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RESEARCH ARTICLE

NOVEL CORONA VIRUS: A GLOBAL EMERGING THREAT

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ABSTRACT

Different viruses have been posing threat to humanity from time to time, and in 2019 a severe respiratory illness (Pneumonia of unknown etiology) reported in Wuhan, Hubei province China, became a major challenge to public health not only in China but also the countries around the world, and is still creating havoc. Despite of intense efforts about how, when and where this disease appeared is still a source of considerable uncertainty. Little is known about the effectiveness of personal protective equipment for health care workers who take care of patients infected with the novel coronavirus but still infection control measures are necessary to be taken to prevent this disease from further spread and to help control the pandemic situation. Like other health workers, dentists are also at the risk of getting this infection, as COVID 19 was recently identified in the saliva of infected patients and thus playing the pivotal role in human to human transmission. As in bronchoscopy, inhalation of air borne particles and aerosols produced during dental procedures with COVID 19 patients can be a high risk in which dentists are directly and closely exposed to infection. Therefore, it is crucial for dentists to refine preventive strategies to avoid the COVID 19 infection by focussing on patient placement, hand hygiene and completely follow the WHO guidelines. Thus in this article we will discuss in detail about the various strains, incubation period, mode of transmission and the preventive measures needed to overcome this threat.

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INTRODUCTION

Coronavirus are the huge family of viruses that are known to cause illness ranging from simple cold to more severe diseases (WHO, 2020) like severe acute respiratory syndrome (SARS) and Middle East respiratory syndrome (MERS). These viruses are enveloped, non segmented single stranded RNA(ssRNA) viruses belonging to the family coronaviridae (sub family orthocoronavirinae) and the order Nidovirales, genome is 29,903 bp ss-RNA CoVs, with length (26 to 32 kbs) diameter (65 to 125 nm) and is distributed in the humans and other mammals (Huang et al., 2020; Li et al., 2020). Genomic analysis shows phylogenetically its close resemblance to bats and thus bats could be the primary host (Soni). Coronavirus get transmitted between animals and humans and the detailed previous investigation reviewed that SARS was transmitted

from civet cats to humans and MERS from dromedary camels to humans (COVID, 2020), but several known coronavirus present in animals have not yet infected humans (Ramasamy, 2020). It is clear that COVID 19 could use the angiotensin converting enzyme 2 on type II pneumocyte, the same receptor used by SARS Coronavirus to infect humans (Guo et al., 2020). It has a characteristic of crown morphology on microscope (corona) (Ahmed et al., 2020), six strains of coronavirus have been isolated so far from time to time and this COVID 19 is the seventh to add the list. The Chinese centre for disease control and prevention on 7th January 2020 has announced confirmation of SARS CoV2 from the human throat samples, India recorded its first case on 30th of January 2020, WHO named 2019 novel corona virus as COVID 19 on 11th of February 2020 and considered it as Pandemic on 11th of March 2020. The human animal interface activities, the large genetic diversity, its wide distribution and frequent genomic recombination had made this disease a global pandemic (Lu et al., 2020; World Health Organization, 2020).

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The symptomatic patients have been the main source of transmission and the asymptomatic patients and patients in their incubation period are as carriers (<https://www.who.int/dg/speeches/detail/who-director-general-remarks-at-the-media-briefing-on-2019-ncov-on-11-february-2020>). The virus is passed directly from person to person by respiratory droplets, direct contact and fomites, in addition studies have shown that respiratory viruses can also be transmitted directly or indirectly through saliva, as the salivary glands are found to be its reservoirs (Indian Dental Association's) as some of its strains has been detected in saliva as long as 29 days after infection (Sabino-Silva *et al.*, 2020). The incubation period of the virus has been estimated at 5-6 days on average but there is the evidence that it can be as long as 14 days, which is most commonly used time period for quarantine of exposed persons (Backer, 2020). Patients with COVID 19 usually present with clinically symptoms of fever, shortness of breath, dry cough, myalgia, in severe cases it can lead to pneumonia, severe acute respiratory syndrome, kidney failure and even death but less obvious symptoms such as nausea, diarrhoea, reduced sense of smell and abnormal taste sensation has also been reported (Chen *et al.*, 2019; Guan, 2019). Chest computed tomography showed bilateral pneumonia, with ground-glass opacity and bilateral patchy shadows being the most common (Guan, 2019; Wang, 2019). The current reported death is 2-3% and there is no antiviral drug or vaccine available to the disease (Wladyslaw, 2020). Due to its widespread transmission and reports of its spread to health care providers, it is more contagious than SARS-CoV and MERS-CoV (Peng *et al.*, 2020). Dental professionals are also at the high risk of nosocomial infections and can become the potential carrier of disease (Ather *et al.*, 2020). The dental team should be aware of the health protection against virus and should follow strict infection controls setup (Rajput *et al.*, 2015)

OBJECTIVES: This review will summarize the recent update and determine clinical symptoms of COVID-19 infection, modes of transmission, incubation period, risk factors, no of cases in world particularly India, provide guidance on the prevention of infection and its control and determine the mortality rate.

METHODOLOGY

Literatures were reviewed about COVID 19, SARS, MERS at the time of writing. It was carried out through the web of science, medline, pubmed and from the other sources available on internet. Search words comprised the global pandemic, COVID 19, SARS, MERS, and Coronaviruses. No ethical approval was considered mandatory as it was a web search.

DISCUSSION OF OBJECTIVES

Track in fectionous diseases a trend may be a paramount work to alert the international community to the occurrence of cases round the world including the identification of latest foci of infection. The three highly pathogenic viruses (SARS-CoV, MERS-CoV and 2019-nCoV) cause severe respiratory syndrome in humans and the other four human corona virus (HCoV-NL63, HCoV-229E, HCoV-OC43 and HCoV-HKU1) induce only mild upper respiratory diseases in immune competent patients hosts, although many of them can cause severe infections in infants, young children and elderly individuals (Cui, 2019). There are five stages of transmission of virus: the first stage is the appearance of the disease which means the disease is just introduced and the positive cases begins to emerge for the very first time i.e these are the

imported cases. This stage is followed by the stage of local transmission in which the virus spreads locally i.e the most probable got infected and passed to others and can be monitored by contact tracing, isolating people with symptoms, strict screening measures, social distancing, and lockdown efforts. According to the Indian Council of Medical Research (ICMR), India is currently in this stage of the novel coronavirus transmission and Govt of India is putting its best efforts to prevent its progression to other stages. The third stage is the community transmission i.e large area gets affected in which it is difficult to trace the source of infection spread; once the community transmission begins it becomes difficult to contain the disease and to stop the chain of transmission. The fourth stage is the wide spread outbreak in which the number of cases and deaths begin rapidly multiplying, with no end in sight i.e condition becomes epidemic. The fifth and the last stage is the pandemic condition i.e the entire area is under quarantine and an urgent need is mandatory to stop the condition as much as possible (Soni; COVID-19 Explainer). COVID 19 virions shed throughout the clinical course, thus patients with the disease can spread the infection before symptomatic presentation, during the symptomatic course and also during the recovery period (Kakodkar, 2019). Various considerations have to be made regarding the residence time of its virions on the surfaces.

The half life of fit in aerosols is 1.5 h, copper is 1 h, cardboard is 3.4h, stainless steel is 5.6h, and plastic is 6.8hs, and its viable residence time for the same is 3 h, 4 h, 24 h, 48 h, and 72 h, respectively (vanDoremalen *et al.*, 2020) as a dentist one should know about its survival time on stainless steel n plastic so that necessary precautions will be taken accordingly. Common cold is caused by a variety of viruses; many of them are Rhinoviruses, and benign forms of coronaviruses. Both Simple cold and COVID-19 have a gradual course to symptom presentation in comparison to the flu, caused by different strains of Influenza (Orthomyxovirus family). Pyrexia is rare in the simple cold; however it is the most notable symptom in COVID-19 and flu. Symptoms such as rhinorrhea and nasal congestion are mostly found in common cold but rarely found in flu and COVID-19 (Eccles, 2005). Jatien A Backer, Don Klinkenberg, Jacco Wallinga in 2020 conducted a study on the incubation period of 2019 novel coronavirus, in fections travellers from Wuhan, China, from 20 – 28 January 2020. The study used the travel history and the symptom onset of 88 confirmed cases that were detected outside Wuhan in early outbreak phase. The mean incubation period was estimated to be 6.4 days (95% credible interval: 5.6- 7.7), ranging from 2.1 – 11.1 days (25th to 97.5th percentile). These values gave the proper definitions about appropriate quarantine durations. There are various choices one can make about the parametric form of the incubation period distribution, but it is prudent not to dismiss the possibility of incubation periods up to 14 days at this stage of the pandemic (Backer, 2019). Four major discharge criteria exist for quarantine patients, and these are from Italy (Ministero della salute, Consiglio Superiore di Sanità), China (China CDC), USA (CDC), and Singapore (National Centre for Infectious Diseases). These models differ only in their cutoffs. The China CDC discharge criteria state that all four conditions must be met to satisfy a discharge from the hospital.

- A patient must remain afebrile for at least three consecutive days.

COUNTRY	TOTAL CASES	NEW CASES	TOTAL DEATHS	NEW DEATHS	TOTAL RECOVERED
USA	1,367,963	+325	80,787	-	256,336
SPAIN	264,663	-	26,621	-	176,439
RUSSIA	221,344	+11,656	2,009	+94	39,801
UK	219,183	-	31,855	-	NA
ITALY	219,070	-	30,560	-	105,186
FRANCE	176,970	-	26,380	-	56,217
GERMANY	171,879	-	7,569	-	145,600
BRAZIL	163,427	+728	11,168	+45	64,957
TURKEY	138,657	-	3,786	-	92,691
IRAN	109,286	+1,683	6,685	+45	15,179
CHINA	82,918	+17	4,633	-	78,144
CANADA	68,848	-	4,870	-	32,096
BELGIUM	53,449	+368	8,707	+51	13,697
NETHERLANDS	42,627	-	5,440	-	NA
MEXICO	35,022	+1562	3,465	+112	23,100

DATE	TOTAL CASES	TOTAL DEATHS
21 ST APRIL 2020	20,013	632
22 ND APRIL 2020	21,312	678
23 RD APRIL 2020	23,016	720
24 TH APRIL 2020	24,407	770
25 TH APRIL 2020	26,250	811
26 TH APRIL 2020	27,562	873
27 TH APRIL 2020	28,380	886
28 TH APRIL 2020	30,334	1000
29 TH APRIL 2020	32,774	1066
30 TH APRIL 2020	34,765	1,151
1 ST MAY 2020	36,950	1,210
2 ND MAY 2020	39,603	1,314
3 RD MAY 2020	42,248	1,391
4 TH MAY 2020	47,388	1,488
5 TH MAY 2020	49,373	1685
6 TH MAY 2020	52,636	1770
7 TH MAY 2020	55,827	1881
8 TH MAY 2020	59,592	1982
9 TH MAY 2020	62,333	2,074
10 TH MAY 2020	67,113	2,197
11 TH MAY 2020	70,684	2,291

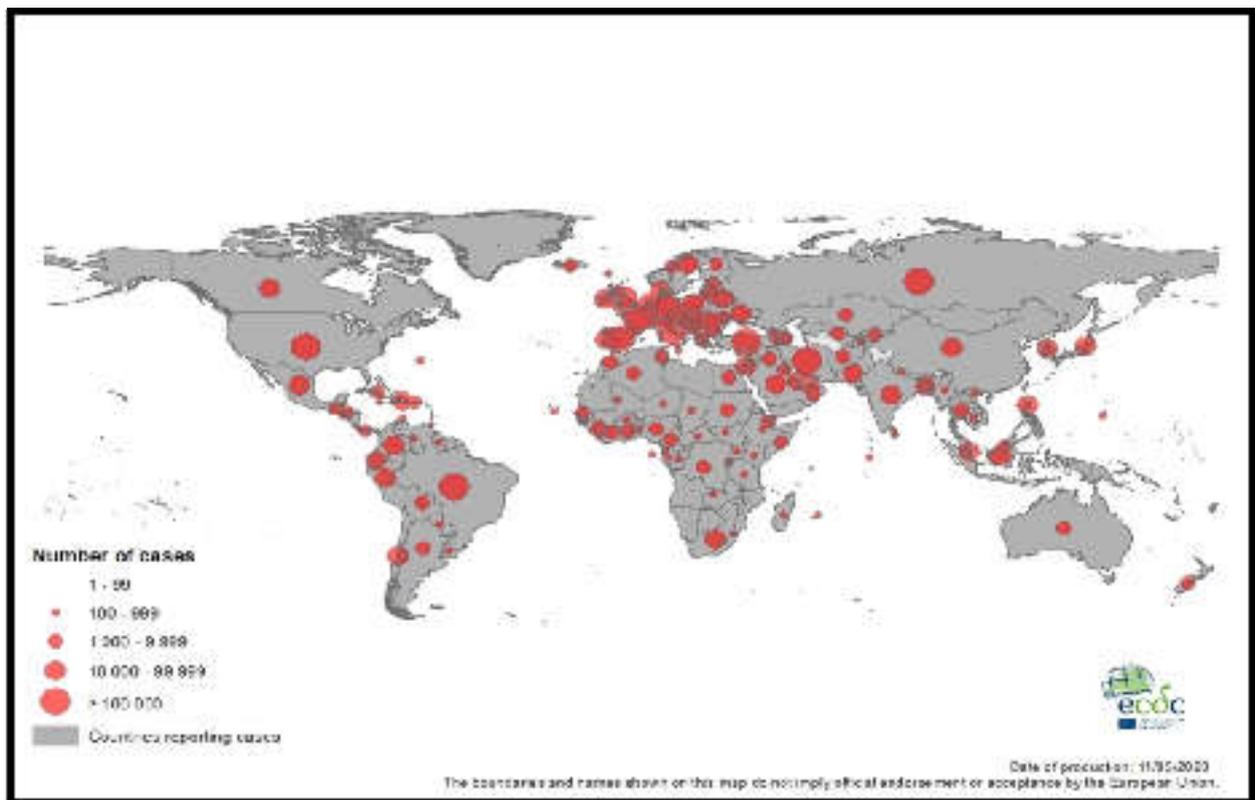


Fig 1. <https://www.ecdc.europa.eu/en/geographical-distribution-2019-ncov-cases31>

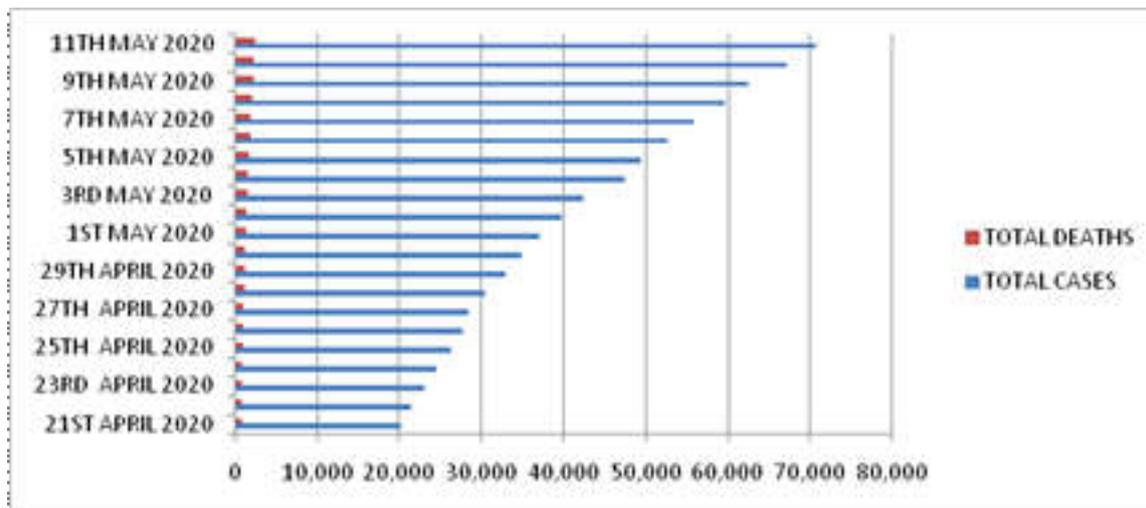


Fig. 2. Online Data collected showing the rise of cases from 21 April to 11 may32

- All respiratory symptoms (cough, dyspnea, sore throat, and nasal congestion) must be resolved.
- Chest CT must demonstrate marked resolution of the exudative lesion.
- Two serial RT-PCRs must be negative for SARS-CoV-2 RNA from the nasopharyngeal collection; these assays must be spaced by 24 hours.

Two separate quarantine discontinuation criteria for COVID patients in self-quarantined at home have been developed by Italy (Ministero della salute, Consiglio Superiore di Sanità) and USA (CDC).

The CDC quarantine discontinuation criteria state that both conditions must be met to satisfy the criteria.

- At least two serial RT-PCRs must be negative for SARS-CoV-2 RNA. These swabs must be nasopharyngeal collections; these assays must be spaced by 24 hours.
- The patient must remain afebrile for at least 72 hrs without antipyretic medication use, and resolution of respiratory signs and symptoms. A minimum of seven days have passed since the preliminary symptom appeared (<http://www.ecdc.europa.eu/sites/default/files/documents/COVID-19-Discharge-criteria.pdf>).

Recent observations suggest that people of all ages are generally susceptible to this new infectious disease. However, those who are in close contact with patients with symptomatic and asymptomatic COVID-19, including health care workers, other patients in the hospital, and elderly people with pre-existing medical conditions (diabetes, asthma, heart diseases) are at higher risk of getting this infection (Meng, 2019). The online world wide data till 11th May dated shows 4,200,968 corona positive cases with 1,502,669 recovered and 284,152 deaths. The active cases are 2,414,147 (serious cases=47,074(2%) and mild cases=2,367,073 (98%)) and the closed cases include (recovered 1,502,669(84%) and 284,152 (16%) deaths). The virus involved 215 countries/ territories till date. The mortality rate is 3.4 % (WHO 3rd March 2020) which is far less than that of SARS CoV 1 (9.6%) and MERS (34%). China, USA, UK, Spain, Italy, France, Brazil, Germany, Belgium, Netherlands, Canada, Mexico, Iran, Turkey are the topmost countries which are severely affected by the virus,

with the USA topping the list (<http://www.worldometers.info/coronavirus/>). Coronavirus cases in India reached the peak of 70,684 by 11th May 2020 with the recovery rate of 31.15% (22455). Online Data collected showing the rise of cases from 21 April to 11 May (<http://www.deccanherald.com/national/coronavirus-india-update-state-wise-total-number-of-confirmed-cases-deaths.html>). The viral research institution in China has conducted preliminary identification of the SARS-CoV-2 through the classical Koch's postulates and observing its morphology through electron microscopy⁷. Simple PCR is used in case of asymptomatic or mildly symptomatic contacts that have had contact with a COVID-19 case. Real-time reverse transcription polymerase chain reaction (rRT-PCR) a type of nucleic acid amplification test is one of the most popular testing method for detecting COVID 19 (but it is only 66-80% sensitive), thus indicating that 20-34% of patients with COVID-19 out of 100 would test negative in spite of being positive. This sensitivity can be attributed to the patients being tested early in the disease course during which the viral load is below detection level or due to absence of automation in preparation of sample for RT-PCR. Thus a single negative RT-PCR does not rule out COVID-19, a repeat RT-PCR must be done (Ai *et al.*, 2019).

The concern rises regarding the timeframe of the repeat RT-PCR, the ideal window lies between 24 to 72 hours of the negative test. Antibody-based immunoassay techniques combined with different signal detection methods are also found to be typically rapid detection methods. Serological testing, virus sequencing, virus culture, Use of the programmable RNA sensors is another promising approach for RNA virus detection³⁴. For transporting samples for the detection of virus, use of viral transport medium (VTM) is necessary which contains antifungal and antibiotic supplements, avoiding repeated freezing and thawing of specimens. If VTM is not available sterile saline may be used in such case (WHO, 2020). Various Medical researchers are initiating the measures for treatment of COVID 19 using previous strains (SARS, MERS) as prototypes. For example, platform diagnostic modalities are being rapidly adapted to incorporate COVID 19, early recognition and isolation of cases. In animal models broad-spectrum antivirals, like remdesivir, lopinavir/ritonavir, RNA polymerase inhibitor, and interferon beta have shown favourable effects against MERS-CoV and are also being assessed for activity against COVID

19. China tried first vaccine trial by sharing the genetic sequence of the virus, first human trial vaccine to defeat COVID 19 was done in USA, many clinical trials have been done to check the safety and ability of Chloroquine and hydroxychloroquine, some other potential drugs such as DNA synthesis inhibitors, dendritic cell based vaccine, and Chinese traditional medicines are in use. Various clinical trials have been done such as ChAdOx1 nCoV, AJ vaccine, integral molecular vaccine by Tulane University, nanoviricides, INO-4800 by inovio pharmaceuticals and Beijing Advaccine biotechnology, APNO1 by University of British Columbia and APEIRON biologics, plasma therapy, Indian Immunologicals ltd/ Griffith University, Geo Cax/ BravoVax, Vaxart, Bharat Biotech/Thomas Jefferson University etc but none of them produced 100% results and some of them are in their pre clinical trials.. Thus there is no exact treatment/vaccination available for this disease. On 9th may 2020 China reported its first successful coronavirus vaccine (PiCoVacc) on monkeys which is a significant development in the race to find a cure for the COVID 19 virus, a clinical trial on humans is further needed to be done so that the exact success of the vaccine can be determined^{36, 37}.

Health care workers are the primary line of defence and face an elevated risk of exposure to infectious diseases. It is essential to ensure the safety of healthcare worker not only to safeguard continuous patient care but also to ensure they do not transmit the virus. Like other health workers dentists are also at the risk of getting nosocomial infection thus becoming the potential carrier of disease (Ather *et al.*, 2020), Kohn *et al.* 2003 suggested that infections can spread by the puncture of sharp instruments or directly contacting mucous membranes by contaminated hands so it is better that dentists should take strict personal protection measures and avoid or minimize operations that can produce droplets or aerosols (Kohn *et al.*, 2003), The use of rubber dams can significantly minimize the production of saliva and blood- contaminated aerosol or spatter, particularly in clinical situations where high-speed handpieces and dental ultrasonic devices are used (Samaranayake, 1989). Effective infection control measures for the prevention or minimization of viral infection transmission should be implemented in clinical practice which can finally prevent the cross infection. Since the beginning of the COVID-19 outbreak, and in alignment with available evidence, WHO maintains the advise, within the context of droplet and get in touch with precautions for the utilization of medical masks for normal care of COVID-19 patients and respirators (N95, FFP2 or FFP3) for circumstances and settings where aerosol generating procedures are performed. It also continues to recommend that everybody performs hand hygiene frequently, follows respiratory etiquette recommendations and frequently clean and disinfect surfaces it. The importance of maintaining physical distances and avoiding people with fever or respiratory symptoms. These preventive measures will limit viral transmission (World Health Organization, 2019).

Conclusion

284,152 people have lost their lives and about 4 million have been infected till date by this present pandemic. The number of infected cases is rising day by day and has become the global concern. Preventive care is necessary to be taken in order to break this chain of transmission. Health care workers are more prone to cross infection.

Due to the lack of available and validated therapeutics, most of the countermeasures rely on the usage of public health containment and quarantine approaches. Scientists have made progress in the characterization of the novel coronavirus and are working extensively on the therapies and vaccines against the virus, but none of them is 100% fruitful till date. However, questions remain vague and more studies are urgent to explore the transmission and pathogenicity mechanism of the emerging coronavirus. Considering the fact that the working environment of a dental professional is unique in a way that it requires a close operator and patient contact in addition to the amount of bioaerosol production, the risk of COVID 19 transmission from an infected patient is high, dental professionals should be well informed and educated about not only the signs and symptoms of the condition but also how to follow stringent infection control measures in such clinical scenarios. Without the power to stop community infection, prevention of health care transmission will remain a challenge

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