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CORONAVIRUS DISEASE 19 (COVID -19) TRANSMISSION, CLINICAL IMPLICATIONS AND MODIFICATIONS IN FUTURE CLINICAL DENTAL CARE

Dental Science

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ABSTRACT

The emergence of Covid-19 virus in China is creating havoc across the globe. As the information regarding the novel Corona virus is continuously being renewed. The latest addition being its airborne nature. However, the virus spreads primarily through droplets of saliva or discharge from the nose when an infected person coughs or sneezes. The virus is continuously spreading, even though the newer drugs and vaccines are being experimentally tried for cure. Since, there is no specific treatment for the virus till now, the best option is to adopt preventive approaches. Dental health care personnel (DHCP) are at increase risk of exposure to saliva, blood and other body fluids, hence the risk of cross infection is much higher. Lot of reviews about dental precautions regarding corona virus is being published. Hence, this article provides an overview of the modes of transmission in dental settings, their clinical implications and different modifications that will be required in future to practice clinical dentistry.

KEYWORDS

Coronavirus disease 2019 (COVID-19), Dental health care personnel (DHCP), Clinical implications, Dental modifications

INTRODUCTION

The corona virus disease 2019 (COVID-19) which had started from the seafood market of Wuhan city had spread across 216 countries till now despite strict measures being implemented[1]. Most of the countries have began to unlock and the restrictions are being taken off gradually but the uncertainty regarding the virus is still there[1]. The novel coronavirus was identified in Wuhan, China, in December 2019 in patients presenting with pneumonia of unknown origin. On 30th January 2020, World Health Organization declared it as a public health emergency of international concern because of its rampant spread, thus posing a high risk to countries with vulnerable health systems[2]. According to the latest WHO situation report (19 July 2020) update on COVID-19, there have been more than 14,043,176 confirmed cases and 5,97,983 deaths worldwide. The unlockdown phase had gradually started in some countries but due to continuous growth of the infection curve, the chances of lockdown again had increased.

2. CHARACTERISTICS OF 2019 NOVEL CORONAVIRUS :

Corona viruses are single-stranded RNA viruses that can infect not only humans, but also a huge variety of animals as well[3].Tyrell and Bynoe in 1966 first studied corona virus from patients with common cold. Corona viruses belong to the family of Coronaviridae, of the order Nidovirales, comprising large, single, plus-stranded RNA as their genome. Currently, there are four genera of coronaviruses: α-CoV, β-CoV, γ-CoV, and δ-CoV[3]. Most of the coronavirus can cause the infectious diseases in human and vertebrates. The α-CoV and β-CoV mainly infect the respiratory, gastrointestinal, and central nervous system of humans and mammals, while γ-CoV and δ-CoV mainly infect the birds[3-6].

3. CLINICAL SYMPTOMS :

Patients with Covid-19 have symptoms similar to other respiratory illnesses, and includes runny nose, fever, cough and shortness of breath[7]. In severe cases, infections can lead to pneumonia, acute respiratory syndrome, kidney failure and death[1,8]. A definitive diagnosis of covid-19 can only be established with a laboratory test[9]. The older individuals with preexisting systemic conditions like heart disease, high blood pressure, cancer, diabetes or lung conditions, may experience more serious complications. Susceptibility of pregnant women and children to virus is not clear till now[9,10].

4. ROUTES OF TRANSMISSION :

Novel coronavirus transmission can occur in two ways- a) Indirect transmission (cough, sneeze, and droplet inhalation transmission) and b) Contact transmission (contact with oral, nasal, and eye mucous membranes)[3]. The role of 'direct contact transmission' (not involving contaminated surfaces) and 'indirect contact transmission' (involving contaminated surfaces) in the spread of viruses with pandemic potential has been controversial[11]. Chan et al (2011) observed that SARS-CoV survived for 5 days with less than 10-fold reduction in titre at room temperature and humidity and was viable for more than 20 days. More stability was observed at lower temperatures and lower humidity[11].

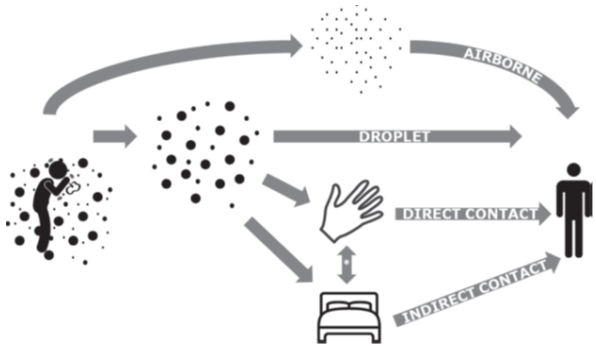

Figure 1. Transmission routes: droplet, airborne, direct contact, and indirect contact. (Indirect contact: routes involving a combination of hand and surface.) Figure from Otter et al, Journal of Hospital Infections 92(2016)

Eye exposure of 2019-nCoV can also be an effective way of entry into the body. This is confirmed by analysis of suspected conjunctival samples[3]. Corona viruses especially have the ability to survive for longer periods in aerosols[11,12].

A recent study found that even the act of coughing and talking can lead to spread of corona virus [13]. However, another study suggested high variability between individuals in terms of particle emission rates during speech. Increase amplitude of vocalization was found to be associated with increase rate of emission[13]. Thus the transmission of SARS-CoV-2 by this type of aerosol route is controversial and much more research is required to establish this fact[13].

5. CLINICAL IMPLICATIONS IN DENTISTRY:

The airborne spread of SARS-Cov (severe acute respiratory syndrome coronavirus) is being reported across many literatures[3,14]. Dental health care professionals are at high risk of contracting and spreading the virus to the general population through aerosol generating procedures (AGPs)[2]. Dental healthcare personnel (DHCP) refers to all paid and unpaid persons serving in dental healthcare settings who have the potential for direct or indirect exposure to patients or infectious materials, including body substances, contaminated medical supplies, devices and equipment, contaminated environmental surfaces and contaminated air[15]. Aerosol and droplets frequently mix with saliva and blood in everyday dental treatment, increasing the likelihood of airborne spread and transmission of viruses such as COVID-19[16]. AGPs include the use of: High-speed handpieces, slow speed handpieces, 3-in-1, ultrasonic scalers and high-volume suction/aspirator[16,17]. Thus, droplet and aerosol transmission of 2019-nCoV are the most important concerns in dental clinics and hospitals, because it is hard to avoid the generation of large amounts of aerosol and droplet mixed with patient's saliva and even blood during dental practice[8].

Meng et al[18] (2020) reported the occurrence of 9 cases of COVID-19 among 169 dental practitioners, stressing the high risk of professional contagiousness. Direct contact transmission can occur not only through the patient's oral mucosa but also through contaminated hands which is a potential high risk route, the mucosa of the oral cavity has been recognized as a potentially high-risk route[19]. Using viral culture method, To et al. reported live viruses in the saliva of infected individuals. Also, it has been confirmed that 2019-nCov enters the cell in the same path as SARS coronavirus, that is, through the ACE2 cell receptor. 2019-nCoV can effectively use ACE2 as a receptor to invade cells, which may promote human-to-human transmission[19,20].

6. MODIFICATIONS IN FUTURE DENTISTRY :

Dental surgeons are at the highest risk of contracting and transmitting the Corona virus, alongside paramedics, nurses, and other healthcare workers[21]. Dental clinics across the country were shut for more than two months. With the pandemic still on the growth curve, there is no hope of revival anytime soon. However, slowly the dental clinics are beginning to open up in certain parts of the world. But now the approach to practice dentistry will be entirely different from the earlier ones. We have arbitrarily divided the treatment protocol following the guidelines given by Meng et al[18], Peng et al[3] and Ministry of Health and Family Welfare, India[22] into two phases 1) Prophylactic measures and 2) Urgent/Emergency measures. In prophylaxis phase, patients triage and their entrance into the practice are important. All dental practitioners are advised to mandatorily perform phone triage to define the real need for emergency treatment (i.e. treatment of acute pain, abscesses, trauma, and hemorrhagic events). Patients should be asked a set of questions aimed at investigating the risk of exposure to SARS-CoV-2 (Table 1)[22]. Patients are allowed to visit the dental office only if the entire questionnaire is negative, otherwise, the appointment must be preferably postponed.

TABLE I [7,22]: PROPHYLAXIS PHASE

Medical History Interview	Type of Questions to ask	Recommendations
Prior to Appointment/ Telephonic screening	1) Have you travelled outside of the country or within a geographical area that has a high incidence of Covid-19 in the last 14 days ? 2) Have you been in contact with anyone who has travelled outside the country or within a geographical area that has a high incidence of Covid-19 in the last 14 days ? 3) Do you have a cold or any other respiratory issues ? 4) Do you have a fever or have you had a fever within the last 14 days ? 5) Do you have a sore throat ?	1) If yes to any of the questions then follow Phone Advice Line Tool for Possible COVID-19 patients. 2)Ask patient to seek medical treatment first. 3) Instruct patient to reschedule after free from signs and symptoms of ailment.
Upon Arrival	If prior to patient's appointment, no questions asked, then same questions as above to be asked	Same as above

As a prophylactic measure, telephone triage of all patients requiring dental care need to be done first. The patient's dental condition should be assessed and determined whether he or she needs to be seen in the dental setting. Tele-dentistry can be used as an alternative to in-office care[23,2,8].

7. URGENT AND EMERGENCY DENTAL PROCEDURES (UEDP):

First, DHP should decide if the patient's condition constitutes a true emergency or it requires an urgent onsite intervention. For this, the guidelines issued by the Centers for Disease Control and Prevention (CDC) in each country should be strictly followed. In India, Ministry of Health and Family Welfare (MOHFW) has issued guidelines for DHP. Accordingly, the clinical conditions of dental origin, which require priority care but do not increase the patient's death risk are categorised as URGENT and which increase the patient's death risk are categorised as EMERGENCY (Table 2)[22]. Also, the urgency of a procedure is a decision based on clinical judgement and should be made on a case-by-case basis[23,24].

Table 2 : Emergency and Urgent dental procedures (Issued by MOHFW)[22] Emergency Dental Procedures

Clinical Condition/Procedures	Risk level
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 Dental Procedures

Clinical Condition/Procedures in Children and Adolescents	Risk Level
Acute Pulpitis	High
Dental Abscess	Very High
Dento-alveolar Trauma	High
Pain of cavitation	High
Unavoidable Dental extractions	Very High
Orthodontic Procedures	Moderate
Clinical Condition/Procedures in Adults and Geriatrics	
Pulpal pain not controlled by Advice,Analgesics,Antibiotics (AAA)	High
Acute dental abscess of pulpal / periodontal/ endo-perio origin/ Vertical fracture	High
Completion of ongoing root canal treatment (RCT)	High
Temporization of cavitation in teeth which are approximating pulp but do not need pulp therapy	High
Broken restoration/ fixed prosthesis causing sensitivity of vital teeth/ endangering to pulpitis /significant difficulty in mastication	High
Unavoidable Dental Extractions / Post extraction complications	Very High
Already prepared teeth/ implant abutments to receive crowns	High
Peri-implant infections endangering stability	High
Pericornitis / Operculetomy	High/Moderate
Oral mucosal lesions requiring biopsy	High
Long-standing cysts and tumours of the jaw with abrupt changes	High
Sharp teeth /Trigeminal neuralgia	Moderate
Orthodontic wire or appliances, piercing or impinging on the oral mucosa.	Moderate
Orthodontic treatment causing Iatrogenic effects	Moderate
Delivery of clear aligners	Moderate
Repair of Broken complete dentures	High
Implant prosthesis related issues	High
Oral mucosal infections such as candidiasis	High
Oral mucosal lesions showing sudden changes or suspicion of causing severe problems,/ oral cancer requiring biopsy	High
Patients with Medical Conditions	
Diabetes patients requiring treatment for periodontal conditions	High
Dental treatment for patients requiring cardiac surgery	Very High
Hospitalised patients requiring dental care for acute problems	Very High
Patients requiring dental treatment for radiotherapy /oragn transplantation	Very High

7.1 GUIDELINES FOR UEDP:

To prevent infections from spreading during emergency dental procedures, an effective asepsis protocol including administrative rules, engineering controls, environmental hygiene, correct work practices, and appropriate use of personal protective equipment (PPE)

must be followed[25]. Most dental procedures require close contact with the patient's oral cavity, saliva, blood, and respiratory tract secretions. Saliva is rich in COVID 19 viral load. Many patients who are asymptomatic may be carriers[26]. For this reason, it is suggested that all patients visiting a dental office must be treated with due precautions. Several guidelines have been issued earlier by DCI, IDA and other organizations and hence there is a need to issue unified guidelines[22]. Hence, MOHFW India, had issued an unified guidelines on 19-06-2020 addressing all dental services across the country. According to these guidelines[22], dental operations should be restricted to emergency and urgent treatment procedures only. Also, all routine and elective dental procedures should be deferred for a later review until new policy/guidelines are issued[22].

7.2 Recommendations for UEDP

In patients with dento-alveolar trauma, fascial space infection etc dentists should be aware of the following recommendations: a) Hand hygiene b) Mouth rinses containing 1% hydrogen peroxide or 0.2% povidone prior to dental treatment[3,8,27]c) Use of disposable dental equipment is mandatory to prevent cross-contamination[27]. d) Radiographs: Intraoral Radiographs should be avoided as it may produce gag reflex or cough. Extraoral radiographs (e.g. panoramic radiograph or CBCT) should be preferred. When intraoral imaging is mandatory then double barrier should be done on sensors[28]. e) Rubber dam for non-surgical endodontic treatment. f) Avoiding use of ultrasonic instrument, high-speed handpieces and three-way syringes. g) Suspected or confirmed cases of COVID-19 should only be treated in negative pressure rooms or airborne infection isolation rooms (AIIRs) & not in routine dental practice setting[27] h) Use of anti-retraction handpiece[3].

Following precautions should be taken while performing emergency endodontic and oral surgery treatments[21]. First, longer lasting temporary restoration material should be used after emergency pulpectomy since we are not sure when will the patient receive definitive endodontic treatment due to lockdown restriction. In order to avoid use of airotor handpiece, temporary restorations should be done at sub-occlusal level[21]. Odontectomy and ostectomy procedures should be avoided. For high risk oral surgical procedures, it is important to refer such cases to COVID-19-designated hospital-based dental clinics[21].

7.3 Personal Protection

Depending upon the degree of community transmission, personal protection will vary from those precautions to be taken during all clinical settings (standard precautions) and those to be taken if there is strong evidence for person-to-person transmission via droplet, contact, or airborne routes in healthcare or non-healthcare settings (transmission based precautions)[29]. This is depicted in table 3.

Standard Precautions are the basic practices that apply to all patient care, regardless of the patient's suspected or confirmed infectious state, and apply to all settings where care is delivered. These practices protect healthcare personnel and prevent healthcare personnel or the environment from transmitting infections to other patients[29].

Table 3.

Personal Protective Equipment	
Moderate-Substantial Community transmission	Standard Precautions- Recommended for all patients in all settings. Includes hand hygiene, environmental cleaning and disinfection, injection and medication safety, risk assessment with use of appropriate personal protective equipment (e.g., gloves, gowns, face masks) based on activities being performed, minimizing potential exposures (e.g. respiratory hygiene and cough etiquette), reprocessing of reusable dental equipment between each patient and when soiled. Also, Eye protection should be worn in addition to the facemask to ensure that eyes, nose, and mouth are all protected from splashes and sprays of infectious material. N95 or equivalent or higher-level respirator, instead of a facemask recommended for aerosol generating procedures. In case of surgical procedures that poses higher risk, respirators with exhalation valves are not recommended since as unfiltered exhaled breath can compromise the sterile field
Minimum –No Community Transmission	Universal eye protection and respirator recommendations described for areas with moderate to substantial community transmission are optional. However, HCP should continue to adhere to Standard and Transmission-Based Precautions, including use of eye protection and/or an N95 or equivalent or higher-level respirator based on anticipated exposures and suspected or confirmed diagnoses. Universal use of a facemask for source control is recommended for DHCP

8. MODIFICATIONS FOR DENTAL SET-UP[22]

As per the Dental Advisory issued by MOHFW, India issued on 19-05-2020, different types of clinical set-up will require different modifications. The dental clinic set-up should include the following changes : a) Ventilation and air quality management in stand-alone dental clinics b) Re-circulatory system in central AC buildings c) Modifications at clinic entrance, reception and waiting area d) Provision for changing room e) Dedicated sterilization room f) Changes in Washroom area g) Equipment and instrumentation modifications h) Training of Health care workers i) Hand hygiene. After following the MOHFW guidelines we tried to summarize the modifications required in dental set-up in table 4. Apart from this, the dental clinic disinfection should be carried out frequently. Premises and areas potentially contaminated with the virus should be cleaned before their re-use. Freshly prepared 1% sodium hypochlorite with a contact time of 10 minutes is recommended30. The floor should be mopped from the far corner of the room towards the door after any patient/ major splash or two hourly30. For rest of the surfaces, damp dusting should be done in straight lines overlapping each other. Delicate Electronic equipment Should be wiped with alcohol-based rub/spirit (60-90% alcohol) swab before each patient contact.

Table 4 : Modifications in Dental Clinic set-up[22]

Type of Clinical Settings	Modifications
Ventilation in stand-alone clinic	Use an independent exhaust blower, Open windows frequently, avoid use of ceiling fan while performing procedure, table fan to be placed behind patient, placing the exhaust fan such that to create a unidirectional flow of air away from patient, frequent servicing of window air condition system or split AC, Use of indoor portable air cleaning system with HEPA filter and UV light.
Re-circulatory system in central AC building	Blocking of return air vents in patient area, Allowing fresh air into rooms by opening of windows or doors slightly.
At clinic entrance, reception and waiting area	Display visual alerts at the entrance of the facility and in strategic areas (e.g., waiting areas or elevators) about respiratory hygiene, cough etiquette, social distancing and disposal of contaminated items in trash cans. glass or plastic barrier at the reception desk with two way speaker, three-layer masks, sanitisers and paper tissue at the registration desk, nearby hand hygiene stations,distant waiting chairs atleast one meter part, digital payments, a bin with lid at triage to discard used paper tissues.
Changing room	For staff and all workers to wear surgical top, pyjama and clinic shoes, Dedicated area for donning and doffing of PPE.
Sterilization room	A dedicated and trained person should be available to undertake transport, cleaning, drying, packing, sterilisation, storage and testing the quality of sterilisation as per the standard guidelines and manufacturer's instructions.
Washroom provision	Sensor taps or taps with elbow handles, use paper towels instead of towel.
Equipment and instrumentation	Fumigation, high volume extra oral suction, indoor air cleaning system, water lines with anti retraction valves, handpieces with anti retraction valves, chemicals for disinfection. Maintaining supply of all consumables related to PPE, sterilisation and disinfection.

Health care workers	Educate all HCW on proper selection and use of PPE. Psychological support and morale-boosting of HCW. Impart training to administrative personnel on hand hygiene, social distancing, use of facemask. Frequent rotation of clinical staff , avoiding long working hours, ensuring proper nutrition and sleep. Compulsory use of surgical attire in the dental office, Avoiding personal clothing.
Hand hygiene	As per the WHO guidelines : https:// www. who. int/ gpsc/ 5may/ Hand Hygiene Why How and When

9. FUTURE PROSPECTS

In the current scenario, the facts and findings related to covid-19 are constantly changing. The latest news is that the Covid-19 may have airborne transmission also as one of the routes of spread of infection. Hence, it might be possible that in the near future WHO will be issuing new guidelines or the modified ones addressing the HCW. Its an urgent need that a high quality research be carried out to elucidate the relative importance of different transmission routes and the role of airborne transmission in the absence of aerosol generating procedures. Accordingly, the various dental guidelines recommended by different health organizations might change in future.

10. CONCLUSION

The present situation for practicing regular dentistry is quite insecure. In addition, if the latest speculation about Covid-19 regarding air borne transmission in absence of aerosol procedures is found true then the chances of these recommendations being modified are very high. In such a case, apart from other modified recommendations, wearing a face mask for patient and respirator for dentist might become mandatory.

REFERENCES

1) Ali. I, Alharbi. OML. COVID-19 Disease, management, treatment, and social impact. Science of the total environment. 2020;728:1-6
2) Parin B, Farhin K, Shantanu. D et al. COVID-19 Changing trends and its impact on future of dentistry. International Journal of Dentistry. 2020; https://doi.org/10.1155/2020/8817424
3) Peng X, Xu X, Li Y et al. Transmission routes of 2019-nCoV and controls in dental practice. Int J Oral Sci 2020; 12: 1–6.
4) Perlman, S. & Netland, J. Coronaviruses post-SARS: update on replication and pathogenesis. Nat. Rev. Microbiol. 2009 : 7, 439–450
5) Weiss, S. & Leibowitz, J. Coronavirus pathogenesis. Adv. Virus Res.2011:81: 85–164
6) Yin, Y. & Wunderink, R. G. MERS, SARS and other coronaviruses as causes of pneumonia. Respirology: 2018: 23:130–137
7) World Health Organization. Corona virus. Available at: https://www.who.int/health-topics/coronavirus. April 6, 2020.
8) Izzetti1 R, Nisi1 M, Gabriele M and Graziani. F. COVID-19 transmission in dental practice: Brief review of preventive measures in Italy. Journal of Dental Research.2020:DOI: 10.1177/0022034520920580 journals.sagepub.com/home/jdr
9) U.S. Centers for Disease Control and Prevention. Coronavirus Disease 2019 (COVID-19) Symptoms. Available at: https://www.cdc.gov/coronavirus/2019-ncov/about/symptoms.html.
10) U.S. Centers for Disease Control and Prevention. Information on COVID-19 and Pregnant Women and Children. Available at: https://www.cdc.gov/coronavirus/2019-ncov/specific-groups/pregnant-women-and-children.html .
11) Otter J.A, Donskey.C, Yezli. S et al.Transmission of SARS and MERS corona viruses and influenza virus in healthcare settings: the possible role of dry surface contamination. Journal of hospital infection. 2016; 92;235-250
12) Ijaz MK, Brunner AH, Sattar SA, Nair RC, Johnson-Lussenburg CM. Survival characteristics of airborne human coronavirus . J Gen Virol. 1985; 66(12):2743-2748.
13) https://www.who.int/news-room/commentaries/detail/transmission-of-sars-cov-2-implications-for-infection-prevention-precautions Accessed on 20 July 2020
14) Wei, J. & Li, Y. Airborne spread of infectious agents in the indoor environment. Am. J. Infect. Control. 2016 ;44;S102–S108.
15) Heinzerling A, Stuckey MJ, Scheuer T, et al. Transmission of Covid-19 to health care personnel during exposures to a hospitalized patient—Solano County, California, MMWR Morb Mortal Wkly Rep. 2020; 69:472–476.
16) Ilyas N, Agel M, Mitchell J and Sood S.Covid-19 pandemic: the first wave – an audit and guidance for paediatric dentistry. British Dental Journal.2020; 228(12);927-931
17) Harrel S K, Molinari J. Aerosols and splatter in dentistry: a brief review of the literature and infection control implications. J Am Dent Assoc 2004; 135: 429–437
18) Meng L, Hua F, Bian Z. 2020. Coronavirus disease 2019 (COVID-19): emerging and future challenges for dental and oral medicine. J Dent Res [epub ahead of print 12 Mar 2020]. doi:10.1177/0022034520914246
19) Xu H, Zhong L, Deng J et al. High expression of ACE2 receptor of 2019-nCoV on the epithelial cells of oral mucosa. Int J Oral Sci. 2020; 12(8):1-5
20) To KK, Tsang OT, Chik-Yan Yip C, Chan KH et al. Consistent detection of 2019 novel coronavirus in saliva. Clin Infect Dis Feb 2020; doi:10.1093/cid/ciaa149
21) Kevin Y. Wu, David T. Wu, Thomas T. Nguyen et al. Covid-19's impact on private practice and academic dentistry in North America. Oral diseases. 2020;00;1-4
22) Guidelines for dental professionals in Covid-19 pandemic situation issued on 19-05-2020. https://www.mohfw.gov.in
23) U.S. centers for disease control and prevention. Corona virus disease 2019. Steps to prevent illness.https://www.cdc.gov/coronavirus/2019-ncov/about/prevention-treatment.html.accessed April 6, 2020.
24) Kevin Y. Wu, David T. Wu, Thomas T. Nguyen. Covid-19's impact on private practice and academic dentistry in North America.Oral diseases, Jun 16 2020 ; 00;1-4.doi:10.1111/odi.13444
25) Guidance for Dental Settings. Interim infection prevention and control guidance for dental settings during the Covid-19 respons https;// www. cdc. gov/ oralhealth/ infectioncontrol/summary-infection-prevention-practices/standard-precautions.html
26) Ruoshi X1, Bomiao C, Xiaobo D et al. Saliva: potential diagnostic value and transmission of 2019-nCoV.2020;12(11);1-6
27) Marwaha J, Shah K. Safety & Preventive Measures for Dental Health Care Professionals on Covid-19. International Journal of Science and Healthcare Research.2020;5(2);1-4
28) Hokett SD, Honey JR, Ruiz F, Baisden MK, Hoen MM. "Assessing the effectiveness of direct digital radiography barrier sheaths and finger cots." J Am Dent Assoc 2000;131:463-7
29) Core infection prevention and control practices for safe healthcare delivery in all settings –recommendations https;//www.cdc.gov/hicpac/recommendations/core-practices.html
30) https://www.cdc.gov/oralhealth/infectioncontrol/summary-infection-prevention-practices/standard-precautions.html