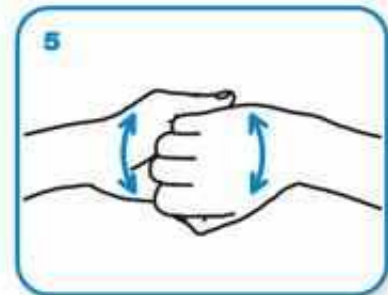
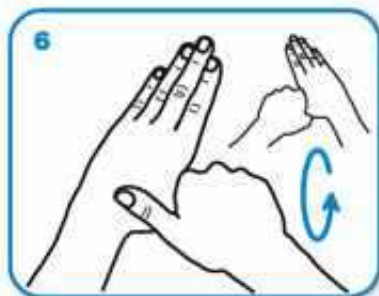
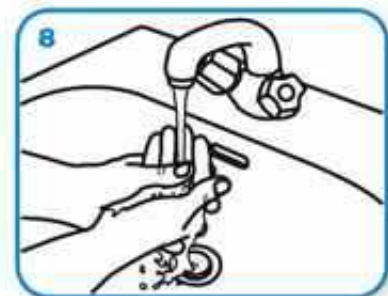
Wet hands with water



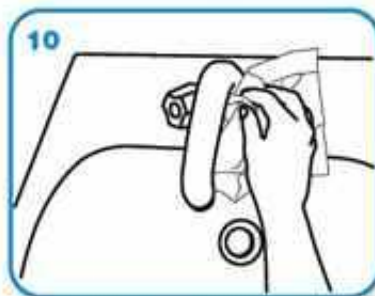
apply enough soap to cover all hand surfaces.



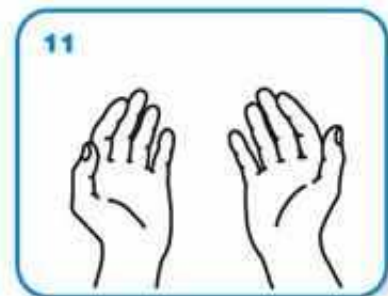
Rub hands palm to palm

right palm over left dorsum
with interlaced fingers
and vice versapalm to palm with fingers
interlacedbacks of fingers to opposing
palms with fingers interlockedrotational rubbing of left thumb
clasped in right palm
and vice versarotational rubbing, backwards
and forwards with clasped
fingers of right hand in left
palm and vice versa.

Rinse hands with water

dry thoroughly with a single
use towel

use towel to turn off faucet



...and your hands are safe.

Source- https://www.who.int/gpsc/clean_hands_protection/en/

Personal Protective Equipment

Use of face mask or respirator –

There is a range of respirators including full-and half-mask types. The common types of respirators that are used in healthcare settings include half-mask Filtering Facepiece Respirators (FFRs) and Powered Air-Purifying Respirators (PAPRs). Since all dental guidelines recommend using FFRs, they are discussed in greater detail.⁷ The most widely used FFRs are the N95 respirators, which are disposable Filtering Facepiece Respirators (FFRs) that tightly fit to provide optimum face seal and have a 95% or above particle filtering efficiency for a median particle size of 0.3 μm .⁸

Since the outbreak, there is a lack of data comparing the efficacy of surgical mask versus respirators in mitigating the spread of CoViD-19 virus; however, there is an abundance of published data comparing the two against the influenza virus and SARS.⁹⁻¹⁰

Wen and colleagues tested the performance of various respirators and surgical masks against viral aerosols and demonstrated that the protection factor of N95 was thirty times greater than normal surgical masks.¹¹ Likewise, the superiority of N95 over surgical masks has also been demonstrated against SARS in a number of case-control studies.⁹⁻¹⁰

The prefix N is a description of the filter material (N = oil nonresistant, R = some resistance to oil and P = oil proof) and suffix 95 describes its protective properties (95 would filter 95% particles whilst 99 filters 99% particles).¹¹

The respirators mentioned below according to 3M™ are equivalent in performance to N95 (United States NIOSH-42CFR84) and may be considered as viable alternatives to N95.

- FFP2 (Europe EN 149-2001)
- KN95 (China GB2626-2006)
- P2 Particulate respirator (1716:2012; 3M™ Australia/New Zealand)
- Korea 1st class (Korea KMOEL-2017-64)
- DS (Japan JMHLW-Notification 214, 2018)

Levels of PPE

Personal Protective Equipment for droplet and contact precautions includes a surgical mask, eye protection (goggles or procedure mask with face-shield), an Association for the Advancement of Medical Instrumentation (AAMI) level-2

gown, and gloves that overlap the gown sleeve enough to prevent wrist exposure during movement.¹²

Personal protective equipment for airborne, droplet, and contact precautions consist of head covering, eye protection, N95 respirator, an AAMI level-2 (or higher) gown, and a single pair of gloves overlapping the gown sleeve enough that movement does not expose the wrists.¹²

For AGMP (Aerosol Generating Medical Procedures), in addition to the airborne, droplet, and contact precautions above, a neck covering is also recommend, a gown with AAMI level-2 (or higher), and two sets of gloves that overlap the gown sleeve enough to prevent wrist exposure during movement.

A Cochrane review of PPE by Verbeek JH et, al. in 2019 stated that double gloving was associated with less contamination than single gloving (relative risk, 0.36; 95% confidence interval, 0.16 to 0.78).¹² It also allows the healthcare provider performing airway management to doff a heavily soiled pair of gloves without breaching their overall PPE.

How to Put On (Don) PPE Gear

More than one donning method may be acceptable. Training and practice using your healthcare facility's procedure is critical as there is a high chance of spread of infection especially during doffing if strict protocol is not followed. Below is one example of donning.

1. **Identify and gather the proper PPE to don.**
Ensure choice of gown size is correct (based on training).
2. **Perform hand hygiene using hand sanitizer.**
3. **Put on isolation gown.** Tie all of the ties on the gown. Assistance may be needed by other healthcare personnel.
4. **Put on NIOSH-approved N95 Filtering Facepiece Respirator or Higher (use a facemask if a respirator is not available).** If the respirator has a nosepiece, it should be fitted to the nose with both hands, not bent or tented. Do not pinch the nosepiece with one hand. Respirator/facemask should be extended under chin. Both your mouth and nose should be protected. Do not wear respirator/facemask under your chin or store in scrubs pocket between patients.*

- **Respirator:** Respirator straps should be placed on crown of head (top strap) and base of neck (bottom strap). Perform a user seal check each time you put on the respirator.
 - **Facemask:** Mask ties should be secured on crown of head (top tie) and base of neck (bottom tie). If mask has loops, hook them appropriately around your ears.
5. **Put on face shield or goggles.** When wearing an N95 respirator or half facepiece elastomeric respirator, select the proper eye protection to ensure that the respirator does not interfere with the correct positioning of the eye protection, and the eye protection does not affect the fit or seal of the respirator. Face shields provide full face coverage. Goggles also provide excellent protection for eyes, but fogging is common.
 6. **Put on gloves.** Gloves should cover the cuff (wrist) of gown.
 7. **Healthcare personnel may now enter patient room.**

How to Take Off (Doff) PPE Gear

More than one doffing method may be acceptable. Training and practice using your healthcare facility's procedure is critical. Below is one example of doffing.

1. **Remove gloves.** Ensure glove removal does not cause additional contamination of hands. Gloves can be removed using more than one technique (e.g., glove-in-glove or bird beak).
2. **Remove gown.** Untie all ties (or unsnap all buttons). Some gown ties can be broken rather than untied. Do so in gentle manner, avoiding a forceful movement. Reach up to the shoulders and carefully pull gown down and away from the body. Rolling the gown down is an acceptable approach. Dispose in trash receptacle. *
3. **Healthcare personnel may now exit patient room.**
4. **Perform hand hygiene.**
5. **Remove face shield or goggles.** Carefully remove face shield or goggles by grabbing the strap and pulling upwards and away from head. Do not touch the front of face shield or goggles.

6. **Remove and discard respirator (or facemask if used instead of respirator).** Do not touch the front of the respirator or facemask.*
 - **Respirator:** Remove the bottom strap by touching only the strap and bring it carefully over the head. Grasp the top strap and bring it carefully over the head, and then pull the respirator away from the face without touching the front of the respirator.
 - **Facemask:** Carefully untie (or unhook from the ears) and pull away from face without touching the front.

Perform hand hygiene after removing the respirator/facemask and before putting it on again if your workplace is practicing reuse.

Conclusion

To protect Health Care Workers caring for patients, health care facilities should continue to follow CDC and local infection control and PPE guidance. Early recognition and prompt isolation, including source control, for patients with possible infection can help minimize unprotected and high-risk HCW exposures. There is evidence that the use of PPE does reduce rates of disease transmission and protects staff. It is essential that staff understand the purpose of PPE and its role as part of a system to reduce disease transmission from patients to staff and other patients. It is equally important that staff use it appropriately to preserve what may be limited stocks to ensure there is sufficient supply for necessary use throughout the epidemic surge.

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Saliva: Its Role In CoViD-19 Diagnosis And Preventive Measures

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Abstract

The oral cavity is a moist fluid environment due to the presence of saliva. Saliva has a vast variety of roles in the oral cavity, it also contains a variety of biomarkers, microorganisms and enzymes which can be used as diagnostic tools for detection of diseases in the body. Most of the dental procedures are directly or indirectly related to saliva and aerosol generation. There have been many researches which proves that saliva has a vast role in the virulence and transmission of SARS-CoV-2. Thus, the aim of this review was to evaluate the role of saliva as a diagnostic tool and the measures for prevention of transmission of SARS-CoV-2.

Key Words : Saliva, SARS-CoV-2, CoViD-19, Diagnosis, Prevention.

Introduction

Human saliva is a secretory body fluid that is produced by the salivary glands. Saliva consists mainly of water (94–99%) with organic molecules accounting for nearly 0.5% and inorganic molecules accounting for 0.2%.¹ It plays an important role in digesting food, lubricating oral mucosa, cleaning and preserving the oral cavity, and influencing the homeostasis of the oral cavity. A normal adult usually generates about 600 ml of saliva every day.² Saliva offers an ecological niche for the colonization and development of oral microorganisms but it also prevents the overgrowth of specific pathogens in order to preserve the homeostasis of the oral cavity.

It may also acts as a medium for transmission of various pathogenic microorganisms.³ Viruses responsible for diseases such as hepatitis viruses, herpes virus infections (e.g., with Herpes simplex types 1 and 2, Epstein-Barr virus, Cytomegalovirus, and Kaposi syndrome herpes virus), and papillomaviruses can be conveyed by salivary transmission—as can potentially other viruses present in saliva such as Ebola and Zika viruses.⁴

An emergent pneumonia outbreak originated in Wuhan City, within the late December 2019.⁵ The infectious agent of

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this viral pneumonia was finally identified as a novel CoronaVirus (2019-nCoV), the seventh member of the family of CoronaViruses that infect humans.⁶ The novel CoronaVirus belongs to a family of single-stranded RNA viruses known as Coronaviridae.⁷ This family of viruses are known to be zoonotic or transmitted from animals to humans. These include Severe Acute Respiratory Syndrome CoronaVirus (SARS-CoV), first identified in 2002, and the Middle East Respiratory Syndrome CoronaVirus (MERS-CoV), first identified in 2012.⁸ . On 11th February 2020, WHO named the novel viral pneumonia as “Corona Virus Disease (CoViD-19)”, while the International Committee on Taxonomy of Viruses (ICTV) suggested naming this novel CoronaVirus as “SARS-CoV-2” counting on the phylogenetic and taxonomic analysis of this novel CoronaVirus.¹⁰ This review explores the potential role of saliva in the CoViD-19 pandemic, as both a mechanism for the spread of the disease and a readily accessible diagnostic tool for detecting the presence of the virus. Also it emphasizes on the precautionary measures to be taken in the dental practice specifically related to aerosol and direct salivary contamination.

Saliva as a diagnostic and informative fluid

The role of saliva is at par with that of blood. Like blood, saliva also plays a vital role in diagnosis of health and the disease. Over the past decade, considerable progress has been made in identifying useful biomarkers present in saliva, as well as identifying oral buccal epithelial cells from which DNA can be extracted for human genomic studies and diagnostics. Saliva is also informative for biomarkers which indicate for viral infections such as measles, mumps, rubella, hepatitis A and B. Direct antigen detection is also available for influenza A and B, streptococcus group A (N-acetylglucosamine), salivary estradiol and several breast cancer biomarkers. In addition to hundreds of specific species of oral bacteria as well as yeast cells, several hormones and narcotics including aldosterone, cortisol, estrogen, insulin, melatonin, progesterone, testosterone, carbamazepine, lithium, methadone, phenytoin, antipyrine, caffeine, cocaine, methamphetamine, marijuana and various opiates are identified and measured in saliva. And the list continues with the addition of informative messenger RNAs. Further miniature devices are being developed for salivary diagnostics using microcapillary electrophoresis and other nanobiotechnology advances.¹⁰

Mechanism of disease transmission through salivary droplets

The size of droplets, along with the speed of airflow, can determine how far and long they can reach. Huge droplets travelling within a short distance or touching infected surfaces spread majority of transmissible respiratory infections. Huge droplets with a diameter of more than 60 µm tend to settle rapidly on the surface, thereby reducing the risk of transmission to individuals in close proximity to the source of the saliva droplet. Small droplets with a diameter of less than or equal to 60 µm can cause short range transmission for individuals with distance less than one meter. In a suitable environment, small droplets are likely to fade into droplet nuclei with a diameter less than 10 µm, and then become capable of transmission of long-range aerosols.¹¹ Thus, the science behind maintaining social distance is that the larger particles from cough droplets are transmitted for less than 1 meter and do not remain suspended in air.¹²

When speaking, coughing, sneezing, or even breathing, saliva droplets are produced and shaped as particles in a combination of moisture and droplet nuclei of microorganisms. The quantity, distance, and size of saliva

droplets vary among individuals, indicating that the infectious intensity and transmission route of saliva droplets differ when the same pathogen is contracted. For a susceptible host to develop infectious droplets of saliva, they can enter the mouth, eyes, or be inhaled directly into the lungs. Thus, the SARS-CoV-2 contamination is minimized to a degree by wearing surgical masks and protective eyewear or face shield in vulnerable healthcare workers.¹³

SARS-CoV-2 in salivary gland

It was confirmed that SARS-CoV-2 reaches the cell in the same route as SARS CoronaVirus, i.e. via the cell receptor ACE 2 (Angiotensin Converting Enzyme 2).¹⁴ SARS-CoV-2 can effectively use ACE 2 as a receptor to invade cells, which can facilitate transmission from human to human.¹⁵ ACE 2 + cells have been shown to be abundant in the respiratory tract as well as cells that are morphologically compatible with the epithelium of the salivary gland duct in human mouth. ACE 2 + epithelial cells of salivary gland ducts have shown to be an early target of SARS-CoV infection and same might be the situation with SARS-CoV-2 infection, although no research has been reported so far.¹⁶ Chen et al. analysed saliva directly from the salivary gland opening of infected person and found SARS-CoV nucleic acid, indicating SARS-CoV contamination of salivary glands.¹⁷

Diagnostic potential of saliva for SARS-COV-2

The detection of 2019-nCoV nucleic acid from the throat or nasal swab of patients is considered as a confirmatory test.¹⁸ Throat swabs are relatively invasive, induce coughing and occasionally cause bleeding, which may increase the risk of infection among healthcare workers. With the characteristic of being non-invasive and fewer hazard to healthcare workers, collecting saliva specimen has the benefits of being more acceptable to patients and more secure for healthcare workers for CoronaVirus diagnosis. To date, three approaches for saliva collection have been identified - coughing out, saliva swabs and collection of saliva directly from the salivary gland duct.¹⁹ Oral swabs are likely to be useful in early detection. By extracting oral swabs and checking RNA among 15 CoViD-19 patients, Zhang et al. found that half of them (50%) were positive for 2019- nCoV RNA in oral swabs, four (26.7%) had positive anal swabs, six (40%) had positive blood test and three (20%) had positive serum tests.²⁰

The presence of SARS-CoV-2 in the saliva of infected patients also bears implications for a high potential of

transmission in the dental operator, and underscores the need for awareness and use of effective Personnel Protective Equipment practices.

Precautions for aerosol and salivary contamination in dentistry

Aerosols are suspension of particles in air, liquid, or solid, within size ranging from 0.001 to 100 μm .²¹ Splatter is a mixture of air, water and/or solid substances (50 μm to several millimetres diameter).²² Occupational Safety and Health Act (OSHA) has categorized dentistry as a very high exposure risk job with high potential for exposure to CoViD- 19 during specific aerosol-generating procedures.²³ Aerosol transmission is identified in spread of tuberculosis, measles, chickenpox, SARS-CoV, influenza virus and adenovirus.²⁴ It is possible that the 2019-nCoV will spread through airborne transmission if aerosol generating procedures in dental practice is implemented.²⁴

Hence, other than Personal Protective Equipments (PPE), face mask and eye protection, certain precautionary measures need to be implicated in the dental practice for the prevention of transmission through aerosol and direct salivary contamination.

Preprocedural mouth rinse

Preoperative antimicrobial mouth rinse could minimise the number of microbes in the oral cavity.²⁵ Previous studies have shown that SARS-CoV and MERS-CoV were highly susceptible to povidone mouth rinse.²⁶ Since 2019-nCoV is vulnerable to oxidation, it is recommended to use preprocedural mouth rinse containing oxidative agents such as 1% hydrogen peroxide or 0.2% povidone-iodine to reduce the salivary load of oral microbes, including potential 2019-nCoV carriage. Enveloped viruses such as herpes simplex virus 1 and 2, human immunodeficiency virus, cytomegalovirus, influenza A, parainfluenza and hepatitis are vulnerable to virucidal effect of chlorhexidine.^{27,28,29,30}

It has been recommended that the patient performs 1 minute mouth rinse with 0.2% to 1% povidone, 0.05% to 0.1% cetylpyridinium chloride or 1% hydrogen peroxide before the dental procedure.³¹

Rubber dam isolation

It has been stated that the use of rubber dam could minimize airborne particles by 70% in ~3-foot diameter of the operating field.³² When rubber dam is applied during the

procedure, extra high-volume suction for aerosol and spatter should be used along with regular suction.³³ It is also important to enforce the implementation of a complete four-hand operation. If rubber dam isolation is not feasible, manual devices, such as Carisolv and hand scaler, are recommended for caries removal and periodontal scaling to minimize the generation of aerosol as much as possible.¹⁶

USE OF DISPOSABLE (SINGLE-USE) DEVICES such as mouth mirror, syringes and blood pressure cuff to prevent cross contamination is recommended.³⁴

Radiographs

The most common radiographic technique in dental imaging is intraoral x-ray examination; however, it can stimulate saliva secretion and coughing.³⁵ Extra oral dental x-rays, such as panoramic radiography and cone beam CT, are therefore suitable alternatives during the CoViD-19 outbreak. Sensors should be double-barriered when intraoral imaging is required to prevent perforation and cross contamination.⁴¹

Anti-retraction handpiece

Aspiration and expulsion of debris and fluids generated during the dental procedure might occur with the use of high-speed dental handpiece without anti-retraction valves. A study found that the anti-retraction high-speed dental handpiece would substantially reduce the backflow of oral bacteria and HBV into the tubes of the handpiece and dental unit as compared with the handpiece without anti-retraction feature.³⁷ Therefore, there should be prohibition of the use of dental handpieces without anti-retraction function during the epidemic period of CoViD-19. To reduce the risk of developing toxic aerosols, dentists should eliminate the use of ultrasonic devices, high speed handpieces and 3-way syringes.

Additionally, dental teams should be familiar with treatment options that minimise or eliminate AGPs. Micromotor handpieces can be used which can be a little time consuming but will inhibit the formation of aerosols. Also if possible, caries excavation should be performed with manual excavating instruments.

Negative-pressure treatment rooms/ Airborne Infection Isolation Rooms (AIIRs)

It is worth noting that patients with suspected or confirmed CoViD-19 infection should ideally be treated in

negative-pressure rooms or AIIRs and not in a routine dental practice setting.³⁸ Alternatively, patients could also be treated in an isolated and well-ventilated rooms. Ventilation of the operating room should be adequate, i.e. natural ventilation with air flow of at least 160 L / s per patient or in rooms with negative pressure with at least 12 air changes per hour.³⁹ High Efficiency Particulate Air (HEPA), an extra oral evacuation device can be used effectively to monitor the generated aerosol.⁴⁰

Sterilization and disinfection of all the surfaces that come in direct contact with the saliva of the patient

Disinfection of all surfaces that may be touched by the patients should be performed with sodium hypochlorite 0.1% or 70% isopropyl alcohol.³¹

Sterilization of handpiece

Studies have shown that viral DNA and viable viruses can possibly be retained inside high speed dental handpieces and scaler devices. It is challenging to clean the internal area of the handpiece because of limited access. The proposed disinfection approach is to discharge 20-30 seconds of air and water after each patient, to flush out infected material that may have reached the turbine and the air and water tubes. The manufacturer's instruction for cleaning, lubrication and sterilization should be performed.⁴¹

Sterilization of dental burs

Dental burs are used for various procedures in clinical dentistry, some involving caries excavation, access cavity preparation and crown preparation.⁴² Burs can become heavily contaminated with necrotic tissue, saliva, blood and potential pathogens during these procedures and can be a possible vehicle for cross-infection.^{43, 44, 45} Burs are unique because of their complex architecture which makes it difficult to pre-clean and subsequently sterilize. Inadequate sterilization causes cross infection among the patient and transmission of disease between the patient and dental personnel.^{43,46} Under suitable conditions, steam under pressure (Autoclave) can kill all microorganisms including bacterial spores and is considered to be relatively the best method for decontaminating dental burs.⁴² In the midst of CoViD-19, it is necessary for considering new bur for each patient.

Sterilization of endodontic instruments

One of the fundamental phases of sterilization process is the cleaning of coarse debris consisting of necrotic and protein material, blood residue and dentinal mud that is

deposited on the endodontic instrument.⁴⁷ A study conducted by Popovic et al. compared different methods of disinfection and cleansing of endodontic instruments and reported the use of ultrasonic tray as a method giving efficient results.⁴⁸ Most common sterilization techniques used in the last thirty years have been autoclaving, glass-bead sterilization for 45 seconds at 240°C, UV light at 240–280 nm, laser sterilization, and exposure to 2% glutaraldehyde. Steam sterilization in an autoclave does not alter the mechanical and physical properties of most nickel titanium instruments and is considered the most effective method for the sterilization of endodontic instruments.⁴⁷

Disinfection of impressions and prosthesis

All dental impressions of only emergency work should be sent to the laboratory after thorough disinfection in the dental office before dispatch.

Proposed disinfection protocol (According to ISOI Guidelines) is-

- 1] Thoroughly wash the impression in running water after removing it from the mouth. [For all materials including alginates, polyethers and vinyl polysiloxanes.]
- 2] Gently scrub with a camel hair brush and liquid detergent under running water. [For all materials including alginates, polyethers and vinyl polysiloxanes.]
- 3] Immerse the impression in a solution of 5.25% Sodium Hypochlorite with 1:10 dilution. The solution should be changed daily. [Only for vinyl polysiloxanes.]
- 4] Alginates and Polyethers are generally sprayed with an intermediary level disinfectant for required time.

Hydrophobic materials should be immersed in disinfectant solution for ten minutes. There shall be minimal distortion. Hydrophilic silicones and alginates should be sprayed to avoid dimensional changes.

- 5] Packet containing prosthesis received from the laboratory should be disinfected first with disinfectant spray and the prosthesis should be disinfected by immersing in glutaraldehyde or any other suitable disinfecting solution for appropriate time.⁴¹

Conclusion

Saliva may be a viable alternative to nasopharyngeal specimen for CoViD-19 testing. The dental professionals should be aware regarding the different protocols to be followed to prevent the transmission of the virus through

aerosols and direct salivary contamination in the dental practice. Further studies are needed to investigate the efficacy, feasibility and scalability of using salivary specimens for SARS-CoV-2 detection and surveillance on a nationwide basis.

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CoViD-19 and Saliva – A Diagnostic Challenge

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Abstract

Covid-19 is the new scare! Declared as a global pandemic by the World health Organization (WHO) on 11th March 2020, the disease spreads from person to person by droplet infection. The symptoms range from mild flu-like to severe acute respiratory infections. Early diagnosis is necessary for limiting the symptoms and thus better patient management. Current diagnostic test for viral RNA is the real time reverse transcription- polymerase chain reaction (RT-PCR). Saliva is suggested as a tool for diagnosis as collection of saliva is a non-invasive procedure and minimizes the risk of exposure of the health care professional. The aim of this paper is to discuss the pathogenesis of Covid-19, its oral manifestations and the significance of saliva.

Key Words : Covid-19, immunity, cytokines, saliva.

Introduction

SARS-CoV-2 virus has spread around the world at an alarming rate and continues to rise out of control in many countries.

Coronavirus has revolutionized medical science and research. Scientific community all over the world, researchers and health care professionals are working to study the intricacies of the virus and to protect the world. Identifying the facts about this virus at a molecular level will help design targeted therapies.

The basic screening procedures for suspecting an infection with coronavirus include history of travel, exposure to an infected person, temperature check and monitoring of the oxygen levels.

Coronavirus is a positive, enveloped, single stranded RNA virus. It belongs to Orthocoronavirinae subfamily.¹ The subfamily Orthocoronavirinae is classified into four genera alpha coronavirus, beta coronavirus, deltacoronavirus and gammacoronavirus. Severe Acute Respiratory Syndrome Virus – 2 (SARS-CoV-2) belongs to beta coronavirus category.²

This virus was first detected in the respiratory tract of patients with pneumonia in Wuhan, China in December 2019. Strains of SARS-CoV-2 were isolated from the samples of pneumonia patients who were workers in Wuhan seafood market.³

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In the past two decades, three epidemic diseases, namely COVID-19, severe acute respiratory syndrome (SARS) and Middle East respiratory syndrome (MERS) were caused by coronavirus.⁴

Given the initial zoonotic existence of the virus, currently there is rapid spread of the virus through human to human contact. The typical clinical symptoms are fever, non-productive cough, dyspnoea, malaise and pneumonia. Many a times other symptoms are sputum production, headache, hemoptysis, nausea, vomiting and diarrhoea.⁵

The SARS-CoV-2 virus mainly affects the respiratory system, though other organs are involved as well. The presentation of Covid-19 is extremely heterogeneous and ranges from minimal symptoms to significant hypoxia with acute respiratory distress syndrome (ARDS).⁶

Certain comorbidities which increase the chances of Covid-19 infection are hypertension, diabetes, heart diseases, immunodeficiency states, respiratory illness and malignancies.⁷

Pathogenesis

Coronavirus is pleomorphic and has a round or elliptical form. The diameter of the virus is approximately 60-140 nm.⁸ The total length of the viral genome is 30 kb and consists of 5'-terminal noncoding region, an open reading box (ORF)

1a/b-coding region and 4 regions encoding different proteins.⁹

The main determinant of viral infectivity and pathogenesis is the entry of the virus into the host cell, which is mediated by the surface anchored spike protein.⁵ SARS coronaviruses have four main glycoproteins namely – Spike (S), membrane (M), nucleo-capsid (N) and envelope (E). The membrane, nucleo-capsid and envelope glycoprotein play a role in the virus assembly, replication and release. The S glycoprotein binds to the receptor on the host cell and fuses the viral and host cell membranes. This process is essential for entry of the virus into the host cell.¹⁰ The spike (S) glycoprotein has two subunits S1 and S2. The distal S1 subunit contains the receptor binding domain and S2 has the fusion machinery. S1 facilitates the binding to the host cell receptor and S2 is responsible for the fusion of the viral and host cell membrane.¹¹ The spike(S) protein directly interacts with the peptidase domain of the angiotensin converting enzyme -2 receptor (ACE-2).¹² (Figure - I)

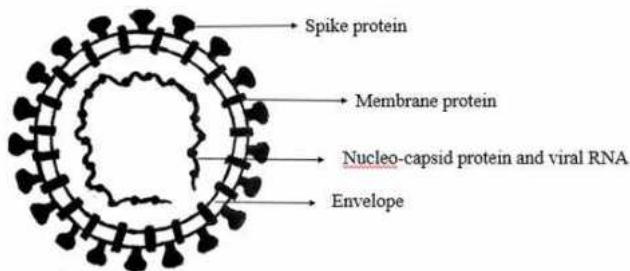


Figure -I : Schematic diagram of SARS-CoV-2

Angiotensin converting enzyme-2(ACE-2) is expressed by the respiratory epithelium, intestinal epithelium, kidney cells, endothelial cells and immune cells such as macrophages.¹³

After the entry of the virus into the host cell, Covid-19 viral infection can be divided into 3 phases¹⁴

1. First phase – It is asymptomatic in which the SARS-CoV-2 virus binds to the ACE-2 receptors in the nasal epithelial cells and starts replicating. The innate immune response here is limited.

2. Second phase - The virus propagates to the respiratory tract, airways and an intense innate immunity response is activated. The level of cytokines (CXCL 10) generated may suggest the resultant clinical course of the disease. About 80 % of the cases will show mild infection restricted to the upper airways.

3. Third phase - In about 20% of the cases the disease will progress to third phase. In the third phase the virus reaches the lungs and infects alveolar type II cells where the viral

particles are released and death of the cells occurs by apoptosis. Pathologically there is diffuse alveolar damage, fibrin rich hyaline membranes and few giant cells.

Patients with adequate immune functions and without any risk elements may develop an effective immune response. This can suppress the virus in the early phases without immune over-reaction. Patients suffering from immune dysfunction may have a greater risk of progression to the critical phase and high chances of mortality.¹⁵

The two steps of immune response during the progression of the disease are¹⁶

1. Immune-defense based protective phase – Adaptive immune response of an individual eliminates SARS-CoV-2 virus.

2. Inflammation-driven phase – When an individual's protective immune response is defective and prolonged virus load results in an adverse inflammatory reaction in organs which show high ACE expression.

The inflammatory reaction shows an over-activation of T-cells followed by an increase in T helper-17 (Th-17) and cytotoxicity of CD-8 T which accounts for severe immune injury. During the acute phase (2 weeks) of the disease SARS-specific IgG antibodies are produced and their level is significantly higher in mild cases compared to severe ones.¹⁷

There is release of large amount of pro-inflammatory cytokines like IL-1, TNF-alpha and IL-6. A major source of these cytokines are the tissue macrophages, mast cells, epithelial and endothelial cells.¹⁸

Monocytes are cells of innate immune response and play a role in inflammatory process, antigen presentation, phagocytosis and many other immune functions. Circulating monocytes enter into the peripheral tissues and differentiate into macrophages or dendritic cells during inflammation. Studies have characterized monocytes in SARS-CoV-2 infection as suggested by Zhou et al (Zhou et al 2020)¹⁹

Monocytes should be observed in the peripheral blood smear of Covid-19 patients as they contribute to respiratory infections, inflammation and fibrosis. Several studies are being carried out and a confirmatory role of monocytes in the pathogenesis is still under scrutiny.

Normally, the cytokines are part of the body's immune response to infection, but their sudden release in large quantities can cause multi-system organ failure and death. Cytokine storms can be caused by a number of infectious and non-infectious etiologies especially viral respiratory infections like influenza, SARS-CoV-1 and SAR-CoV-2.

There is a sudden acute increase in the circulating levels of pro-inflammatory cytokines which is called as the cytokine

Conclusion

Saliva seems to be a viable source of community transmission of Covid-19 infection. The SARS-CoV-2 virus has been detected in salivary samples of patients with this infection. Saliva has many advantages as a test specimen over nasopharyngeal swabs, oropharyngeal swabs and sputum. Collection of saliva with proper instructions to the patients becomes a much easier task for early diagnosis. This will minimize the risk of transmission of the virus. Studies on saliva have proved that it is an ideal fluid for research at a molecular level. The field of salivary diagnostics and research has up-surged with the advancements in molecular technologies. All the disciplines of omics technologies like genomics, proteomics, transcriptomics, metagenomics, metabolomics can be applied for studying the saliva. Saliva as a fluid for diagnosis will be more conducive for the patient, will reduce the risk of the health care professional and allow widespread screening. These changes will be the new normal even after the Covid-19 pandemic subsides and it will be necessary to adapt to these changes for maximum safety and minimum risk. Studies are essential to evaluate the sensitivity and specificity of salivary tests for Covid-19. Keeping saliva as a significant element further research needs to be carried out for characterization of the virus and to understand the intricacies of Covid-19.

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Conflicts of interest

There are no conflicts of interest.

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A help in need is never small indeed- Dentists Performing Swab Collection for CoViD-19

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Abstract

Corona Virus Disease 2019 (CoViD-19), a highly infectious disease rapidly spreading worldwide is caused due to a novel β corona virus. Symptoms range from mild flu like symptoms to severe pneumonia which may lead to death. Presently, no specific antiviral drug or vaccine is available against SARS-CoV-2. Early diagnosis, isolation and management of the cases is needed. Healthcare systems worldwide are employing tremendous resources on testing more for CoViD-19. Upper respiratory tract samples involving Nasal, Nasopharyngeal and Oropharyngeal swabs are frequently used due to their ease in sampling for initial diagnosis. Testing ratio per population in India is low than many other developed countries. Medical hospitals and professionals are overwhelmed due to increasing number of confirmed CoViD-19 positive cases. In this pandemic dental professionals are providing additional manpower to the current public health system of the country by pre-screening and triaging, medical examination, swab collection, recording case histories and Post-discharge counselling.

Key Words : CoViD-19, SARS-CoV-2, testing, swab, dentist

Introduction

CoViD-19 is a highly contagious disease caused by Severe Acute Respiratory Syndrome CoronaVirus-2 (SARS-CoV-2). World Health Organization (WHO) has declared CoViD-19 a public health emergency of international concern on January 30, 2020.¹ It was first reported in Wuhan city of China in December 2019² and later spreading to around 216 countries and territories around the world till 16 June 2020³. SARS-CoV-2 virus has low mortality rate but high transmissibility and infectivity than Severe Acute Respiratory Syndrome Corona Virus (SARS-CoV) and Middle East Respiratory Syndrome Corona Virus (MERS-CoV).⁴

SARS-CoV-2 virus belongs to β Corona Virus family having a single positive strand RNA genome. It encodes four structural proteins spike (S), envelope (E), matrix (M), and nucleocapsid (N)⁵. It can be transmitted through droplets,

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aerosols from infected patient or direct contact with the contaminated object on touching the mucous membrane of eyes, nose and mouth.² Symptoms include fever, cough, shortness of breath, sore throat, nasal congestion, fatigue and headache. Most patient experience mild symptoms or are asymptomatic carrier and transmit the disease.⁶ SARS-CoV-2 virus have been detected in the asymptomatic patients with similar viral load as in symptomatic patients.⁷

Early diagnosis & management

According to the WHO, there are 7,941,791 confirmed CoViD-19 positive cases with 4,34,796 deaths globally till 16 June 2020³. Treatment of patients having CoViD-19 is mainly symptomatic. Most cases have mild symptoms or are asymptomatic. Elderly, immunocompromised and patients with co-morbidities are more vulnerable. Prevention can be done by following social distancing, respiratory etiquettes and proper personal and hand hygiene. There are no specific drugs or vaccines for CoViD-19, early detection and management are the most important steps to contain the outbreak. Thus healthcare systems all over the world are engaging lot of resources to test more and more individuals for CoViD-19.

Sampling for CoViD-19

Samples collected include nasal swab, nasopharyngeal swab, oropharyngeal swab, BronchoAlveolar Lavage (BAL), tracheal aspirate, nasopharyngeal aspirate, tissue biopsy from lung, sputum, serum, whole blood and stool. Mawaddah Azman et al in a systematic review on the present literature on sampling of CoViD-19 reported that nasopharyngeal swab had higher viral load than the oropharyngeal swab but less than the bronchoalveolar lavage.⁸ Chunbao Xie et al compared oropharyngeal swab, blood, urine and stool samples from 19 suspect cases for nucleic acid detection using three different fluorescent Real time Reverse transcriptase-Polymerase Chain Reaction (RT-PCR) kits. Nine patients (47.4%) were confirmed to be infected by SARS-CoV-2 virus detected in oropharyngeal swab and eight of these nine confirmed cases showed positive results for SARS-CoV-2 virus in stool samples. However, all the blood and urine samples were tested negative.⁹ Wang et al compared Nasopharyngeal (NP) and Oropharyngeal (OP) swabs in 353 patients and found NP swab had higher positive rate than OP swab.¹⁰

Giwan Seo et al used Field Effect Transistor based biosensor for rapid detection of SARS-CoV-2 spike protein from the human nasopharyngeal swab with Limit Of Detection (LOD) of 2.42×10^2 copies/ml in the clinical samples.⁵ Helen Pere et al reported sensitivity (89.2 %) and specificity (100%) of SARS-CoV-2 detection by RT-PCR from nasal swab over nasopharyngeal swab.¹¹ Kiran Kumar et al reported presence of SARS-CoV-2 in conjunctival swab in one of the forty-five CoViD-19 patients positive for RT-PCR for SARS-CoV-2 in nasopharyngeal swab.¹² Swab results may also show variability due to inadequate specimen, handling and transporting errors and technical problems.¹³ Center for Disease Control and Prevention (CDC) also recommends supervised self collected nasal swab in order to increase testing and reduce burden on the health care workers¹⁴

CoViD-19 testing in India

India reported first confirmed CoViD-19 case on 30 January 2020 in state of Kerala. On 24th March 2020 Prime Minister of India announced a nationwide lockdown to prevent transmission. Till 16 June 2020 there have been 3,43,091 confirmed cases with 9900 deaths³ in the country with fourth highest number of confirmed cases in the world.

Testing rate in India is low proportionate to its high population compared to other developed countries. According to Indian Council of Medical research (ICMR) 60,84,256 cumulative total samples have been tested in India till 16th June 2020¹⁵.

ICMR, Ministry of Health and Family welfare (MoH&FW) and Government of India have issued guidelines for sample collection, handling, storage and transport.¹⁶ MoH&FW in its revised guidelines for management of CoViD-19 recommended throat and nasal swab in Viral Transport Medium (VTM) preferably or nasopharyngeal swab, BAL or tracheal aspirate mixed with VTM and transported in proper cold storage box.¹⁷ ICMR recommends Real Time Reverse Transcriptase Polymerase Chain Reaction i.e. RT-PCR test, gold standard for testing this virus¹⁸ and using rapid antibody tests only for surveillance. In India upper respiratory tract samples are most frequently used.

Swab Collection Procedure:

1. Prerequisites: Personal Protective Equipment (PPE) kits, gloves, N-95 mask, face shield, sterilium for personal safety and Specimen referral form, VTM containing antifungal and antibacterial supplements, swab sticks (Dacron or polyester flocked with plastic shaft), sticky tape or labels, cutter, zip lock pouches, absorbent material, scissors and cold storage box for swab collection. Thorough case history is taken of the subject and SRF (Specimen Referral Form) ID is generated which is to be mentioned on the VTM tube of the patient along with Patient's Name, Age and sex.
2. Follow proper guidelines for donning of PPE¹⁹ which contains shoe cover, protective gown, head cap, N95 mask, gloves, goggles, face shield.
3. For nasopharyngeal swab²⁰, ask patient to lower his mask and tilt head upwards ensuring visibility and accessibility of nasal passages. Holding the swab stick away from the breakpoint, gently insert swab stick into the nostril just above floor of nasal passage into the nasopharynx parallel to palate until the resistance is felt directed in an imaginary line joining external nares to tragus of ear. Allow it to stay for few seconds to absorb the secretions and slowly remove swab rotating it. Care should be taken for patients having deviated nasal septum, nasal polyp, recent history of nasal trauma or coagulopathies.

4. For oropharyngeal swab²¹, ask patient to lower his mask and open mouth wide ensuring visibility of pharyngeal wall, gently insert the swab stick without touching the tongue, palate, teeth and gums. Rub the swab stick over both the tonsils and pharyngeal wall for few seconds. Gently remove the swab stick without saliva contamination and ask the patient to wear his mask. If patient experiences gag, cough or sneeze reflex during procedure, ask him to cover his mouth or cough over his bent elbow to prevent aerosolization of virus and reduce risk of transmission of infection to the health care worker.
5. For nasal swab¹⁷, ask patient to lower his mask and tilt head upwards, gently insert swab stick about one inch upwards into the nostril, rotate it several times for few seconds to absorb nasal secretions and gently remove it.
6. Insert the sampled swab stick into the tube containing Viral Transport Medium (VTM) and gently break the stick at breakpoint and tightly cap the tube ensuring the sampled area of the stick is dipped in the VTM.
7. Seal the tube with the absorbent material and place it in a leak proof container or zip lock pouch. Ensure triple layered packaging for protecting sample and place it in cold storage box (4°C)
8. After completion of swab collection, doffing of PPE is to be done according to guidelines¹⁹. Biomedical waste generated during the procedure is to be discarded cautiously.
9. Cold storage box containing sampled VTM tubes along with SRF form is to be sent to recognised laboratory for RT-PCR testing.

Role of Dental professionals in pandemic

Dental procedures involve face to face communication with frequent and inevitable exposure to oral cavity, saliva and blood. The pathogenic virus can transmit through inhalation of aerosols generated during dental procedures, direct contact with the saliva or indirect contact with the contaminated instrument or environmental surface. Dental clinics can be a source of nosocomial infection if proper infection control measures are not taken. In order to prevent unnecessary exposure, telemedicine and triaging of the patients is advised.²² Elective emergency dental procedures like uncontrolled bleeding, trauma, cellulitis or space infection, acute pulpitis, acute pericoronitis and abscesses etc should be given priority and planned procedures scheduled in future.

With the increasing number of CoViD-19 patients in India the hospitals and the medical professionals are overburdened. In order to strengthen the medical team, Dental Council of India (DCI) has released advisory on 16th May 2020 for allowing the dental surgeons after ample training and with adequate protection for pre-screening and triaging of patients involving medical examination and swab collection, recording case history, administrative work, post discharge counselling.²³ In accordance, Government Dental College and Hospital Nagpur had deployed a team consisting of teaching and clinical faculty, residents and paramedical staff for swab collection duty after training at different quarantine and isolation centres under Nagpur Municipal Corporation. Team collected total 1748 upper respiratory swab samples for CoViD-19 in course of 3 weeks later went into quarantine of 2 weeks and now second team has been deployed. We were fortunate to be one of the members of deployed team for swab collection. The procedure of swab collection of a patient takes less than a minute but is at high risk. We had to collect 100-150 samples in a day at the quarantine centre. Working for prolonged hours in PPE became very difficult due to sweating, suffocation due to mask and faceshield, inability to drink water or eat. Doctor needs to work at a rapid pace and avoid contact with the patients due to sneezing or cough during swab collection. Fogging of the face shield makes it difficult to visualize the oropharynx. Being a dentist, we have the practice of handling patient's oral cavity. The accompanying staff also needs to stay alert and seal the samples immediately and place them in proper cold storage facility. Also we need to sometimes counsel the patients fearing the risk acquiring infection. Many dental professionals are doing their bit by performing a dual role of providing dental treatment as well as being a part of CoViD-19 healthcare team.

Conclusion

In this pandemic outbreak of CoViD-19, testing more and more subjects is needed for early detection and management. Upper respiratory tract sampling is recommended for initial diagnosis of CoViD-19. Due to increasing number of confirmed positive CoViD-19 cases healthcare systems all over the world are overburdened. Dental surgeons are in close contact and well versed with the oral cavity and related head and neck structures. Thus dental professionals are encouraged to strengthen the present healthcare team for pre screening of patients and swab collection.

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Conflicts of interest

There are no conflicts of interest.

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Dental aerosols in the spread of CoViD-19

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Abstract

Aerosols generated in the dental operatory can expose dental personnel as well as patients to the causative virus of CoViD-19. Ultrasonic and sonic instrumentation is associated with the highest incidence of droplet transmission, followed by air polishing, and use of air/water syringe and high-speed handpiece. Risk of transmission of the infection is proportional to the duration of atmospheric suspension and viability on surfaces of the infectious particles. Herein, we highlight about aerosols generated during dental procedures and their implications in spread of viral infections like CoViD-19, and summarize the preventive guidelines stated by the regulatory authorities.

Key Words : CoViD-19, SARS-CoV-2, Dental, Aerosols, Ultrasonic, Droplets.

Introduction

CoronaVirus Disease (CoViD-19) caused by the novel Severe Acute Respiratory Syndrome-CoronaVirus-2 (SARS-CoV-2) was declared a pandemic by the WHO on March 11, 2020 due to rapid global spread of the condition.¹

Given the widespread transmission of CoViD-19 and reports of its spread to health care providers, dental professionals are at high risk of acquiring the infection and can become potential carriers of the disease. The risks can be attributed to the nature of dental interventions, which include aerosol generation, handling of sharps, and proximity of the provider to the patient's oropharyngeal region.

Lauer et al. (2020) reported that the incubation period following infection by the novel CoronaVirus is 1-14 days, with a median of 5.1 days.² The results stated that 97.5% of the patients will show symptoms within the first 11.5 days; therefore, would require to be quarantined/treated for at least 14 days. However, Chen et al., among few other studies, reported positive oropharyngeal swab tests of SARS-CoV-2 during the convalescence period.³ To date, there is no clarity regarding the exact period of contagiousness or the period of complete eradication of the virus from the body/body fluids. Furthermore, there is lack of evidence regarding transmission of the virus via asymptomatic carriers.

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SARS-CoV-2 typically spreads through respiratory droplets or by contact. To et al. reported detection of the virus in the saliva of 91.7% of the total patients, and serial salivary viral load monitoring demonstrated a declining trend.⁴ The authors argued that the virus could be transmitted while talking, sneezing, or coughing through the saliva even in those with no symptoms of the disease. The study proposed the use of saliva as a noninvasive specimen for diagnosis, monitoring, and infection control in patients with CoViD-19. It is known that the point-of-entry of SARS-CoV-2 into the human body is via the Angiotensin-Converting Enzyme (ACE) 2 receptors.⁵ ACE-2 receptors are highly concentrated in the oral mucosa, epithelial cells of the tongue, as well as salivary glands, which could be a possible explanation for the identification of SARS-CoV-2 in the secreted saliva.⁵⁻⁷

A study by Sabino-Silva et al. reported at least three separate routes for presentation of the SARS-CoV-2 in saliva. First, SARS-CoV-2 in the lower and upper respiratory tracts can reach the oral cavity along with the liquid droplets. Second, virus in the blood may enter the mouth through the gingival crevicular fluid; and third via major and minor infection of the salivary gland, wherein the particles may be released into the saliva through salivary ducts.⁶

The chief concern with dental procedures related to this disease is the production of aerosols. Dental aerosols refer to

clouds of particulate matter (debris, microorganisms and their metabolites) and fluid (water, saliva, blood), with droplets of varying sizes depending on the procedure. Studies have demonstrated presence of bacteria and viruses in such droplets, thereby increasing the risk of spread of infections. A study by Miller et al. demonstrated that ultrasonic instrumentation could transmit 100,000 microbes per cubic foot with aerosolization of up to six feet, which persisted from 35 minutes to 17 hours in the absence of appropriate air current.⁸ SARS-CoV-1, among other viruses, has been identified in dental aerosols with a median half-life of 1.1 to 1.2 hours.⁹

Keeping these in mind, dental professionals must ensure thorough screening of patients prior to planning dental procedures to reduce further risk of transmission of CoViD-19. Furthermore, universal precautions are crucial to minimize the spread of the virus. Herein, we have discussed about the aerosols released during routine dental procedures and an overview of techniques to control the same.

Sources of aerosols in dentistry

Ultrasonic scalers, rotary instruments, air abrasion devices, dental unit waterlines, and air-water syringes, among others generate aerosols during routine dental procedures. Table I classifies the aerosols based on particle size. Dental aerosols may be considered as droplets $\leq 50 \mu\text{m}$ in diameter.¹⁰⁻¹⁴ Micik et al. defined “splatter” as droplets more than $50 \mu\text{m}$ in diameter.¹⁰ In contrast to aerosols, owing to the larger size, splatter cannot be suspended in the air;

however, are ejected forcefully and land on surfaces. Therefore, the risk of acquiring infections due to skin contact with splatter droplets is higher. Droplet nuclei remain suspended in the air until they evaporate, subsequently leaving behind nuclei that may contain organisms related to respiratory infections. Furthermore, droplet nuclei can contaminate surfaces of up to three feet from their source and may remain airborne for 30-120 minutes. Thus, aerosols that remain suspended in the air for long periods before settling on surfaces can enter the respiratory tract via inhalation. Smaller aerosol particles have been demonstrated to lodge in smaller lung passages, thus are more likely to transmit infections. Respiratory pathogens such as *Mycobacterium tuberculosis*, *Legionella pneumophila*, *Hemophilus influenzae*, among others have been identified in aerosols in the dental clinic.⁹

Long-distance transmission of pathogens via aerosols depends on factors such as the duration of persistence of the droplets in the air (physical decay) and infective ability of the pathogens within the droplets (biological decay). van Doremalan et al. (2020) reported that viable SARS-CoV-2 was detected in air droplets even after 3 hours.¹¹ These aerosols may also pose a health hazard to other patients and personnel during dental treatment of patients who are positive for SARS-CoV-2. Therefore, it is important to categorize dental procedures based on the aerosols generated and implement barrier and disinfection techniques to prevent the spread of CoViD-19 as well as other infections.

Table I: Categories of aerosols based on particle size

Aerosol	Size	Characteristics
Splatter	$>50 \mu\text{m}$	Visible spray generated during ultrasonic scaling and other procedures
Droplets	$\leq 50 \mu\text{m}$	Invisible, suspended in the air for shorter duration before settling on surfaces
Droplet nuclei	$\leq 10 \mu\text{m}$	Invisible, suspended in the air for longer duration considering small size of particles, possibility of long-distance transmission of infection

Ultrasonic scaling

Ultrasonic scaling is the primary treatment before most general dentistry and periodontal procedures. It is known that pathogens are present in both supra- and sub-gingival dental plaque and calculus. Furthermore, saliva and nasopharyngeal secretions are a source of several pathogens such as influenza, herpes, as well as SARS virus along with bacterial pathogens

such as Streptococci and Staphylococci, among others.¹²

Ultrasonic scaling generates the largest amounts of aerosols.¹⁵ The coolant (water) used during the procedure results in a spray (splatter), which is visible to the eye and is the chief source of contaminants. However, one study reported on ultrasonic scaling without the use of a coolant and observed that the aerosols and splatter nonetheless

generated spread for a distance of up to 18 inches from the operative site.¹⁶ Thus, use of high volume suction during the process is imperative to reduce the dangers of the contaminated aerosols.¹⁷ Furthermore, the speed and the amount of spray generated by the scaling unit should be controlled to prevent high-velocity splatter.

Air-polishing devices

Tooth polishing remains a commonly performed procedure in the dental clinic to remove extrinsic stains and other deposits from teeth. Conventional techniques involved use of a handpiece with rubber-cup and prophylaxis paste to polish teeth and restorations. However, newer air polishers use a light handpiece similar to an ultrasonic scaler that generates a slurry of pressurized air, abrasive powder, and water to remove the biofilm and stains. Thus, air-polishing is also a source of aerosols similar to ultrasonic scalers, which must be considered during treatment. The classical universal precautions for air-polishing suggested by Guttman continue to be recommended, and include use of high-volume evacuation instead of a saliva ejector and rinsing with an antimicrobial mouthwash before treatment.¹⁸ Use of aerosol reduction devices such as JetShield™ has been shown to reduce the number of colony-forming units generated on the operator's face mask. Therefore, where possible, this device must be used to reduce the exposure to contaminant droplets generated during air-polishing.

Restorative procedures

High-speed dental handpieces operate at speeds between 200,000-800,000 rpm, and can be a major source of aerosols. Splatter in such procedures would comprise of debris from the tooth or even the restorative material being removed. The Center for Disease Control has recommended use of a rubber dam to reduce the aerosols generated during rotary dental procedures.¹⁹ A rubber dam ensures isolation of the treatment zone from saliva, thereby preventing the risk of contamination via salivary droplets.

In both ultrasonic scaling and restorative procedures, droplet nuclei may be generated, which generally exit the mouth as relatively large particles; therefore, could possibly carry more biologic material from the patient. As the water evaporates, these droplets become small enough to become aerosols, and the biologic material becomes more concentrated. Transmission of the SARS-CoV-2 through such droplets could lead to more rapid and long-distance spread of the disease.

Transmission of viruses has been reported through significant amounts of patient-related fluids and tissues that remain within the lumen of dental handpieces as well as in the internal structures of the unit.²⁰ Therefore, guidelines recommend both internal and external cleaning of rotary instruments to minimize the risk of infections. External cleaning is commonly accomplished by flushing and autoclaving, and internal cleaning can be done by chemiclaving that incorporates stem, alcohol, and formaldehyde under pressure.

Surgical procedures

Aerosols are not commonly generated by surgical procedures per se; however, are linked to the use of ultrasonic and other high-speed rotary instruments that may result in splattering of blood and fluids, thus causing contamination. In the current CoViD-19 scenario, a small percentage of blood samples demonstrated positive test results for the virus.²¹ This can indicate systemic spread of the infection, especially in individuals with co-existing medical conditions. The Ministry of Health and Family Welfare (MoHFW) has designated most surgical dental procedures as elective and are not recommended in this CoViD-19 period until further notification. However, emergency and urgent surgical procedures such as treatment of rapidly spreading space infections, uncontrolled symptomatic teeth requiring extraction, oro-facial trauma, acute abscesses, ongoing multi-stage treatments, among few others may be performed under universal and specific precautionary measures.²² The guidelines specifically state that urgent procedures should only be undertaken after teleconsultation, tele-triage, consent, and through pre-fixed appointment along with suggested modifications in the dental set-up.²²

Infection control during dental procedures

Disinfection and sterilization of dental equipment and the operatory as well as barrier techniques are not novel, and are followed by dentists in routine practice. However, the need of the hour is more stringent measures to curb the spread of CoViD-19 via aerosols through additional use of Personal Protective Equipments (PPE) and more frequent sterilization strategies.²² Table II categorizes the dental procedures according to the risk level adapted from the recent guidelines of the Ministry of Health and Family Welfare (MoHFW).²² A study reported that the survival period of SARS-CoV-2 on inanimate surfaces or objects was up to nine days at room temperature, with higher chances of persistence in humid

conditions.²³ Therefore, in addition to disinfection of surfaces, maintenance of dry conditions is essential to curb the spread of the virus.

Specific emphasis has been given on the use of face masks and shields, as studies have reported significant presence of oral pathogens on the faces of dental personnel, due to the splatter generated during procedures. Particulate filtration ability measures the percentage efficiency of masks to filter particulate (nonviable particles) matter passing through it. Disposable surgical masks are composed of multiple layers of synthetic filter materials designed to collect and retain microscopic particles. The minimum goal is to filter out at least 95 percent of small particles that directly contact the mask. However, in the current scenario, considering the small size of the SARS-CoV-2 (between 65-125 nm),²⁴ particulate respirator masks, such as the N95, are required for higher filtration efficiency (0.1-0.3 μm).

Secondly, fluid resistance of the mask plays an important role, which refers to the ability of the mask material to minimize fluid traveling through it and potentially coming into contact with the user. The N95 has a reported fluid resistance of 80 mmHg pressure based on standard criteria. In cases of non-availability of N95 masks, a triple-layer medical mask of non-woven material with a nose-piece may be used. Furthermore, clear plastic shields are important, which protect the face against splatter contaminants. These face shields may be re-usable after thorough cleaning and disinfection. Disposable aprons and head caps must be provided to the patient as well. Table III summarizes the general infection control measures based on guidelines of the MoHFW. Dentists are directed to the May 2020 release of the MoHFW for detailed guidelines on the use PPE, sterilization protocols, and maintenance of the dental operatory and waiting areas while planning dental procedures during this CoViD-19 pandemic.²²

Table II: Categorization of dental procedures based on risk level (Adapted from the MoHFW guidelines 2020)

	Procedure	Risk level
Emergency Dental Procedures	Fast spreading infections of facial spaces/Ludwig Angina/Acute cellulitis of dental origin/Acute Trismus. Should connect with hospital settings/ emergency settings immediately	Very high
	Uncontrolled bleeding of dental origin. Should connect with hospital settings/ emergency settings to rule out other causes	Very high
	Severe uncontrolled dental pain, not responding to routine measures	High
	Trauma involving the face or facial bones	Very high
	Radiographs like PNS, OPG, CBCT in facial trauma and in medico-legal situations	High
Urgent Procedures	<u>Children and adolescents</u> <ul style="list-style-type: none"> - Acute Pulpitis - Dental abscess - Dentoalveolar trauma - Pain of cavitation needing temporization - Unavoidable Dental Extractions - Orthodontic procedures (see the section on adults) 	<u>In the order of the conditions</u> <ul style="list-style-type: none"> - High - Very high - High - High - Very high - Moderate
	<u>Adults and Geriatric</u> Unavoidable Dental Extractions / Post extraction complications	Very High

	<ul style="list-style-type: none"> - Dental pain of pulpal origin not controlled by Advice, Analgesics, Antibiotics (AAA) - Acute dental abscess of pulpal / periodontal/ endo-perio origin/ Vertical split of teeth - Completion of ongoing root canal treatment (RCT) - Temporization of cavitation in teeth which are approximating pulp but do not need pulp therapy - Broken restoration/ fixed prosthesis causing sensitivity of vital teeth/ endangering to pulpitis /significant difficulty in mastication - Already prepared teeth/ implant abutments to receive crowns - Peri-implant infections endangering stability - Pericoronitis / Operculectomy - Oral mucosal lesions requiring biopsy - Long-standing cysts and tumors of the jaw with abrupt changes - Repair of broken complete dentures - Implant prosthesis related issues - Oral mucosal infections such as candidiasis - Oral mucosal lesions showing sudden changes or suspicion of causing severe problems,/ oral cancer requiring biopsy 	All High-risk
	<ul style="list-style-type: none"> - Sharp teeth /Trigeminal neuralgia - Orthodontic wire or appliances, piercing or impinging on the oral mucosa - Orthodontic treatment causing Iatrogenic effects - Delivery of clear aligners - Patients on skeletal anchorage 	Moderate
	<p><u>Patients with medical conditions</u></p> <ul style="list-style-type: none"> - Diabetes patients requiring treatment for periodontal conditions - Dental treatment for patients requiring cardiac surgery - Hospitalized patients requiring dental care for acute problems - Patients requiring dental treatment for radiotherapy /organ transplantation 	Very high

Table III: General infection control measures during the CoViD-19 pandemic (Summary of the MoHFW guidelines 2020)

<p>Common for all procedures</p>	<ul style="list-style-type: none"> - Barrier protection: use of masks, head caps gloves, face shields, eye protection/goggles - In addition: Coveralls/gown and shoe cover - Washing hands with soap before and after each procedure - Wiping handpiece, scalers, and other instruments with disinfectant between patients and autoclaving/chemiclaving routinely. - Flushing dental water units and suction tanks and disinfecting them at the end of the day - Disinfection of the dental chair, light, and surrounding areas by wiping, mopping etc. after each patient - Disposal of replaceable items: patient covers, suction tips, cotton, sharps, among others, after each patient
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Ultrasonic scaling/Periodontal procedures	Pre-procedural mouth rinse, use of high volume evacuation
Restorative procedures	Use of rubber dam and aerosol reduction device
Surgical procedures	Rinsing instruments (preferably under running warm water), submerging the cleaned instruments in neutral pH detergent, autoclaving
Maintain air circulation with natural air through frequent opening of windows and using an independent exhaust blower to extract the room air into the atmosphere. Avoid switching on the ceiling fan while performing procedures.	
Fumigation of the operatory, installation of High-Efficiency Particulate Air (HEPA) room filters, ultraviolet treatment of the ventilation system. Routine servicing of all units mandatory, including air conditioning systems	
Autoclave and other sterilizing equipment maintenance: Routine disinfection of external surfaces and cleaning of internal surfaces according to manufacturer's instructions	
Washing and sterilization of re-usable laundry	
Appropriate disposal of wastes	

Conclusion:

CoViD-19 may be considered an eye opener, reinforcing the importance of appropriate universal barrier techniques and sterilization strategies to limit the spread of aerosol-induced infections. Aerosols are invisible particles and can survive in the air and surfaces for long periods; therefore, a seemingly clean dental operatory may also be a breeding zone of infections. Complete elimination of infections via aerosol control may not be possible. Nonetheless, several layers of protective procedures, ranging from personal protection (dentists, staff, and patients) to appropriate maintenance of the operatory will significantly reduce the extent of aerosol-induced infections to the lowest possible level.

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Conflicts of interest

There are no conflicts interest.

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Pediatric dentistry and non pharmacological behavior guidance in CoViD-19 era

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Abstract

The CoronaVirus Disease (CoViD-19) pandemic has posed an unprecedented challenge to the world. Dental health care personnel are considered to be at the highest risk as they work in close proximity to the oral cavity of the patient. New methods of approach and management have to be incorporated in different aspects of routine dental practice. In addition, pediatric dental practitioners are posed with unique and unprecedented challenges of parental anxiety and behaviour guidance of patients which need to be modified according to the current infection control protocols. The aim of the present article is to highlight the effects of CoViD-19 on various aspects of non pharmacologic behaviour guidance techniques unique to routine pediatric dental practice.

Key Words: CoViD-19, Pediatric dentistry, Non pharmacological, Behaviour guidance, Behaviour management.

Introduction

There has been a great impact of CoronaVirus Disease (CoViD-19) on dentistry across the globe. Due to the rapid spread and dynamic nature of the disease, a challenging situation has developed world wide for dental practitioners, academicians and policy makers in terms of practice management, infection control, communication, management of emergencies and training of future dentists. Due to the pandemic, dental care had been restricted to emergency procedures and all elective procedures had been deferred in most nations. Dental practitioners all over the world have been in a dilemma as this situation has both health and financial consequences. Centers for Disease Control and Prevention (CDC) have recently updated their 'Interim Reopening Guidance for Dental Settings' on 3rd June, 2020, for resuming non-emergency dental care during the CoViD-19 pandemic.¹ Region and country specific guidelines have been put forth by various specialty bodies for resuming non-emergency dental care. In India, guidelines for dental professionals in CoViD-19 pandemic situation have been put

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forth by Ministry of Health and Family Welfare-Government of India and Dental Council of India.^{2,3}

Due to CoViD-19, routine dental management practices have to be altered in order to incorporate infection prevention and control measures. Guidelines and practice checklists pertaining to pediatric dentistry have been published by American Academy of Pediatric Dentistry (AAPD) and Royal College of Surgeons of England.^{4,5} Apart from these general measures to prevent transmission of disease in a dental office, pediatric dental practice in the current pandemic situation has certain additional challenges that are unique to this branch of dentistry, one of the key challenges being behaviour guidance of pediatric patients. Non pharmacological behaviour guidance techniques are one of the prime tools of any pediatric dental office. It is the process of inculcating and promoting a positive attitude toward oral health care in children and involves continuous interaction between the dental team, the patient and the parent. The altered protocols for pediatric dental practice in the current scenario have an impact on the routinely practiced behaviour guidance techniques. This in turn may hinder the process of developing a rapport and providing quality dental care to

pediatric patients. The aim of the present article is to highlight the effects of CoViD-19 on various aspects of non pharmacological behaviour guidance techniques unique to routine pediatric dental practice. This review highlights the general precautions to be taken and certain modifications of the non pharmacological behaviour guidance techniques which can be incorporated in pediatric dental practice.

General Precautions

According to the Occupational Safety of Health Administration (OSHA) Dental Health Care Personnel (DHCP) are considered at the highest risk as the dentists work in close proximity to the oral cavity of the patient.¹ It is necessary to ensure their safety, not only to protect patient health, but also to protect themselves from viral infection and prevent viral transmission. The manifestations of CoViD-19 in children are reported to be less severe than adults. Children may be asymptomatic or may present with mild, nonspecific symptoms. All patients and parents visiting the dental office should be considered as potential carriers of the virus unless proved otherwise. Hence, all standard precautions and measures pertaining to infection prevention and control should be strictly exercised in routine pediatric dental practice.¹⁻³

Tele-consultation and triaging

The purpose of triaging is to determine those in most need of care. Practicing during CoViD-19, triaging will further mitigate the risk of virus transmission.¹ Prioritize the most critical dental services and provide care in a way that minimizes harm to patients from delaying care and harm to dental health care team from potential exposure to CoViD-19.

All patients must be screened on telephone before scheduling an appointment. The office administration will be the first point of contact and therefore should be thoroughly trained in the triaging system.⁶ A digital questionnaire asking about demographic data, symptoms consistent with CoViD-19, medical history and symptoms related to the orofacial region can be sent out to all patients (where appropriate) or parents. In a pediatric dental setup, the person accompanying the child must also be screened for symptoms of CoViD-19.

Walk-ins should be discouraged unless it is an emergency. The same should be conveyed to patients via digital portals like social media and messages. Tele consultation or video consultation helps to determine if the patient needs to be present in the dental clinic. Also, the child

can see the dentist and a rapport can be established in case an in office consultation is scheduled.

Pre-visit behaviour guidance

A supplementary pre-appointment letter to parents will give them an idea of what to expect during their first dental visit. This will also help address parental anxiety who can subsequently prepare the child for the appointment.

Digital pictorial booklet or leaflets which are age appropriate can be sent to patients and parents along with the pre-appointment letter. This illustrates what the first dental visit will be like and what is expected of the parent and child.⁷ Here, the concept of 'tell-play-prepare' can be introduced as a pre appointment behaviour guidance technique. Parents or dentist, during video consultation can tell the child what will be done during first dental appointment. The pediatric dentist can also send a video of modelling on a doll as a representation of first dental visit. The same can be demonstrated at home on a toy by the parent. Children use different coping strategies during their dental visit. Hence, it is advised to inform the child about the appearance of dentist in Personal Protective Equipment prior to the dental visit so it does not come as a surprise to the child.

Arrival and waiting area

Once the pre-screening via phone is done and appointments are scheduled, they should be spaced out and waiting should be avoided. Instructions should be given during tele consultation specifying that the patient should be accompanied with one guardian and no siblings should be brought along for the appointment. The guardian and patient are advised to come to the dental office directly from their homes without making any scheduled stops. Both the guardian and the child should wear masks, avoid touching any surfaces and avoid interaction with others on their way to the clinic. Guardians may opt to wait in their personal vehicles or outside the dental office and they can be contacted on mobile phone when it is their turn for appointment.

Upon arrival in the dental office, it must be ensured that the patient and guardian have covered their own face with masks or provide a surgical mask if supplies are adequate. On entering the dental office, body temperature should be measured and evaluation regarding presence of fever or other symptoms consistent with CoViD-19 should be performed. If the patient and guardian are afebrile and without symptoms consistent with CoViD-19, then dental care may be provided

using appropriate infection control protocols.¹

As mentioned in various guidelines, the waiting area should be planned to maintain social distancing and other infection control measures. Child friendly and easy to understand infographic images regarding the same should be exhibited in the common areas in the waiting room. Toys, books and other hard-to-disinfect items should be removed from the waiting area to avoid contamination.^{1,4} At the same time, the ambience of the waiting area should be child friendly, receptive and should not instill further fear in the times of the CoViD-19 pandemic. This can be achieved with the help of music, attractive walls and other aids.

Operatory

Personal Protective Equipment (PPE): The appearance of the dentist in a PPE can have a negative impact on the pediatric patient. The child should be prepared and conditioned during the preappointment consultation regarding the attire of the dentist. Attempts should be made to incorporate colours and modifications to the conventional PPE kits to suit pediatric dental practice. Innovative products like modified face shields and colourful PPE kits are already available in the market. Care should be exercised in maintaining appropriate infection control while incorporating these modifications.

Conventionally used methods of non-verbal communication like appropriate contact (hand shake, pat), posture, facial expression, and body language should be avoided. Verbal communication and voice control will play a major role in communicating with the child as the face and eyes cannot be appreciated well in PPEs. For younger children who may need to be treated on the parent's lap, it is important that the parent is wearing an N95 mask during the entire procedure. Also, the parent should be given a fresh pair of gloves on entering the operatory as they may tend to touch surfaces while holding the child on the dental chair. For older and cooperative pediatric patients, only the patient should be allowed in the operatory, except in cases where parents are unwilling or unable to extend effective support.⁸

Distraction techniques: Distraction with the help of various aids and devices which cannot be disinfected based on the current infection control protocols should be avoided. Audiovisual distraction techniques like television, screens and speakers kept at a sufficient distance and which can be easily disinfected may be used. Use of virtual reality glasses, video games and other hand held devices should be avoided.

Pre procedural mouth rinses: Pre procedural mouth rinses using 1% hydrogen peroxide or 0.2% povidone iodine prior to dental treatment are known to reduce the viral count in the aerosols. However, in younger children who are not capable for rinsing, a swab dipped in the mouth rinse may be used to clean the oral cavity.⁹

Rewards: It has been a routine practice in pediatric dentistry to present rewards to children in the form of toys, badges etc. Care should be exercised while doing this in the current scenario. Only items that can be disinfected and handed over in a non-contact manner should be considered for the same. Alternatively, digital methods of rewarding like e-Certificates can be incorporated into practice.

Post operative instructions: General post procedural instructions should be conveyed to the parents along with the pre-appointment letter. Instructions unique to the treatment rendered must be digitized and sent to parents via email or messages. Digital modes of payment and prescription are now available which can be assimilated in routine practice to minimize contact.

Procedural aspects

Dentists are advised to minimize operations that can produce droplets or aerosols: four handed technique, rubber dam, double and high-volume saliva ejectors, anti-retraction handpieces, hand instruments are recommended in order to avoid viral spread.^{4,10,11}

Emphasis should be laid on the prevention of dental problems by regular communication with parents via teleconsultation and other digital portals. Avoiding aerosol generating procedures, continuing at-home and in-office preventive measures as well as minimally intervention dentistry should be focused upon. These include topical fluoride application, Atraumatic Restorative Treatment (ART), silver diamine fluoride, chemo-mechanical caries removal techniques, selective caries removal, Silver Modified Atraumatic Restorative Treatment techniques (SMART) and the Hall's Technique.^{11,12}

Conclusion:

The current CoViD-19 pandemic has altered the routine ways of dental practice worldwide. It is imperative to follow the guidelines issued by governing and specialty bodies regarding precautions to be taken in order to provide quality dental care. Pediatric dental practice has additional unique challenges pertaining to behavior guidance which

plays a pivotal role in management of pediatric patients. It is important to stay up to date with the latest information and adopt new strategies to safeguard themselves and protect pediatric patients during the pandemic.

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Prosthodontic Treatment Consideration Post CoViD -19

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Abstract

In lieu of the current pandemic, prosthodontic treatment needs special emphasis on cross infection control for patient and dental personnel's safety. Impression disinfection can prevent spread of infection from dental clinic to dental laboratory technician, patients and dental auxiliaries. It is the responsibility of the dentist to make appropriate choice of disinfection method for different impression materials. Adhering to Standard Precautions, using aseptic technique, following proper disinfection and sterilization procedures, and wearing appropriate personal protective equipment can prevent disease transmission from contaminated items entering the dental laboratory. Effective communication and coordination of efforts between the laboratory and dental office are critical components of a successful infection control programme. It is also extremely important to change to Digital impressions that offer advantages over conventional impressions by expediting the laboratory process, avoiding an uncomfortable conventional impression material, and allowing a magnified view of the preparation. This also helps to reduce cross infection and expediting the dental procedure.

Key Words : Cross infection, Infection control protocol, Laboratory personnel's, Digital impressions.

Introduction

With the current scenario of CoViD -19 pandemic, it is extremely important to safe guard not only ourselves but our patients and above all our lab personnel's. This entrusts the need of certain stringent protocols in our practice. The importance of cross-infection control cannot be overemphasized. Disinfection and sterilization methods are to be strictly used to achieve disinfection and sterility of instruments. In order to avoid the spread of pathogens from patients to patient, patient to health care personnel and health care personnel to patient, it is the duty of the health care personnel to include appropriate methods of cleaning, disinfection and sterilization for various surfaces and instruments¹. Cleaning is the removal of all foreign material (e.g. blood, saliva, debris) from objects while decontamination is the removal of pathogenic microorganisms from objects.

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Disinfection is the process that eliminates many to all pathogenic microorganisms on inanimate objects except bacterial endospores. While sterilization is the complete elimination of all micro-organisms including spores¹. Disinfection can be divided into three categories according to their efficacy. High level disinfection involves bacterial spore inactivity along with other microbial forms. Intermediate level disinfection involves destruction of microorganisms like tubercle bacilli but not able to kill spore. Low level disinfection possesses narrow antimicrobial activity.(Table I)^{2,3,4}

Dental impressions are categorized under semi-critical objects in dental practice and require high level disinfection or sterilization.⁵ Sterilization in an autoclave will compromise the dimensional accuracy of the impression hence it is not feasible⁶. Until 1991, the recommended procedure for disinfection of impression was rinsing under running water with which only 40% of bacteria, viruses and fungi were removed and potential for transmission of microorganisms remains there.^{3,7,8} In recent times, a pre wash of the impression with running water is advocated first to cast off all particles, blood and saliva prior to active disinfection procedure.⁹ Disinfection of dental impression should be a routine procedure in the dental office and dental laboratory. By knowing all the methods and techniques, any dental personnel can make a better choice and get best results for impression disinfection. However, most of the dental professionals in private clinics, hospitals, dental schools and

prosthetic laboratories are not following the required protocols for impression disinfection.^{10,11} Keeping in view the above findings, it is of utmost importance to raise the level of awareness in dental professionals involved in any process of handling, transportation, processing and storage of the dental impressions. Different techniques of impression disinfection and other methods of cross-infection control must be a part of undergraduate curriculum of dental universities and dental technician schools. The aim of this literature review is to generate an update on the various techniques of impression disinfection along with their mechanism of action and simple guidelines for their usage.

Table I: Levels of Disinfection.

Type Of Disinfection	Disinfectants	Type of impression materials	Time of exposure
High level disinfection	Glutaraldehyde	Irreversible hydrocolloid	10 min
		Zinc-oxide eugenol	10 min
		Polysulfide Polyether	10 min
		Addition silicon	10 min
Intermediate Level Disinfection	Sodium hypochlorite	Irreversible hydrocolloid	10 min
	Complex iodophors		10 min
	Phenols	Zinc-oxide eugenol	10 min
	Chlorhexidine	Polysulfide	10 min
	Alcohols	Polyether	10 min
		Addition silicon	10 min
Low Level Disinfection	Quaternary ammonium compounds Simple phenols detergents	Not recommended for impression disinfection	Impression compound
			10 min

Disinfection Techniques: Disinfection solutions : (Table 2^{3,12,13,14}.)

- Glutaraldehyde:** It is a high level disinfectant and is available in neutral, alkaline and acidic forms.⁴ It is a broad spectrum chemical agent with fast killing capability. It is also called chemo sterilizer. If it is used in proper concentration and specialized equipment, it can destroy all types of micro-organisms including bacterial and fungal spores, tubercle bacilli and viruses.¹⁵ It is a colourless liquid with pungent odour. Although it is considered as the best disinfectant for cold sterilization of medical equipment, it also has many health hazards including irritation to skin, eyes and respiratory tract. It is a sensitizer of skin and respiratory tract, so special precautions are needed while using it e.g. wearing butyl or nitrile gloves, closed system for solution handling, exhaust ventilation of the places of handling and keeping the temperature of the solution low as it will reduce the airborne concentration of the solution.¹⁶
- Sodium hypochlorite:** It provides intermediate level disinfection and has a broad spectrum antimicrobial activity. It is very useful disinfectant with advantages including fast bactericidal activity, ease of use as it is soluble in water, relatively stable, nontoxic at used concentrations, low cost, non-staining, non-flammable and colourless. Disadvantages include mucous membrane irritation, less efficient in organic environment and corrosive effect on metals¹². According to one study, alginate impression disinfected with spray method using 1% NaOCl did not show any severe dimensional changes or surface roughness of stone model that were fabricated from that impression.¹⁶ However, in another study impression disinfection by immersion method with 0.5% NaOCl for 15 min exhibited small dimensional change.¹⁷
- Iodophors:** These halogens provide low to intermediate level disinfection. These are bactericidal, mycobactericidal and viricidal. It is also fungicidal but requires more contact time. These are mainly used as antiseptics rather than disinfectants. These are not sporicidal and cause staining of fabrics. They are not flammable. They have irritating effect on mucous membrane.^{18,19} Organic material present on any surface can lead to neutralization of disinfectant capability of iodine. Hence, more frequent application of disinfectant

Table II: Types of Disinfectants.

Class of disinfectant	Type of disinfectant	Recommended concentration	Primary Mechanism of action	Commercial preparations available
Glutaraldehyde	Non-oxidizing	2%	Alkylating agent for proteins. Mainly affects amines, amides and sulfhydryl groups	Cidex
Sodium Hypochlorite	oxidizing	0.5% Or 200-5000 PPM	Disrupts cell membrane transport chain by causing inhibition of enzymes and damage to DNA	Clorox Chloramine T Purex
Iodophors	oxidizing	1-2%	Proteins and enzymes are inactivated	Betadine Hy-Sine Ioprep
Alcohols	Non-oxidizing	60-90%	Cell membrane lipid content is solubilized and proteins are precipitated	Isopropyl alcohol
Chlorhexidine	Non-oxidizing	2-4%	Intracellular contents are coagulated and cell membrane is damaged	Savlon
Phenolic	Non-oxidizing	1-3%	Protoplasmic poison causes damage to cell membrane	Lysol Dettol Hi-phene

is required for complete disinfection.² According to one study, 30 min exposure to 0.1 % povidine-iodine did not cause remarkable distortion of polysulfide and polyvinylsiloxane impression material.⁴

- **Alcohols:** These provide intermediate level disinfection and include isopropyl alcohol and ethyl alcohol. Isopropyl alcohol is normally used as antiseptic. Medical

surfaces can also be disinfected with isopropyl alcohol. Ethyl alcohol is more potent in bactericidal than bacteriostatic activity. It is also tuberculocidal, fungicidal and viricidal for enveloped viruses as well.^{13,18,20,21}

Alcohols are contraindicated for impression disinfection because they can cause surface changes of impressions². They are also not suitable for disinfection of denture

bases consisting of non-cross linked resins.²²

- **Phenols:** Complex phenols are classified as intermediate level disinfectants. These are also known as protoplasmic poisons. At low concentration, they cause lysis of rapidly growing *E.coli*, *Staphylococci* and *Streptococci*. They possess antifungal and antiviral properties as well.²¹ These are commonly used in mouthwashes, scrub soaps and surface disinfectants. Ideally not recommended for impression disinfection as simple phenols are low level disinfectants. They are incompatible with latex, acrylic, rubber and cause acute toxicity as well.^{2,3}
- **Chlorhexidine:** It is an intermediate level disinfectant and antiseptic. It has broad spectrum of activity and also used as preservative. It is commonly used in hand washes and oral products. It is bactericidal, viricidal and mycobacteriostatic. Its activity declines in the presence of organic matter because its activity depends on specific pH²¹. 2% chlorhexidine has shown activity against *S.aureus*, *E.coli*, *B.surbititis*, but no antifungal activity was seen in agar diffusion test at low concentration. 0.2% chlorhexidine disinfectant solution can be used as water substitute in alginate mixing. Impression can also be immersed in chlorhexidine solution and it causes effective disinfection²³ According to one study, 1.0 g/L chlorhexidine solution can be used to produce self-disinfecting alginate impression material for clinical use. In this way, it has shown antimicrobial activity and did not cause any changes in dimensional accuracy, flow ability and setting time of irreversible hydrocolloid impression material.^{24,25}
- **Ozonated water:** Ozone is an inorganic gaseous molecule. Its chemical formula is O₃. It is less stable than O₂ in lower atmosphere². It has antimicrobial, antihypoxic, analgesic and immunostimulatory activities.²⁶ It is used for disinfection of water lines, oral cavity and dentures. It is also used as prophylactic agent before etching for the placement of restorations²⁷. Ozonated water can also be used as impression disinfectant. According to one study, aqueous ozone is more biocompatible than other disinfectant solutions e.g. chlorhexidine, NaOCl, H₂O₂. Ozonated water can reduce the number of microorganisms on the surface of irreversible hydrocolloid impression materials and by increasing time of immersion more effective disinfection can be achieved.²⁶

Other methods:

- **Microwave irradiation:** Microwaves cause disruption of cell membrane integrity and cell metabolism which ultimately leads to microbial death². Microwaves are simple to use, low in cost and provide good disinfection. Dentures are being disinfected with microwaves and are found better disinfected than NaOCl. Microwaves can be used as an effective tool for impression disinfection. Polyvinyl siloxane impression materials were disinfected with microwaves with no changes in physical properties of impression material.²⁸
- **Cast disinfection:** Microorganisms have been recovered from dental cast as well. These dental casts can be a medium of cross infection between patients and dental health care workers. Therefore, dental casts should also be disinfected.⁶ The American Dental Association recommends various methods for cast disinfection. These include use of disinfectant spray, immersion in disinfectant solution, and incorporation of disinfectant in stone at the time of mixing.²⁹ Immersion in 0.525% NaOCl did not cause any changes in dimensional accuracy, surface detail quality and compressive strength.³⁰ Microwave irradiation can also be used for cast disinfection. Dental cast can also be sterilized.²

Sterilization of impression: Various methods are available for sterilization of impressions e.g. exposure to UV light, steam autoclave, ethylene oxide gas autoclave, and radiofrequency flow discharge etc.² Cross-infection control is of prime importance in dental practice but impression disinfection is still a widely neglected aspect. The proper criteria for impression disinfection involves:

- The most suitable method (spray or immersion).
- Appropriate application (time of contact).
- Periodic check for efficacy.³¹

The factors to be considered for any disinfection protocol for dental impression are effectiveness, chemical stability and efficacy of the disinfectant solution. The disinfection procedure should not alter the dimensions and surface details of the impression and resultant cast.^{30,32} It has been proven that the most effective method of reducing the burden of micro-organisms from impression surface is chemical disinfection. Spray disinfection and immersion disinfection are the two methods of impression disinfection. However, immersion is the most reliable method because all surfaces of

impression and tray come in contact with disinfectant solution. But immersion is not the method of choice for hydrocolloids material as they are extremely hydrophilic.^{2,32}

In 1996, the American Dental Association council on dental materials endorsed immersion for polysulphide and addition silicone impression material whereas spraying with chlorine compound was advocated for disinfection of polyether impression material for 2-3 min.³³ UV rays can be used for disinfection of water supplies, laboratory equipment, dental headpieces, dental impression and implants. In one study, while comparing UV rays disinfection with Glutaraldehyde and NaOCl, UV rays exhibited maximum efficacy.³⁴

The factors affecting the efficacy of NaOCl include concentration and life of solution, pH, temperature and contact time with the impression surface. According to Fahimeh et al, the compatibility of disinfectant solution with impression material should be assessed prior to disinfection procedure. Any compatible disinfectant solution should not cause any alteration on the surface detail reproduction³⁵. Although some chemical disinfectants cause dimensional changes in impression surface, these changes are not expected to alter the clinical performance. This is why, chemical disinfection is considered the most harmless form of impression disinfection. 2% glutaraldehyde had exhibited more dimensional changes than 5.25% NaOCl in immersion disinfection procedure.³⁶

The American Dental Association's revised guidelines recommended the chemical agents that are virucidal, bactericidal and sporicidal. These chemical agents are chlorine compounds, phenols, iodophors, formaldehyde and glutaraldehyde. Immersion in NaOCl at concentration of 1:10 (0.525%) is advised for 10 minutes. Samra and Neiman investigated the effects of glutaraldehyde, phenol, iodophors and chlorine compound immersion disinfection procedure on set stone cast. The results of this study showed that a 0.525% NaOCl least affected the cast with regard to compressive strength, surface changes, surface hardness and chemical reactivity.³⁰

The Japan Prosthodontic Society has recommended the alginate impression in either 0.1-1% NaOCl solution for 15-30 min or 2-3.5% glutaraldehyde solution for 30-60 minutes. But immersion in glutaraldehyde for more than 30 min has shown dimensional changes and altered surface quality of the resultant cast.¹⁷

Ethylene oxide gas autoclaving has shown significant

structural changes of heavy and light body addition silicone impression material. Sterilization of dental stone cast has shown improved mechanical properties but decreased compressive strength. Addition or condensation silicone impression materials can be sterilized in steam autoclave without remarkable changes in dimensional accuracy.²

Dental laboratory personnel and infection protocol

Dental laboratory personnel are at risk for infection transmission by the same mechanisms as other dental healthcare professionals. Potential routes of transmission include direct contact with infected saliva or blood through cuts and abrasions, indirect accidental percutaneous exposure when using knives and other sharps items, and airborne infection from microbial-laden aerosols and spatter created during laboratory procedures.³⁷ The greatest exposure risk for dental laboratory personnel is indirect contact through cross-contamination.³⁸ Most of the cases being handled, manipulated, and processed in the dental laboratory move back and forth between the operatory and the laboratory setting. Impressions, prostheses, and appliances may be contaminated with saliva and blood and facilitate the transmission of microorganisms from operatory to laboratory. For example, microorganisms on a dental impression may be transferred to dental casts and remain in set gypsum for up to 7 days.^{39,40} Thus, the potential for cross-contamination may occur from dental office to laboratory, and back to the dental office. Cross-contamination may also crop up within the laboratory from case to case, and may also occur from surface contact, contaminated handpieces, burs, rag wheels, pumice pans and hands.

In order for an infection to be transmitted along any of these routes, specific conditions must be present: a viable microorganism, a reservoir that allows the microorganism to survive, a mode of transmission, a portal of entry, and a susceptible host. This is termed "the chain of cross-infection." A primary goal of infection control is to minimize the spread of infection by breaking as many links in the chain as possible. In the dental laboratory, this would incorporate adherence to principles of aseptic technique, appropriate immunizations for laboratory personnel, the use of barrier techniques, and implementation of standard precautions. Standard precautions dictate that all laboratory cases are handled the same way and are treated as if contaminated and infectious.

As mentioned above, dental laboratories are required to

comply with all infection control protocols mentioned above regulations and all personnel must be evaluated for potential occupational exposures.^{41,42} At-risk employees must be offered the hepatitis B vaccination, and all employees are to be provided initial and annual training regarding bloodborne pathogens. If an employee's responsibilities change such that exposure risk increases, the individual must be given additional training consistent with the new duties. It is also important to note that infection control policies in the dental laboratory must be written, as they are for dental practices. They should be clear and concise, in a manner such that all laboratory personnel can clearly understand the policies. Written infection programs should be reviewed at least annually and periodically updated. All occupational exposure incidents should be recorded. Documentation of accidents should include the type of first aid administered, provision of healthcare professional counselling, post-exposure evaluation, and any indicated follow-up.^{37,42 5-9}

Digital impressions

In the fast evolving era and the risk of cross infection we must resort to more digital medias.

Digital impressions eliminate many of the steps required with traditional impressions such as selecting the tray, disinfecting the impression, shipping the impression, pouring the stone model, manual die trimming, and reducing the steps required for articulation. Clinical skill, experience, and the particular clinical situation can also substantially affect the quality of a final impression. One report stated that more than 89% of impressions sent to the laboratory for prosthesis fabrication were inadequate, with one or more observable errors. A large clinical study evaluating 300 impressions stated that bleeding was most often associated with inadequate impressions⁴³. Some material and technique limitations found in traditional impression-making techniques were addressed when digital impressions were introduced in the 1980s. Christensen described advantages of the digital impression technique as improved patient acceptance, reduced impression material distortion, 3D pre-visualization of the preparation, and potential savings in cost and time.⁴⁴

Types of Intraoral Scanners

Digital impressions obtained by intraoral scanning devices were originally a part of CAD/CAM systems. These in-office CAD/CAM systems produce an oral scan (digital impression) of prepared teeth. Computer-assisted design of the final prosthesis is completed, and the file is sent to an in-

office milling machine, where the final prosthesis is milled from a ceramic or composite block. More recently, intraoral scanners were introduced as stand-alone devices that capture a digital impression and send the file to a dental laboratory for prosthesis fabrication. With these stand-alone intraoral scanners, the design of the crown cannot be performed with the device; however, some systems allow the clinician to indicate the location of the margins prior to sending the scan to the lab.

Each scanning system offers benefits which determine convenience for individual practitioners, such as size of wand, use of powder, method of scanning (individual images or video capture), wand positioning (hovering above tooth or resting on tooth), ability to capture colour, ability to capture full-mouth scans, method of obtaining intra-occlusal record, ease of software, portability of device, and time/scans required for scanning. After scanning, the final prostheses can either be fabricated directly (in-office or lab milled) from digital information or indirectly (cast or pressed) from a resin model. Each company determines if the digital impression can be sent directly to the lab in an STL (stereolithography or "Send-To-Lab") file or sent to the company first and if a fee is applied. The monthly service or data plans included with some systems must also be factored when calculating a cost analysis. All of these intraoral scanners are also capable of full-arch scans, and some systems are also capable of fabricating orthodontic retainers and integrating with cone-beam computed tomography images for implant planning.

Advantages and Disadvantages of Digital Impressions

Digital impressions offer advantages to both the clinician and the patient. For clinicians, digital impressions may reduce laboratory remakes because the computer screen image of the prepared teeth is magnified, improving the view of the preparation quality. If defects or inadequate preparation reduction are noted in the preparation, that area may be rescanned rather than making another impression, as with conventional impression techniques. Additionally, digital impression devices measure the occlusal clearance between the prepared and opposing teeth and allow the dentist to make changes if required before sending the impression to the laboratory. A major advantage of digital impression systems is their ability to stop the imaging process at any time and continue, which allows the dentist to remove blood and saliva and then continue scanning; this is helpful in large cases with multiple preparations. The accuracy and

durability of the model produced by some digital systems are also significant advantages. Made of resin, these models are significantly more abrasion-resistant and precise than gypsum models. Peripheral advantages of digital impressions include elimination of impression disinfection and the need for shipping and cast storage. Another advantage of digital systems is that the laboratory prescription accompanies the digital impression file and is completed before making the digital impression. In fact, the digital impression cannot be started till the laboratory prescription is completed.

These devices are also extremely patient friendly. They eliminate the uncomfortable, messy impression-taking process, which causes some patients to gag. A recent study reported that patients found digital impressions more convenient than conventional impressions and would prefer a digital impression in future visits. Digital impressions may shorten prosthesis delivery time, because Internet transfer of the file and fewer laboratory procedures (pouring stone models, mounting casts, etc.), reduce the total prosthesis fabrication time. In addition, there is the “wow factor” produced when the digital impression appears on the screen and the patient asks, “Are those my teeth?”

Digital impression systems do have some disadvantages. Like conventional impressions, the gingival margin must be captured to produce an accurate impression. Digital impressions require that the entire margin is exposed along with 0.5 mm of tooth structure apical to the margin to ensure a favourable emergence profile⁴⁵. Digital impression taking is also associated with a significant initial cost investment, an operating learning curve, the need for equipment repair and updates, and a cost for processing the digital impression. Also, a larger wand can be a problem for patients with restricted opening. The use of powder with some systems is a disadvantage that discourages some dentists from using a particular system.

Conclusion

Cross infection control is very important aspect of patient safety. Impression disinfection can prevent spread of infection from dental clinic to dental laboratory technician, patients and dental auxiliaries. It is the responsibility of the dentist to make appropriate choice of different impression procedures.

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FACE SHIELDS –A simple economical solution

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Abstract

Face shields are personal protective equipment devices that are used by many healthcare workers (e.g., medical, dental, veterinary) for protection of the facial area and associated mucous membranes (eyes, nose, mouth) from splashes, sprays, and splatter of body fluids. Face shields are generally not used alone, but in combination with other protective equipment and are therefore classified as adjunctive personal protective equipment. Although there are millions of potential users of face shields, guidelines for their use vary between governmental agencies and professional societies.

Key Words : Face shield, Healthcare workers, Guidelines.

Introduction

During epidemics/pandemics of highly infectious diseases, such as CoViD-19, HealthCare Workers (HCW) are at greater risk of infection than the general population. Personal Protective Equipment (PPE) offers a way of reducing the risk of infection, when treating patients, by minimising exposure to contaminated body fluids.

PPE have the least risk of contamination or infection for health care workers. For CoViD-19, this entails preventing droplets from entering mouth, nose or eyes and preventing them from contaminating the skin elsewhere. Dentists and members of the dental team work in close proximity, usually face-to-face, with patients often for sustained periods of time. As part of routine care, they are exposed to saliva and blood and carry out aerosol-generating procedures (e.g. use of high-speed air rotors and ultrasonic scalers).¹

Face shields are personal protective equipment devices that are used by many workers (e.g., medical, dental, veterinary) for protection of the facial area and associated mucous membranes (eyes, nose, mouth) from splashes, sprays, and spatter of body fluids. Face shields are meant to be used as barrier protection for the facial area and associated mucous membranes from airborne body fluids, expelled as a result of coughing, sneezing, etc. in medical, dental, and veterinary procedures (suctioning the airway, placing nasogastric tubes, obstetrical procedures, surgery, dental procedures, etc.). There are currently no standards for face/eye protection against biological hazards, and research

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data is scanty, recommendations for the proper selection of face shields for infection control must rely on currently available knowledge, the task to be performed and the anticipated risk associated with the procedure. The selection of the most appropriate face shield model(s) will depend on the circumstances of exposure, other PPE used concurrently, and personal vision needs.

Healthcare workers' faces have been reported to be the body part most commonly contaminated by splashes, sprays and spatter of body fluids. A face shield is classified as Personal Protective Equipment (PPE) that provides barrier protection to the facial area and related mucous membranes (eyes, nose, lips). A face shield offers a number of potential advantages, as well as some disadvantages, compared with other forms of face/eye protection used in healthcare and related fields.

The benefits of using a face shield

They are comfortable to wear at work, easy to don and doff while protecting a larger portion of the face. They are relatively inexpensive and do not act as a hindrance to breathing. They are easy to don and doff, can be comfortably worn along with the other face and eye PPE. Their usage may also increase the longevity of the face mask. They do not fog as easily as the goggles, they can be disinfected. This PPE does not require any special skills hence preferred to be worn by many. Shields are endlessly reusable, simply requiring cleaning with soap and water or common disinfectants. Shields are usually more comfortable to wear than masks,

and they form a barrier that keeps people from easily touching their own faces.

Disadvantage

The glare when used with dental loupes could be a hindrance to good vision at work, the peripheral fit is variable and not customised hence it could interfere with the operators smooth ergonomic movements.

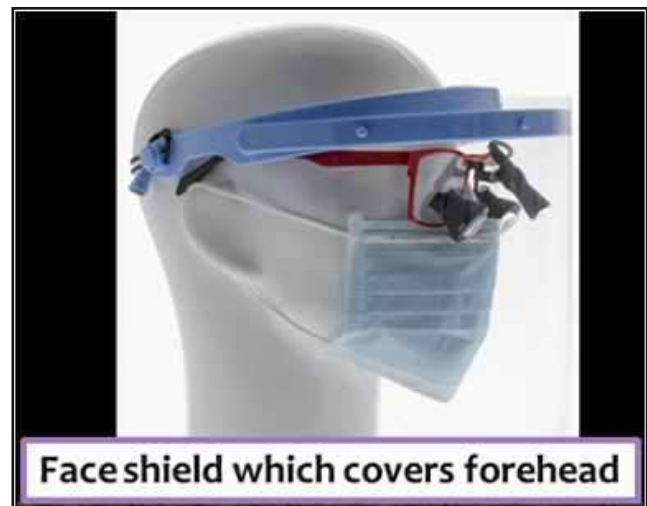
The major structural components of the face shield

- 1) **Visors** - Visors, also referred to as lenses or windows, are manufactured from several types of materials like polycarbonate, propionate, acetate, polyvinyl chloride, and polyethylene terephthalate glycol (PETG) and come in disposable, reusable, and replaceable models. They differ in their clarity and optical quality. Visors can be treated with advanced coatings to impart anti-glare, anti-static, and anti-fogging properties, ultraviolet light (UV) protection, and scratch resistance features to extend the life of the visor. Recommendations from the Centres for Disease Control and Prevention (CDC) are for visors that are of sufficient width to reach at least the point of the ear, as this will lessen the chances of the likelihood that a splash could go around the edge of the face shield and reach the eyes. In addition, visors should have crown and chin protection for improved infection control purposes.
- 2) **Frame** - The frame generally made of lightweight plastic, come in adjustable and non adjustable frames that either completely or partially encircle the circumference of the skull. There are also metal clip on frames worn like standard eye wear. The detachable frame version provides for easy change of the visor. The distance of the visor from the face can be increased to accommodate a pair of dental loupes, eye wear, respirators etc. This is achieved with a brow cap that also provides additional splash protection in the forehead area. This forehead foam cushion provides a comfortable seal to the forehead. A frame which covers the forehead completely is preferred.
- 3) **Suspension Systems** - There are a variety of face shield suspension systems on the market that offer either fully or partially circumferential attachment features. They are either fully adjustable or semi adjustable. OSHA's Bloodborne Pathogens standard (1910:1030 subpart (d)(3)(i)) states: "Masks in combination with eye protection devices, such as goggles or glasses with solid side shields, or chin-length face shields, shall be worn

whenever splashes, spray, spatter, or droplets of blood or other potentially infectious materials may be generated and eye, nose, or mouth contamination can be reasonably anticipated."

What to look for in a FACE SHIELD ???

- 1) Adjustable visor, with flip up option
- 2) Shielded air vent
- 3) Light cure filter
- 4) Foam cover
- 5) Reusable, replaceable visor
- 6) Flexible arms to avoid pressure points
- 7) Sufficient space to wear loupes and eyewear with faceshield.
- 8) Custom mount to mount the light of the loupes outside and above the visor.
- 9) Anti fog
- 10) Scratch resistant



Maintenance for reusable face shield

1. Immerse in or wipe with neutral detergent and warm water solution, use mechanical action to remove any visible soiling, then quickly rinse with clean water; rinse if needed.
2. Immerse in or wipe with hospital disinfectant solution for the required contact time.
3. Rinse with clean water (sink if available or by immersing in a bucket of clean water) to remove any residue.
4. Fully dry (air dry or use clean absorbent towels).

Manufacturers should be consulted for their guidance and experience in disinfecting their respective products. Chlorine-based disinfectant (0.1% chlorine solution) recommended over alcohol as alcohol may damage and discolor plastic and deteriorate glues over time; note that it may also remove anti-glare and anti-fogging properties of the eye protection.

Note: If reprocessing disposable face shields on a time-limited basis, they should be **dedicated to one HCW**. Solutions must be regularly replaced as they will quickly become contaminated.³

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Conflicts of interest

There are no conflicts of interest

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Pulse Oximeter and its role in management of Hypoxia

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Abstract

Pulse oximeters provide a cost effective and non-invasive method of assessing saturation of oxygen. It uses red and infrared light for assessing level of oxygenated haemoglobin in blood. Oxygen saturation less than 95%, patient becomes hypoxic and requires intervention to maintain oxygenation to prevent organ damage. However, in some Covid-19 cases there is a condition called happy hypoxia; where patient's SpO₂ levels are low without patient developing any symptoms. Such patients deteriorate rapidly and are the leading causes of mortality in Covid-19 related cases. Use of pulse oximeters for OPD screening, door-to-door surveys in hotspot areas, screening at medical and dental hospitals has proven to be an important tool for detection of hypoxemia and reducing mortality by following proper management protocols.

This article will focus on principle, working and uses of pulse oximeter and its crucial role in screening and management of hypoxia.

Key Words : Pulse oximeter, Hypoxia, oxygen saturation.

Introduction

Pulse oximeters are simple and relatively inexpensive devices that provides quick and painless measure of oxygen saturation. However, like most medical measuring devices, proper use and accurate interpretation should be performed by medical or paramedical personnel to avoid ambiguous information. This article reviews information regarding the correct utilization of pulse oximeter device, and also on interpretation of the results obtained. The information in this article in no way replaces the need to be familiar with guidelines on managing hypoxaemia in asthma, Chronic Obstructive Pulmonary Disease [COPD], pneumonia or other cardiorespiratory disorders.

How to use a Pulse Oximeter safely?

Pulse oximeters measure blood oxygen saturation through spectrophotometry.

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Oxygen saturation is basically the amount of oxygen dissolved in blood and it is measured based on the detection of oxyhemoglobin and deoxyhemoglobin.¹ Oxyhemoglobin and deoxyhemoglobin have significant different absorptions in the red and infrared spectra. Oxyhemoglobin absorbs more of infrared spectra and very little of red spectra whereas deoxyhemoglobin absorbs more of red spectra and less of infrared spectra. Thus, pulse oximeters depend on this difference and emit two wavelengths of light, 660 nm in the red spectra and 940 nm in the infrared spectra. This light is emitted through the photodiode from one arm of the pulse oximeter, it passes through the finger to reach the detector at the opposite arm. The arterial blood volume fluctuates during the cardiac cycle, whereas the venous, capillary blood and the volumes of the rest of the tissues tends to remain the same, this assists the pulse oximeter to detect the SpO₂ of only the arterial blood.² The non-absorbed light is detected by the photodetector and is divided into two components: a “direct current [DC]” and “alternating current [AC]”. The stable DC component refers to the light absorbed by the tissue, venous blood, and non-pulsatile arterial blood while the AC component represents the pulsatile arterial blood. It then

calculates the absorption ratio using the formula:

$$R = \frac{(Ac660)/(Dc660)}{(Ac940)/(Dc940)}$$

SpO₂ is determined from a table that is stored on the memory calculated with empirical formulas. A ratio of 1 represents a SpO₂ of 85 %, a ratio of 0.4 represents SpO₂ of 100 %.^[1]

However, a false negative result can be obtained due to false nails/ nail polish and ambient light.

Hence, the following care must be taken before performing the test.

- Nail polish should be removed from the finger that will be used for measurement. Any acrylic nails present might also adversely affect the result.
- Strong ambient light might adversely affect the readings.
- The use of correct probe type should be ensured.
- A waveform is required by pulse oximeters. Poor circulation due to cold or low blood pressure affects the readings. Also, the pulse wave may be reduced on raising the arm or squeezing the finger and affect the signal.
- A good signal on the oximeter should be ensured which could be a regular waveform or a flashing light – varies with the model.
- Manually counted pulse should be within 4-5 beats per minute of the measurement of the pulse oximeter.
- Vasodilating cream should be applied or hands should be warmed up if the signal is poor.
- The hand should be at the level of the heart and squeezing of the finger should be avoided.
- As the reading takes time to stabilise, the oximeter should be kept in place for at least a minute, or longer.³ (Figure I)



Figure I- Pulse oximeter SpO₂- Oxygen saturation
PRbpm- Pulse rate (beat/minute)

Which finger is most suitable for pulse oximetry?

The index finger dominantly is supplied by the ulnar artery. But middle finger receives both ulnar and radial artery blood supply. Mizukoshi et al. have investigated the most suitable finger for the measurement of the pulse oximetric monitoring and concluded that the middle finger of dominant hand had the highest and possibly the most accurate SpO₂ measurements. Higher perfusion in the middle finger seems reasonable to expect the highest and most accurate SpO₂ value.⁴ (Figure II)



Figure II- Test performed with middle
finger of dominant hand.
SpO₂- 99% PR- 74 bpm

What is Normal?

The normal levels of oxygen saturation is at 95% or more in adults and in range of 85-90% in children.⁵

Accuracy of pulse oximeter-

The accuracy of a pulse oximeter is evaluated by the differences between the oxygen-saturation values measured by the pulse oximeter and measured by co-oximetry in extracted blood, the gold standard. Maximum manufacturers claim an accuracy of 2%. However, a greater inaccuracy in SpO₂ measurement by pulse oximeter is seen in critically ill patients, as the empirical calibration of pulse oximeters is based on examinations of healthy volunteers which might not be applicable to critically ill patients. Also, this discrepancy is accentuated in neonates.⁶

Limitations of pulse oximeter-

Limitations of oximeters may result in erroneous readings.

- Oximetry may not be able to detect hypoxemia in patients with high arterial oxygen tension (PaO₂) levels, due to

the sigmoid shape of the oxyhemoglobin dissociation curve.

- High levels of COHb and MetHb adversely affect the accuracy of the readings as conventional pulse oximeters can only detect deoxyhemoglobin and oxyhemoglobin⁷
- Intravenous dyes used for diagnostic investigations, low perfusion states, pigmented patients and patients with sickle cell anemia may report inaccurate readings.^{8,9}
- Various sources of ambient light can alter the readings as they can also produce the same two wavelengths of light as those used by pulse oximeters. Fluck and colleagues used five separate ambient light sources and found the highest difference between the control and any of the light source to be less than 5%.
- Nail polish has also shown to interfere with pulse oximetry readings.¹⁰
- Motion of the patient is also considered as an substantial cause of error and false alarms. To reduce the motion artifacts, various several signal processing techniques have been incorporated.
- The knowledge about the accurate use of pulse oximetry is quite restricted. A study showed 37% of critical care nurses did not know about inaccuracies due to patient motion, 15% weren't aware about the poor signal quality and 30% thought that the readings were same as that obtained from arterial blood gas analysis.¹¹

Pulse oximeter Vs arterial blood gas

Arterial blood gas analysis, though provides an accurate measure of oxygen content of blood, it requires a painful arterial puncture and other limitations such as:

- It reflects only the last few minutes of cardiorespiratory function
- Expensive armamentarium is required.
- Competent personnel are required to perform the arterial stab

On the other hand, pulse oximetry is cost effective, painless and non-invasive. Monitoring change in oxygenation is pretty straight forward. However, at times it might provide inaccurate results and an inability to measure ventilation.

In the COVID-19 pandemic many fake messages on malicious apps are being circulated on social media. Fraudulent claims have come up that instead of using the oximeter, one can measure the oxygen saturation by placing the fingers or fingerprint on the mobile light using these apps. Such apps can be a threat to personal information and data being stolen and hence should be cautiously used.

Happy hypoxia

In a normal person, the blood oxygen saturation is at around 95% or more. In conditions affecting the lungs this value tends to drop below the normal level. This condition is referred to as hypoxemia.

Blood oxygen levels below 90 percent are considered to be too low and patients generally require oxygen therapy. Hypoxic patient might present with shortness of breath and chest pain. However, in happy hypoxia (also called as silent hypoxia), the person shows no such symptoms and is commonly seen in COVID-19 patients.

A pulse oximeter can be used to detect blood oxygen levels in a COVID-19 patient. Also, in conditions like pneumonia, the reduction in blood oxygen saturation levels are accompanied by fluid collection and raised carbon dioxide levels in the lungs. The latter is what makes them unable to breathe properly instead of the low blood oxygen levels.

Hypoxemia, if left unchecked, leads to a condition called hypoxia (low tissue levels of oxygen), which can cause organ damage.¹²

A study of 16 COVID-19 patients with very low levels of oxygen (as low as 50%; normal blood oxygen saturation is between 95 and 100%), without shortness of breath or dyspnoea, found that "several pathophysiological mechanisms account for most, if not all, cases of silent hypoxemia. This included the initial assessment of a patient's oxygen level with a pulse oximeter."¹³

Screening and management of happy hypoxia-

Supplemental oxygen is the first step in facilitating oxygenation. In patients with refractory hypoxemic e.g in respiratory failure (increasing shunt fraction), timely intubation and invasive ventilation support may be superior to non-invasive ventilation in boosting transpulmonary pressure. COVID-19 patients are exquisitely positive end expiratory pressure (PEEP) sensitive. Tolerance for modest permissive hypercapnia minimizes ventilator-induced lung

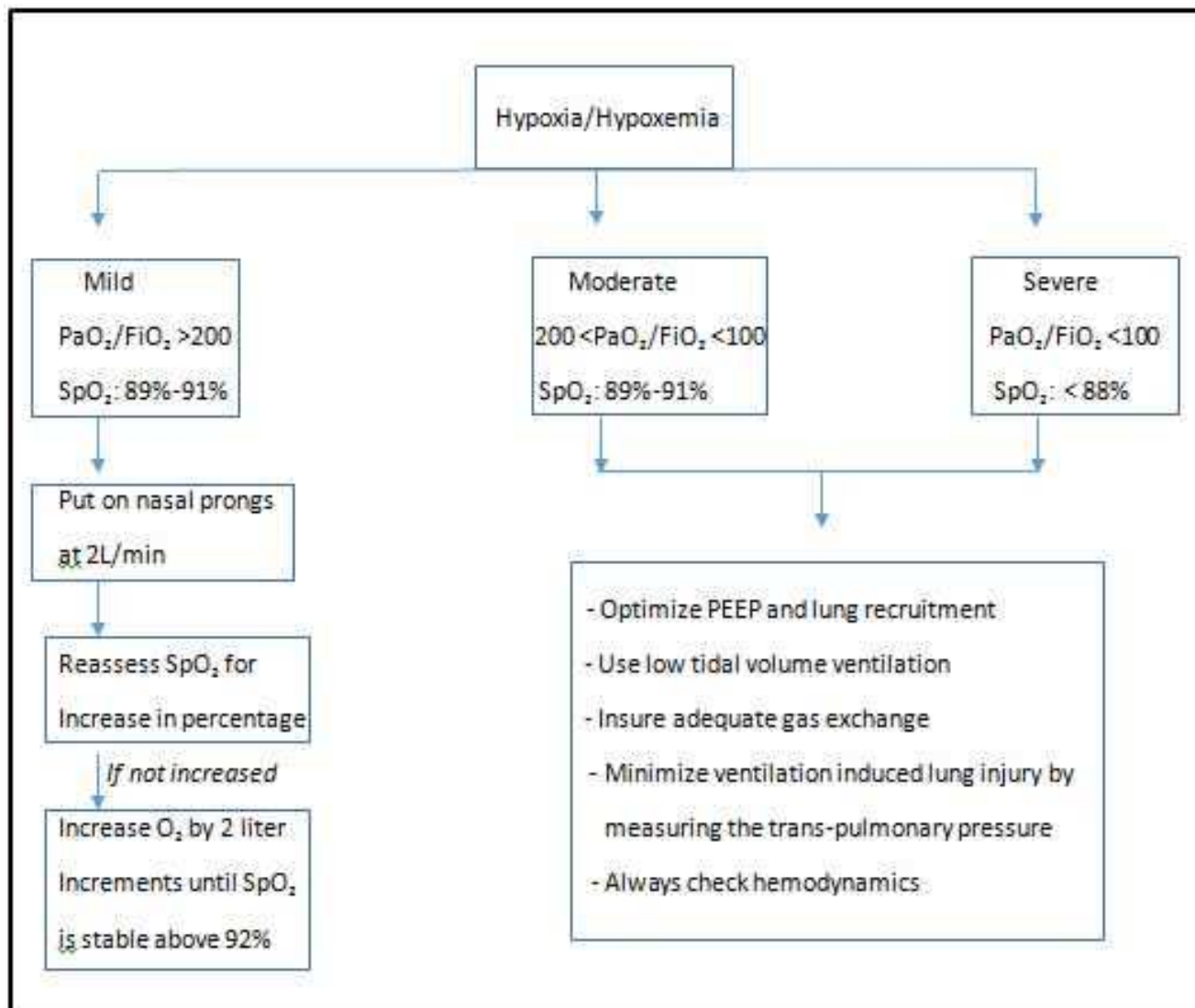


Figure III- Flowchart depicting management of hypoxia/ hypoxemia

injury (VILI). Since prone position recruits the dorsal lung regions and diverts blood flow to these caudal regions, it may have particular importance in CoViD-19 when used early and in relatively long sessions. Although further trials are needed to evaluate the impact on disease severity and mortality, several authors confirmed that awake proning can improve oxygenation in CoViD-19.^{14,15} **(Figure III)**

Summary and Conclusion-

Pulse oximeters provide a cost effective, quick and non-invasive method of assessing oxygenation

There are a number of technical points which must be understood before an accurate saturation can be reliably obtained

Interpretation of the results requires an understanding of the patient's condition and importantly whether the patient is unstable and acutely unwell or whether they are in a stable phase of a chronic illness.

In relation to CoViD-19 pandemic, health department officials claimed that they were continuously checking the health of people, measuring blood oxygen levels of patients, especially in high-risk groups and living in hotspots. This is also being done while conducting door-to-door surveys in hotspot areas, also in OPDs in Medical hospitals and clinics including dental Hospitals & Dental clinics.

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Conflicts of interest

There are no conflicts of interest.

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How dentists can manage their finances in the post CoViD -19 scenario ??? - Part I

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Abstract

The most prudent upcoming challenge in the post CoViD-19 era is the increase in cost of oral health services which can limit the patient access to health care as limited resources lead to rationing and delaying and denial of care to people in need. Practicing dentistry (in a full fledged manner) in the post-CoViD -19 era is never going to be the same as the pre-CoViD -19 era. Dentistry will be one of the costliest professions in India if the majority of Indian dentists apply all the latest norms and practice guidelines upon the resumption of the regular operations of dentistry. As dentists and more importantly, as health care professionals we have to play our part in preparing our patients for this new reality brought to us in our face by CoViD -19. Many dental clinics in whole India kept shut for long and even today are running low key with a risk of their area turning into a containment zone anytime. Yet, a few dentists in metropolitans are still offering just the emergency services. The power of compounding vis-à-vis CoViD -19 has finally set in and it is now the time to play further safe and do the calculations in our home ground and be ready for the scenario mathematically when we start the clinics fully. This is actually the time to analyze "the rising costs in the oral health care services and plan on how to reboot and restart the dental clinics" when the barriers are lifted fully to run the same with full aplomb.

Introduction

The arrival of CoViD-19 to the rest of the world especially Europe, which later became an epicenter of the pandemic, was not unexpected of it, having originated in Wuhan, China, Asia in late 2019. The speed of reaction and type of response to this disease around the world has been very variable according to differing healthcare systems, economies and political ideologies. Routine dental care was suspended in the rest of the world in January 2020 and six months later, it is now starting to get back to normal over there. Even emergency dental care was provided with advice on strict personal protection and measures to reduce and avoid production of droplets and aerosols, use of high-volume aspiration as had been recommended during the earlier SARS outbreak. The New York Times reminded the world that dentistry had the most risk of any profession in every aspect in relation to CoViD-19 exposure.¹

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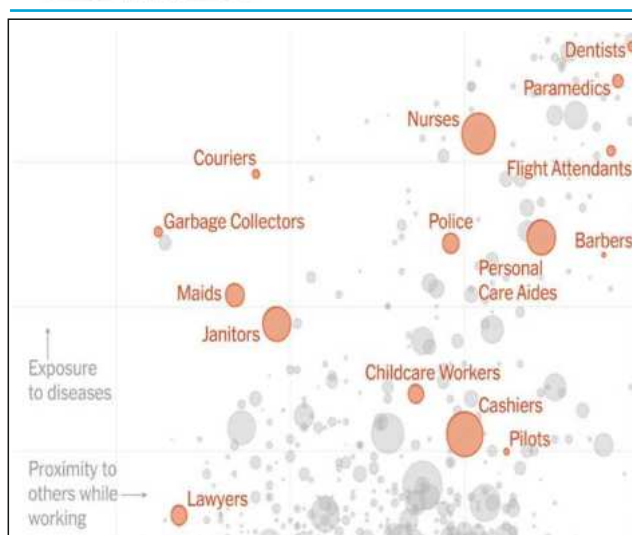


Fig 1 - (Image Source: Google – The New York Times)

Let us begin talking of the problems of CoViD-19 along with the challenges of **COSTING** associated with it in the aftermath phase. In the post CoViD-19 era, improving personnel safety in healthcare environments through appropriate use of Personal Protective Equipment (PPE) like body cover, gloves, gowns, goggles and face masks would be paramount for every dentist and complete staff for dentists all over the world, especially India. Add to this the various other inventory buys like negative ion generator, fogging machines, hepa filters, fumigation machines, hi-vacuum suctions, extra-oral suctions, UV lighting systems etc. which too are going to add up to the initial investment post the CoViD-19 mayhem. Don't forget the regular replenishment for the cost of disinfectants, quaternary ammonium compounds, sodium hypochlorite and absolute alcohol / isopropyl alcohol based chemicals. Meeting all such

expenses would indirectly mean an intensified care factor for the patient by adopting enhanced patient safety measures. We all are very familiar in dentistry with the principle of universal precautions for cross-infection control based on an understanding that we may not know whether a patient has the potential for disease transmission or not. The CoViD-19 is here to stay as far as we can think of the thought process on this. Whatever the PPE – GSM requirements for a dentist finally get settled and approved and whether they are either disposable or if reusable are properly cleaned, laundered, autoclaved and stored as they are done usually for other diseases in many other countries. The compliance concerning PPE based on personal preferences like increased comfort (better fit, ergonomics, less allergies and body temperature regulation) doesn't usually translate into a better safety necessarily because at present, the comfort is directly equitable to the cost in India for those being manufactured here. We are having PPE kits from INR 100 (IIT Kanpur) to INR 5000 (imported ones from Europe / American subcontinent) with about 10 options in between this price range and they are supposed to be disposable after 1 infected patient. An ideal or some sort of comfortable PPE kit is in the range of Rs. 800 (Indian make) which means minimum one for you and one for your assistant and if you are fond of 6-handed dentistry, two for your assistants. Ideally, PPE is meant to be used for one patient and disposed of after that and in this case scenario assume a patient coming in for a restoration (filling) for which you earlier charged Rs. 1000 (suppose as an example). Just add up the bare minimum cost of 2 PPE's of you and your assistant to the procedure along with the cost of disinfection and other standardized protocols.^{2,3}

Won't the landing cost of one simple restoration zoom up to around Rs. 3000?

Would it be feasible and practical?

If I give you the option between choosing your lives and saving some money, which option will you choose?

We all know the answer to it, whether we want to accept it or not?

We see guidelines concerning routine dental patients testing popping up every now and then these days. All this and many more such aspects will add up the cost of doing dentistry in the post CoViD-19 era. The escalating cost usually leads to an inverse care law (a pun actually on the inverse square law of physics).

What does this inverse care law actually mean?

The availability of good medical or social care tends to vary inversely with the need for the population served. This inverse care law operates more completely where medical care is most exposed to market forces, and less so where such exposure is reduced. The market distribution of medical care is a primitive and historically outdated social form, and any return to it would further exaggerate the misdistribution of medical resources. It was proposed by Julian Tudor Hart in 1971 and has since been widely adopted as a pun on inverse-square law, a term and concept from physics.³

Otherwise also speaking, before the pre-CoViD-19 catastrophe, many of the dental practitioners believed that the cost depends on the experience of the dentist too apart from lab work. Let us just assume, these added costs (as mentioned above) in addition to an already expensive dentistry sojourn (before CoViD-19), now, in the post CoViD-19 scenario. A calculation of value is an important and often required element of dental practice transitions. Calculation and management of the costs and expenses relating to clinic (business) overheads, especially when done on a monthly basis is the one of the most important tools for success in any dental practice. The 4 most common reasons that dentists don't take time out to determine the percentage of their clinic's overhead costs and expenses include the following:

- a. The common Indian habit of procrastination
- b. Just too lazy
- c. Don't have the needed acumen to calculate the same
- d. Simply, too busy to invest time in such activity.

Most of the Indian dentists fall into the last category whether actually busy or not. In light of the myriad of tasks and duties that must be completed in a given day, many dentists feel they don't have enough time to calculate overheads on a regular basis. However, the ability to calculate and exert control over monthly overhead costs is vital to the continued success of any dental practice. Therefore, it is imperative that each dentist develops an effective plan which enables them to track their monthly expenses. If this is done, the clinic's overheads can easily be tabulated. The one aspect which will surely come in handy after calculating monthly costs and expenses and determining the total monthly overhead is that many dentists will have to lower their useless expenses.

The commonest business principle which is followed otherwise in business circles to decrease overhead is to increase the production by working more hours, improving scheduling or by increasing selling price (fees, in our case). Sadly, this principle of working more hours defies logic as per the 80-20 Pareto principle.^{3,4}

In Post-CoViD-19 era, the way I can envision it, many things are going to change forever in dentistry, whether or not all dentists wish to adopt the same or not. I strongly believe, the economics is going to change drastically for most of the dentists and accordingly, the cost factor will have to be taken into account for the same. We surely will need to go back to our basics of knowing our figures and numbers and that would also mean eliminating the unwanted expenses when the more prudent ones start taking the precedence. We all will be having less working man-hours now effectively, considering the addition of intricacies of donning and doffing the PPE suits every now and then. So, the planning would have to imperatively rotate around the aspect of treating less, but charging more vis-à-vis the aspect that the input expenses are now all set to go higher.¹⁻⁴

Let me first deal a bit on increased charging.

How are we going to achieve that?

Revenue/charging

I would suggest that the Pareto's principle of 80-20 is all set to play a bigger role in our dental clinics also, as it does in most spheres of business and life. I am not going to go into the intricate details of this principle, per se for lack of space. The understanding of the charging part begins from the breakdown of our income from our record-keeping setup.

We have to first analyze where does the majority (80%) of our clinic come from? Which services are the most predominant ones contributing to our revenue, primarily in clinic (80%)?

One can be a Periodontist but earning may be coming mostly from crown and bridge. The start, thus, has to be from the minute aspects. So, have a breakdown first to arrive at those services which contribute to the 80% income category (believe me, those will be just a handful) and those falling in the 20% income contribution (they would surely be a lot in number) category. Let us assume that you have arrived at a figure that your overall costs are going to increase by 25% as increased costs.

So, how do you decide the raise?

Do you make a raise in all services in clinic?

My answer would be A 'No'.

This is a world of smart phones, thus, smartness is expected in this smart age as well from us.

We don't have to raise all our services by the escalated charge but just the handful of those services contributing to our 80% revenue.

A simple formula would be to increase 25%–30% in the 80% contribution category services and 10%–15% in the services of 20% category, so that your average profit increase still comes up to almost 25%. I believe this should be the basic formula to start with after resumption of dental services and as we arrive at the exact percentage increase in costs after 2–3 months of working, the tweaking can then be done accordingly based on the actual numbers. Some amount of raise in consultation fees is also desirable; although not on the exorbitant side would be the suggestible part by me.⁵⁻⁸

Raising every service by 25%–30% sends across a wrong message to your target group as well. I will demonstrate the above via a few examples (different scenarios) below.

Scenario 1

Assume the average revenue (gross collection/income) per month of a XYZ clinic is Rs. 1 Lac.

The Clinic Expenses/Overheads are generally presumed in the range of 50% – Rs. 50,000.

Thus, Carry Home Net Income is also in the range of 50% – Rs. 50,000 (Rs. 1,00,000 – Rs. 50,000).

Assume the enhanced expenses are in the range of 25% increase – Rs. 12,500 (25% of Rs. 50,000).

Total expenses then becomes Rs. 50,000 + Rs. 12,500 = Rs. 62,500.

If you don't increase the charges, your carry Home Net Income would be down to 75% – A fall of 25% – Rs. 37,500 (Rs. 1,00,000 – Rs. 62,500).

The above is in case of the same revenue being generated in immediate post CoViD-19 scenario which is highly unlikely to happen, at least immediately.

Scenario 2

Let us presume a situation where the monthly revenue or gross collection falls by 25% – a highly likely possibility.

Assume the average revenue (gross collection/income) per month of a XYZ clinic NOW post CoViD-19 is down by 25% from Rs. 1 Lac to Rs. 75,000.

The Clinic Expenses/Overheads are in the range of 50% – Rs. 37,500.

Add your enhanced expenses which are in the range of 25% increase – Rs. 9,375 (25% of Rs. 37,500) – let us round it off to Rs. 9,500 for ease of calculation.

Total expenses is Rs. 37,500 + Rs. 9,500 = Rs. 47,000.

So, if we don't raise our charges, our carry Home Net Income would come down to 56% – A fall of 44% – Rs. 28,000 (Rs. 75,000 – Rs. 47,000).

Imagine for a 25% fall in income, our carry home will reduce by 44%.

Scenario 3

Let us presume a situation where the monthly revenue or gross collection falls by 33% – quite a possibility.

Assume the average revenue (gross collection/income) per month of a XYZ clinic NOW post CoViD-19 is down by 33% from Rs. 1 Lac to Rs. 67,000.

The Clinic Expenses/Overheads are in the range of 50% – Rs. 33,500.

Add your enhanced expenses which are in the range of 25% increase – Rs. 8,375 (25% of Rs. 33,500) – let us round it off to Rs. 8,500 for ease of calculation.

Total expenses is Rs. 33,500 + Rs. 8,500 = Rs. 42,000.

So, if we don't raise our charges, our carry Home Net Income would come down to 50% – A fall of 50% – Rs. 25,000 (Rs. 67,000 – Rs. 42,000).

Imagine for a 33% fall in income, our carry home will reduce by 50%.

Scenario 4

Let us presume a situation where the monthly revenue or gross collection falls by 50% which is although a remote possibility but not unlikely.

Assume the average revenue (gross collection/income) per month of a XYZ clinic NOW post CoViD-19 is down by 50% from Rs. 1,00,000 to Rs. 50,000.

The Clinic Expenses/Overheads are in the range of 50% of above – Rs. 25,000.

Add your enhanced expenses which are in the range of 25% increase – Rs. 6,250 (25% of Rs. 25,000) – let us round it off to

Rs. 6,500 for ease of calculation.

Total expenses is Rs. 25,000 + Rs. 6,500 = Rs. 31,500.

So, if we don't raise our charges, our carry Home Net Income would come down to 37% – A fall of 63% – Rs. 18,500 (Rs. 50,000 – Rs. 31,500).

Imagine for every 50% fall in income, our carry home will reduce by 63% (Alarming).

Solution

You have to plan to increase via Pareto principle phenomenon:

1. 80% of paying services (although handful in number) escalated by 25%–30% (average 27.5%) – the average raise contributing to output is 22%.
2. 20% of services (a bigger lot in number) escalated by 10–15% (average 12.5%) – the average raise contributing to output is 2.5%.

So, adding up the 2 above 22% + 2.5% = 24.5% or close to 25% increase in revenue.

Scenario 5

Now, let us apply the above solution in Scenario 1 mentioned above.

Assume the average revenue (gross collection/income) per month of a XYZ clinic is Rs. 1 Lac.

If now, raising the charges by applying the above formula of 24.5%.

Enhanced Revenue now after raise – the revenue becomes close to Rs. 1,25,000 (rounded off from Rs. 1,24,500).

The Clinic Expenses/Overheads are in the range of 50% (of the original income before raising costs) – Rs. 50,000.

Adding enhanced expenses which are in the presumed range of 25% increase – Rs. 12,500 (25% of Rs. 50,000).

Total Expenses – Rs. 62,500 (Rs. 50,000 + Rs. 12,500).

Carry Home Net Income Now would be plus by 25% as well to 125% – Rs. 62,500 (Rs. 1,25,000 – Rs. 62,500) – A raise in carry home amount.

This is in case of the same revenue being generated in post CoViD-19 scenario which is not a possibility, at least in immediate future.

Imagine if the revenue generated is same, but with a raise in charges selectively and with increased costs as well post

CoViD-19, our carry home amount will rise by 25%.**Scenario 6**

Let us take up a different scenario and expect the monthly revenue or gross collection to fall by 25% – a highly likely possibility.

Now, let us apply the above solution in Scenario 2 mentioned above.

Assume the average revenue (gross collection/income) per month of a XYZ clinic NOW post CoViD-19 is down by 25% from Rs. 1 Lac to Rs. 75,000.

If we apply the same Pareto principle system of charges raise as done above – apply the 24.5% or 25% to our revenue.

Addition of 25% (average enhanced charges) to Rs. 75,000 = Rs. 93,750 – rounding it off to Rs. 94,000 for ease of calculation.

The Clinic Expenses/Overheads would also still be in the range of 50% (of the original income before raising costs) – Rs. 37,500.

Add your enhanced expenses which are in the range of 25% increase – Rs. 9,375 (25% of Rs. 37,500) – let us round it off to Rs. 9,500 for ease of calculation.

Total expenses is Rs. 37,500 + Rs. 9,500 = Rs. 47,000.

Carry Home Net Income now in this case with a 25% dip in revenue would be down to 94% – A fall of only 6% – Rs. 47,000 (Rs. 94,000 – Rs. 47,000).

Imagine for a 25% fall in income, but with a raise in charges selectively and with increased costs as well post CoViD-19, our carry home amount will reduce by just 6%.

Scenario 7

Let us take up a different scenario and expect the monthly revenue or gross collection to fall by 33% – quite a possibility.

Now, let us apply the above solution in Scenario 3 mentioned above.

Assume the average revenue (gross collection/income) per month of a XYZ clinic NOW post CoViD-19 is down by 33% from Rs. 1 Lac to Rs. 67,000.

If we apply the same Pareto principle system of charges raise as done above – apply the 24.5% or 25% to our revenue.

Addition of 25% (average enhanced charges) to Rs. 67,000 = Rs. 83,750 – rounding it off to Rs. 84,000 for ease of calculation.

The Clinic Expenses/Overheads would also still be in the range of 50% (of the original income before raising costs) – Rs. 33,500.

Add your enhanced expenses which are in the range of 25% increase – Rs. 8,375 (25% of Rs. 33,500) – let us round it off to Rs. 8,500 for ease of calculation.

Total expenses is Rs. 33,500 + Rs. 8,500 = Rs. 42,000.

Carry Home Net Income now in this case with a 33% dip in revenue would be down to 84% – A fall of only 16% – Rs. 42,000 (Rs. 84,000 – Rs. 42,000).

Imagine for a 33% fall in income, but with a raise in charges selectively and with increased costs as well post CoViD-19, our carry home amount will reduce by just 16%.

Scenario 8

Let us take up a different scenario and expect the monthly revenue or gross collection to fall by 50% which is a remote possibility although not unlikely.

Now let us apply the above solution in Scenario 4 mentioned above.

Assume the average revenue (gross collection/income) per month of a XYZ clinic NOW post CoViD-19 is down by 50% from Rs. 1 Lac to Rs. 50,000.

If we apply the same Pareto principle system of charges raise as done above – apply the 24.5% or 25% to our revenue.

Addition of 25% (average enhanced charges) to Rs. 50,000 = Rs. 62,500.

The Clinic Expenses/Overheads would also still be in the range of 50% (of the original income before raising costs) – Rs. 25,000.

Add your enhanced expenses which are in the range of 25% increase – Rs. 6,250 (25% of Rs. 25,000) – let us round it off to Rs. 6,500 for ease of calculation.

Total expenses is Rs. 25,000 + Rs. 6,500 = Rs. 31,500.

Net Carry home profit in this case with a 50% dip in revenue would be down to 62% – A fall of 38% – Rs. 31,000 (Rs. 62,500 – Rs. 31,500).

Imagine for a 50% fall in income, but with a raise in charges selectively and with increased costs as well post CoViD-19, our carry home will reduce by 38%.

Bottomline

So, even if the revenue falls by 33% or 50%, the dip in carry home income won't be that substantial if we stick to Pareto principle system of raising charges selectively in our practice. It also conveys a message that hiking all types of pricing in general for all the services of a dental clinic is not going to serve much purpose especially those services which we are not doing much in our practice anyways. The aim should not be to send across a message that we have hiked charges exorbitantly to our target group rather that we are offering latest facilities following the strictest guidelines and protocols in the form of value addition and all that comes at a price escalation (in only a few services). Thankfully, we don't have to explain the same as most people are learned in that sense of education vis-à-vis the awareness on TV news channels and internet currently regarding enhanced safety protocols. 'Seeing is believing' these days and when they see the same, they will pay accordingly keeping their safety paramount and also spread the view about you. There is an adage very commonly used in marketing – If you can't convince them, then confuse them.

Summary of the Charging part

We have to genuinely think that the baseline of the above system of raise was record-keeping and further segregation as to where does the 80% income come from, which is **not followed** meticulously in most of the small to middle level clinics in India, although it is mandated to be diligently resorted to as per the Dental Council of India regulations, Revised Guidelines 2014. So, that should be the first step to start after the lockdown for most dental clinics conscientiously post CoViD-19. Realistically, the other uncommon way of calculating the same in such clinics is via their lab bills. Most small to middle level clinics have their majority income (60%–80%) courtesy lab work and for this usually, kacha (informal) lab bills are retained by them for calculation which can serve as a baseline for above calculations and serve as a roadmap for them.

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Conflicts of interest

There are no conflicts of interest.

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How dentists can manage their finances in the post CoViD -19 scenario ??? - Part II

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The first catch here is that I have taken expenses as 50% average whereas in reality, it might be 30%–40% or 60%–70% (less or more). Secondly, I have kept the average carry home fixed at Rs. 50,000 and made the calculations of increase or decrease assumptions accordingly. Thirdly, with every percentage fall in revenue, I have proportionately reduced the expenses/overheads in accordance with decrease in income whereas in actuality, some fixed expenses may still be there which are fixed and not reduced and only the variable expenses are reduced. The reason for doing so in the manner as mentioned above was that, if my calculations were difficult taking fixed and variable expenses separately, the same would have gone like a bouncer from the head of most of the reading dentists. After all, most of us opted for Medical in 10+1 standard for the fear or hatred for Mathematics. My basic idea was to put across the simple calculation that identifies with the hoi-polloi of dentist population. If I opt for the real time calculations for a standardized clinic, the actual figures will be skewed a lot more and the carry home will decrease more. I fully understand, however, that each clinic is unique and has different resources, so the best answers are known by the one who handles those. My basic aim is just to give you all a road map for calculation for the above. The rosy picture or the saving grace in my above examples is that I have taken the figures of revenue on the higher side (Rs. 1 lac) and expenses at almost 50% range (Rs. 50,000) and which will genuinely not be affected great deal with a rise or fall of revenue (if resorting to fixed–variable costing type calculation) as shown in 8 scenario examples above as most small to middle sized clinics would slot more or less in this range only. The variation would come if the clinic size is really small and revenue on much lesser side than the average shown in examples above. The parity of this formula would then be tough to justify over there and other ways and means would have to be resorted for the same.⁹⁻¹⁰

So, this was a small attempt to demonstrate revenue or charging part.

What about expenses and overheads?

In a survey done very recently amongst dentists of mixed group online, there were many stark findings noted.

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The interesting part below this when asked how many of you will invest for gadgets and which ones post CoViD-19?

- No Investment – 5%
- High Volume Suction – 38%
- Hepa filters – 38%
- Extra-Oral Suction – 49%
- PPE – 87%
- Fumigation Machine – 63%
- The rest upgrades were desirable as negligible (less than 1%)

Thus, all this above will be leading to an increased costing in dentistry in coming times. The initial investments will increase, along with running expenses (consumption) along with overheads.

How to deal with that?

Expenses/overheads

The facebook dentistry approach to dentistry too, will have be shunned away to indulge in an impulsive buy just because of the FOMO (fear of missing out) approach. We have to closely examine each category of expenses of clinic and see where the mistakes are being committed and under which sector. We would also have to look at our material buying pattern (consumption wise) and the ones we bought in the hope of a good discount in the garb of bulk buying but due to lack of consumption, they ended up being expired and rather became a loss making facet for us in the longer run. All such bargain buys will have to be eliminated from future

purchases. The demand in the post CoViD-19 era will have to be re-estimated and the spending channelized accordingly in that direction. Inventory Control, thus, acquires an assumingly more importance in times to come. The cost-revenue-expense is a jigsaw puzzle which will need to be solved very soon by all of us lest we should not drift into a loss zone.¹¹ As I discussed above about applying the Pareto principle styled price raise in charges in our dental clinics and with that, even if there is a drop in the sales, the loss in carry home income won't be much.

Let us now just see the numbers below for costing as an example in a table below for a normal dental clinic setup which is moving with changing times:

	Average Monthly Gross Collection'	Figure Assumption	2,00,000 (in INR)
S. No.	Over Head Name'	Monthly Costs – Amount	Expenses Percentage Contribution
1.	Staff	30,000	15%
2.	Lab costs	20,000	10%
3.	Materials	10,000	5%
4.	Occupancy expenses like rent, office utilities, repair and maintenance, office furnishings	10,000	5%
5.	Administrative costs (Depreciation, accounting, licenses, dues, telephone, internet, website renewal etc.)	10,000	5%
6.	Marketing expenses	6,000	3%
7.	Personal improvement via continuing education	14,000	7%
	TOTAL Monthly Overhead	1,00,000	50%

The above is one way of calculating the expenses. The title and content from serial number 5-7 may vary but the amount may remain the same. As per the above table, the overheads are in the range of 50% and the carry home net amount is Rs. 1 Lac (out of gross 2 lacs). Another way can be by looking at the balance sheet or the Income & Expenditure sheet filed by our CA's. The easiest way is to have a look at the various overhead categories and understand your income and expenditure account aka the profit and loss statement (Fig II) of previous financial year along with a similar expense sheet of the current financial year's first or second quarter. These expenses, naturally, will indicate a loss of our profits, which in hindsight, will determine what causes us greatest overheads. These ones are needed for an easy reference and help us reduce our fretting about our profit and loss, in general and expenses (overheads) in specific. Rent, bills, materials and inventory are a few aspects which may not be first on our list of concerns in our busy OPD of treating patients, but overhead is a key factor in any business and dentistry is by no means, an exception.

DEMO ACCOUNT
INCOME & EXPENDITURE A/C FOR THE YEAR ENDED 31.03.2019

<u>EXPENDITURE</u>	<u>AMOUNT</u>	<u>INCOME</u>	<u>AMOUNT</u>	
Medicines & Dental Items	54,587.00	By Prof. Income	<u>6,75,723.57</u>	<u>6,75,723.57</u>
Lab Charges	<u>1,69,620.00</u>			
Rental Charges	14,400.00			
Water/Sewerage Charges	1,134.00			
Municipal Taxes	2,187.00			
Electricity Charges	11,230.00			
Bank Charges	874.75			
Telephone Expenses	3,036.00			
Assistant's Salary	48,000.00			
I.D.A. Annual Subscription	1,200.00			
Misc. Expenses (Cleansing)	3,600.00			
Printing & Stationery	1,372.00			
Enhancement of Knowledge	1,500.00			
Website Development Charges	16,000.00			
	<u>3,28,740.75</u>			
	3,28,740.75			
Depreciation of Fixed Assets	<u>73,417.00</u>			
	<u>4,02,157.75</u>			
Surplus (Carried To Capital A/c)	<u>3,24,752.82</u>	By Interest Income (Bank)		51,187.00

FIG II (Image Source: Dr. Bhavdeep Singh Ahuja)

We as dentists need to understand all the different categories of overhead, how to calculate them and then decide on how, when and which way to make adjustments in post-CoViD-19 times. We have to remember that every clinic is a unique one and will have different set of costs and charges even if it is situated adjacent to a neighboring dentist in same locality in same area with same number of chairs and staff members. Once we understand the average monthly costs and the corresponding revenue, making a successful financial model for our practice becomes a cake walk for us.

How to calculate your overhead costs is a question that will have to be answered if we want to end up in Green zone (profit). Calculating your dental clinic overhead can be intimidating sometimes, but as soon as we lay out the groundwork, we can look forward to decreasing it.

The bottom-line is pretty much simple – a limited overhead means a larger take home income from our dental clinic, whether one is a solo practitioner or working with a team.

The best way to decrease overhead is to have strong systems in place. We have to understand if the clinic overheads are in the range of 50% (on an average, presumed),

it means we take home Rs. 50 of every Rs. 100 that comes in the clinic and God forbid, if the revenue goes down by 20% (I am supposing the bare minimum immediately post-CoViD-19), the take home will reduce drastically by 40% which is a significant drop (a differentiation from what I discussed in the charging part – the costs remain the same mostly). When times are good, a 50% net is certainly acceptable, but we may be, can deliver excellent care with a 55% overhead.

So, why not operate at a much lower overhead when times are tight, we are still feeling rewarded?

Overhead is sometimes, a choice of how to operate. Thus, it is important to understand that there are two types of expenses: Fixed and Variable. Fixed expenses are those over which you have little to no control and can't be changed regardless of whether or not the practice is open or closed, like for example, rent, salaries, bills like electricity, water, sewerage, telephone etc. The variable expenses are those which often change based on the volume of patient care, like for example, lab bills, materials (consumption pattern), higher electricity bills (increased use of AC especially in North India). Well, the more lab work we have, higher will be the lab costs, but interestingly, an increase in lab costs more or less always represents an increase in output and revenue,

something that we would always strive for. The decrease in over heads would come only from decrease in supplies of materials and inventory which were always in the wish-list courtesy social media dentistry and a strong urge to copy each other. We shall have to see, discuss and brainstorm amongst our staff, with a few like-minded colleagues and with suppliers about best options for purchasing, pricing and volume discounts. We have to make sure that volume discount is always a divisible option amongst multiple colleagues and we should not indulge in panic buying and hoarding of the armamentarium and block cash.⁹⁻¹⁴

Inventory control

Inventory control means stocking adequate number and kind of materials so that the materials are available whenever required. This has to be done at optimal outlay of financial and human resources. High inventory leads to high cost by blocking the finances; large storage space; huge handling and administration charges; obsolescence and spoilage etc. On the contrary, low inventories may lead to frequent stock outs and high shortage costs. Balancing the cost of carrying high inventories and the cost of shortage is done through a system of scientific inventory control.¹⁵

The two primary functions of inventory control are:

1. To provide maximum service consistent with maximum efficiency and
2. Optimum investment and to provide a cushion between forecasted and actual demand for a material.

Basic factors asked in determination in inventory policy are what to order, when to order and how much to order. It depends upon requirement, lead-time, cost factor, financial availabilities and storage, patient service, provider relations, marketing conditions.

Inventory Reduction Tips

We can reduce inventory by following:

1. Fixing up maximum limit of inventory in term of value.
2. By giving responsibility to one person who is at top management.
3. Meticulous material planning.
4. By reducing lead time.
5. A well designed and defined inventory control system.
6. Strict control over obsolete slow-moving and non-moving items.

7. Computerize the inventory control system.
8. By improving the buyer-seller relationship, selecting the right source of supply in terms of location, quantity and quality etc.
9. Surprise check from the top management can play a very important role in proper inventory of materials. Employees will always remain self-conscious on their parts and will perform their duties efficiently.¹⁶⁻²⁰

Back to Basics

Remember, the cost of storage, cost of shelf life and the cost of money along with a risk of expiry are often ignored costs when we indulge in bulk buying. Many dentists have already been on buying spree for PPE kits and pre-booking spree for Hepa Filters, Extra oral Suctions, Negative ion generators, fumigators, UV light systems and what not, even those who are still in lockdown as if they are going to work on with full spree from next day onwards. It is good to be planned and prepared but not impulsive and impatient. There has been a sudden barging in of guidelines from every association like DCI, IDA and individual State Dental Councils along with all individual specialty dentistry associations like IPS, IES and so on. The 70-80% content of these guidelines might be common but it is the remaining 20-30% which makes the difference. Remember these are just guidelines and we have to specifically use our own intelligence, wit and wisdom to make a final discretion for which to follow finally. However, finer set of guidelines, we get, but how strictly we adhere to them is the most important aspect. We are not really sure at the moment as to whether we are doing enough or are we overdoing them (by following the guidelines).

Burning a straight hole into your pocket right away when some of them are struggling to make ends meet (shocking for me anyways) to realize later that these gadgets weren't required in the first place.

The problem gets compounded further when many of the star luminaries have diverging views on so many aspects and who should the average Indian dentist listen to, is the million dollar question?

Where would the buck finally stop on, no one really can predict that.

I strongly believe it is the time to hold your horses, get mentally ready, plan out but don't splurge as of now on these

gadgets. While investing in your practice is smart, wasting money is not. Impulsiveness might force us to jump on to the bandwagon in a FOMO approach only to realize 2 months down the line that many of these things were quite unnecessary and they will be occupying the shelf in our already space starved dental clinics to join the illustrious category of those wannabes which we had earlier bought but rarely used. In this way, many of our earnings are buried in our cupboards in unproductive and seemingly, dead investments.²⁰⁻²²

There is not even an iota of doubt that economy will be impacted a great deal. People just won't be spending money like they have in the past and will be more cautious and conservative. The financial environment may increase savings (as the perennial shift occurs from a want based to a need based in every significant aspect of life) which might be good for individuals but bad for the economy overall. The pertinent point here is that instead of splurging handsomely now further on making investments in clinic, we devise ways to economically reduce our input (costs) so that we have a better carry home output (income). One of the practical ways which I have been following even in the pre-CoViD-19 era is doing more work in the clinic for one patient in one sitting. Of course, patient comfortability and consent is paramount to that if we plan to give a longer than desired sitting to him/her. This nullifies the aspects of more expenses per patient. As Indian dentists, many colleagues are fond of flaunting and flashing their numbers in their peer groups. A tall claim like a dental OPD of 35-40-50 doesn't impress me much especially when coming from a standalone dentist.

Can an average dentist actually 'treat' more than 8-9 in a day, handsomely?

If No is the answer, whom are we showing our numbers to?

In coming times, those numbers will have to be mandatorily shunned away. We might have to learn to love with the virus especially when it seems to have entered our ecosystem and seemingly, social distance might be the new norm for all of us.

Conclusion:

Every small clinic as well would be requiring bare minimum two assistants, one inside the operatory and another in the reception / waiting area. The one outside the operatory will assume more importance as he acquires the role of a guardian angel for us from all evil forces (seemingly) in terms

of guiding the patients coming in randomly or by appointment. The role reversal trait for each of them will have to be acquired pretty quickly assuming one of them is on leave some day and staff training by us will play a big role in that. The dentist should set aside formal time for staff training, but for that sometimes, being ourselves trained is also needed. Sometimes, we need to spend money to reduce our overhead like becoming accomplished at newer tricks and techniques in practice as the confidence we receive in delivering dental excellence will change the treatment mix in our practice. Our investment will pay for itself and it can reduce our overhead by increasing our production. A dentist won't have to constantly reinvent the wheel, then. Once these systems are in place, every team member is trained so he/she can perform the task in the appropriate manner and be accountable for the consistent results. By not having systems as mentioned above, one is not able to train an individual to be efficient and effective, so the overhead increases in such a way when mistakes are happening. This is not about understaffing because your team is critical to patient care, patient satisfaction and practice's success. Most dentists don't have systems, they don't train teams and their teams can't, therefore, be effective and efficient. It is indeed time for some tough love. No one else can save you but yourself. If you don't like what you have, make a better choice and enhance your leadership skills for a different result. We have to draw a line in the sand and then stand firm on it. Dentistry is going to change and our patients will become more sophisticated. So, we have to quit whining about our overhead and do something about it smartly by creating a plan and making the bold decisions, some of them via a tough call.

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CoViD - 19 and Dentistry : The Financial Implications For The Practicing Dentist

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Abstract

CoViD-19 caused by SARS-CoV-2 virus has been a pandemic with its main mode of transmission as a droplet infection. With a routine dental setting, aerosol generation is inevitable, and hence this pandemic has been projected as a major health challenge for all dental practitioners. The financial implications of an enforced nation wide lockdown; along with various primary and adjunctive additions to the sterilization protocols, has left a major mark in the dental fraternity. This article highlights the importance of Continuing Dental Education to maintain relevance in the clinical setting. An attempt is made to present the multiple disciplines in which a dentist can upskill along with criteria to choose the most appropriate courses and mentors.

Key Words: SARS-CoV-2, Continuing Dental, Education, Upskill, Courses, Mentors.

Introduction

On the 8th of January 2020, the world received the first official information about a novel Corona Virus which was the causative pathogen of CoViD-19 from the Chinese authorities. This disease which spread exponentially from its origin in Wuhan, China has become a major health challenge for all the countries of the world. This novel CoronaVirus is officially now named as SARS-CoV-2 (Severe Acute Respiratory Syndrome Corona Virus 2). The disease is CoViD-19 and the pathogen is SARS-CoV-2 (just as AIDS is the disease caused by HIV).

The spectrum of manifestation of the disease varies from being asymptomatic at one end to severe fatal breathlessness at the extreme end (various multiple vital organ failures has also been attributed to this virus). It is the viral spread from the asymptomatic carriers that has severe ramifications in all aspects of public life including the dental visits. To prevent the potential cross infection in dental practices, strict and elaborate infection control protocols have been put forth by various relevant authorities and governing bodies. At the outset of the pandemic, several dental offices had shut down when the first lockdown was announced in India by the Honorable Prime Minister, Shri Narendra Modi, for a couple of weeks starting on 23rd March 2020. The re-opening of these offices was a staggered phenomenon with no distinct guidelines and a few have still now resumed due to their

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location in red zones or containment areas. The picture of a dental setting is now quite different from the one in existence only a few months back. Just like the hepatitis incidence necessitated the wearing of gloves, the HIV necessitated the widespread use of autoclave, the SARS-CoV-2 has necessitated the use of PPE from its basic form to advanced preparations for invasive aerosol generating procedures. Also, an assortment of adjuncts have been proposed such as high volume suction, HEPA air purifiers, UV light sterilisers, negative ion generators, etc to halt the spread of the lethal virus.

With this backdrop, this article looks at the potential financial insights and learnings that one must derive from this massive interruption. This colossal scale of disruption must serve as a source of alarm for all and nobody can afford to not learn from this unanticipated incidence which caught everyone unaware. It is necessary for everyone to rethink on the various aspects of dentistry. Some of these are very vital to stay relevant in the practicing field and are discussed below.

Planning CDE

Continuing Dental Education [CDE] is an important aspect of any practitioners future career planning. It is an utmost necessity to keep oneself abreast of all the recent advances within the relevant perimeters of clinical practice.

Conference

A majority of clinicians usually upgrade themselves by subscribing to various general and specialty associations and attending their annual and/or recurring conferences. This is a

highly recommended career growth strategy. Focused learning on specific aspects of practice like implantology, composite restorative dentistry, endodontics, etc definitely re-orient the clinicians as well as updates them with evidence based approach on one end to recent experimental strategies at the other end. The accompanying trade fair also helps to modernize the technological and material end of the clinics. The techniques and technologies are thus suitably integrated and enhanced. As the diversity of these programs and their numbers increases, a clinician can plan to attend certain disciplines alternate years and a few of them on a yearly basis, whereas some are one off events.

Weekend Specialty Courses

Prosthetics, Pediatric Dentistry, Endodontics, Composite Restorative Dentistry, Basic Surgery, Basic Periodontology, etc is now easily available through the medium of short courses conducted by eminent clinicians of the respective specialties. These are all the branches of dentistry that are taught in dental school and a clinician has a basic understanding of the subject and he/she enrolls to add finesse and get new take home points from these courses. A finishing school is another option to enhance multiple branches at one go.

Reading

Reading is a hobby which must be developed and with the advent of electronically available literature, a determined practitioner must always utilize this medium to enhance his or her capabilities to the maximum. Lectures, slide presentations and recorded videos of clinical techniques and procedures are an extension of this learning experience which definitely add to panache in practice.

Upskill

Upskill is the process of enhancing one's capabilities by learning of additional skills. Upskilling in the context of this article is learning additional disciplines of dentistry not taught or learnt adequately in the academic course of securing the dental degree.

An off-hand contemporary non-comprehensive list would include at least 15 such disciplines. These can be grouped into two broad categories: Non-surgical and Surgical.

Non-surgical:

1. Clinical Fixed Orthodontics
2. Temporo-mandibular Joint Disorders (TMD)
3. Full Mouth Rehabilitation (FMR)
4. Aesthetic Dentistry

5. Digital Dentistry
6. Microscopic Endodontics
7. Non-odontogenic Pain Management
8. Clear Aligners
9. Sleep Dentistry
10. Soft Skills Development
11. Practice and Financial Management

Surgical:

1. Implantology
2. Lasers
3. Botox and Dermal Fillers
4. Surgical Periodontal Procedures.

A formal clinically applicable training in all these branches is not in the purview of the B.D.S. curriculum as of now. But these are sciences which have a tremendous scope in clinical practice and are worth learning and implementing. A clinician must always think of upskilling into at least one of the above mentioned disciplines every two to three years i.e. one new course every 2 - 3 years, learn it and fine tune it and then move on to adding another discipline from the list. This list itself is ever expanding and there is no dearth of learning in dentistry.

How to choose any Course

Abundant real time information is available and a clinician must filter information that will be most useful. The important parameters in deciding to opt for a particular course are based on one's internal liking for a subject as well as its applicability in routine family practice.

The Course must be:

- Adding Value To Your Practice
- Simplified and Easy to Implement
- Most Clinically Relevant
- Follows Evidence Based Principles
- Time Tested
- Provide Continued Support & Mentoring
- Having Positive Reviews
- Financially Viable and Rewarding
- On Live Patients if applicable

The Course Mentor must be:

- Knowledgeable and Skilled
- Easily Approachable and Patient to Teach
- A Very Good Communicator
- A Leader in his/her Specialty

A new skill breaks the monotony of routine dentistry and makes the job more enjoyable. Undeniably, it does justice to the topic of this presentation by definitely adding to the

income and increasing the take home net component every month. Various fiscal measures are also needed and will be discussed as a sequel in the subsequent issues.

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