ISSN: 2581-5989
PubMed - National Library of Medicine - ID: 101738774

International Journal of Dental Science and Innovative Research (IJDSIR)

IJDSIR : Dental Publication Service

Available Online at: www.ijdsir.com

Volume – 4, Issue – 5, October - 2021, Page No. : 273 - 278

Is there a link between oral health, systemic health and Covid-19 disease – A Review

[1]Dr Mayank Das, Assistant Professor, Vyas Dental College and Hospital, Jodhpur, Rajasthan.

[2]Dr Avnica Agarwal, Assistant Professor, I.T.S Dental College, Greater Noida, Uttar Pradesh.

[3]Dr Abhishek Kumar Dubey, Dental officer, ECHS-Ministry of Defence.

[4]Dr Omveer Singh, Assistant Professor, Career Post Graduate Institute of dental sciences, Lucknow.

[5]Dr Mandar Todkar, Assistant Professor, M A Rangoonwala College of Dental Sciences and Research Centre, Pune.

[6]Dr Jyoti Adwani, Resident, Sardar Patel PG Institute of Dental & Medical Sciences, Lucknow, U.P.

Corresponding Author: Dr Mayank Das, Assistant Professor, Vyas Dental College and Hospital, Jodhpur, Rajasthan.

Citation of this Article: Dr Mayank Das, Dr Avnica Agarwal, Dr Abhishek Kumar Dubey, Dr Omveer Singh, Dr Mandar Todkar, Dr Jyoti Adwani, "Is there a link between oral health, systemic health and Covid-19 disease – A Review ", IJDSIR- October - 2021, Vol. – 4, Issue - 5, P. No. 273 – 278.

Type of Publication: Review Article

Conflicts of Interest: Nil

Abstract

World Health Organization (WHO) declared the Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) outbreak a pandemic on 11 March 2020, due to the constantly increasing the number of cases outside China. COVID-19 considered a serious infectious disease with high transmission rate which causes more deaths across the world in the elderly population, immune-compromised individuals, and in co-morbid conditions like diabetes, and hypertension and other systemic condition. In general population, chronic periodontal disease is most commonly seen in children's, adults and geriatric population. Researchers found a possible link between periodontal disease and systemic disease in recent years. Periodontal medicine is the new concept in chronic periodontal diseases as it inter-connected with the whole body of human. So, the dentists and medical professionals should work together so that they can correlate oral health with systemic health conditions and help in prevention of disease and further transmission of COVID-19 as it is hypothesized that improvement in oral health help in reducing the morbidity and severity of COVID-19.

Keywords: Coronavirus disease, Pandemic, Co-morbidities, Periodontitis, Systemic condition

Introduction

Coronaviruses are the group of viruses that causes infectious diseases in both animals and humans. The coronavirus new strain is called Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2. The novel -19 (nCOVID-19) has close similarity with bat coronavirus, and it has been indicated that bats are the primary source of its origin.[1,2] The SARS-CoV-2 pandemic has a zoonotic origin and patients present with

typical pneumonia signs and symptoms that continue to grow and this was first detected in December 2019 at Wuhan, China.[2,3] Total 3.58 million cases of COVID-19 were confirmed worldwide with 2,38,937 deaths were reported as of 1st May 2020 and by 11th March 2020, WHO declared it as pandemic.[4] Most common symptoms of COVID-19 include fever, dry cough, malaise, dyspnea, myalgia and sore throat. Less common symptoms include vomiting and diarrhea. COVID-19 incubation period was found upto 14 days from the exposure time with 4-5 days of median incubation period.[5] Geriatric population, CVC disease, lung diseases, hypertension, diabetes mellitus, and obesity were at high risk for COVID-19.[6]

It is important to understand the link between systemic diseases and oral health for both dental and medical practitioners to appropriately treat and manage patients also it is proved in some studies that the patients with periodontitis and poor oral health have a risk of occurrence of cardiovascular disease, hypertension, diabetes.[7,8] So aim of this review is to elucidate the relationship between oral health and systemic health and the spread of COVID-19.

Impact of Oral Health on systemic disease

Oral health is directly related to general health. Researchers suggested that microbial products or cytokines released in response to oral infection which causes inflammation in different organs, which is directly responsible for the development of systemic disease. It is hypothesized that compromised oral health have severe impact on systemic diseases like diabetes, heart disease, respiratory diseases.[8,] Poor oral hygiene has more likely chances to develop hospital-acquired pneumonia as a complication.[9,10]

Proposed mechanism

There is limited research on relationship between oral health with periodontal status and severe COVID-19 disease. 2 main pathogenic mechanisms to explain periodontal disease with systemic diseases are-

Direct Mechanism

As chronic periodontitis progresses, periodontal pockets epithelial lining becomes ulcerated and provides direct entry for periodontal bacteria into systemic circulation.[11]The circulating bacteria could then have direct effects on certain organs, eg, periodontal bacteria have been detected in thrombi from patients with acute myocardial infarction advocating a possible role in the pathological changes that occur in atheromatous plaque.

Indirect mechanism

When inflammation is involved in the pathogenesis of many chronic illnesses such as cardiovascular disease, type 2 diabetes mellitus the level of C - reactive protein (CRP) in the blood is an accepted method of measuring systemic inflammation in individuals. There is strong evidence that CRP levels are elevated in periodontitis subjects.[12]

Drawbacks

The main drawback in studying the relationship between gingivitis, periodontitis, oral diseases and systemic diseases is the risk factors for systemic diseases overlap with other oral diseases such as age, gender, smoking, obesity, socioeconomic status, etc. Most researchers cannot identify causes, effects and relationships between these diseases. Researchers cannot distinguish whether periodontitis and systemic disease develop due to similar shared disease pathways.[13]

Aging

World Health Organization (WHO) reported that Periodontal Diseases affects geriatric population, who are at the main target groups, because it is most common

that they have the following additional risk factors: poor oral hygiene habits, presence of chronic diseases, smoking, use of medications and also lack of timely dental treatment, which alters gingival microbiota and allow the development of PD and even respiratory infections.[14] People over 65 years are the highest risk group by severe COVID-19 illness, mainly for the multi morbidity which is a common factor in this group that allows the rapid attack of the virus and increase mortality and other cause is for the disease to be severe is the immune response, which is not as strong compared to young people.[15]

Obesity

Obesity is the main cause of several diseases. It is also associated with increase in periodontal pathogens which alter the periodontal microbial composition. The main consequence of obesity is a systemic inflammation state Adipose tissue typically secretes low levels of pro inflammatory cytokines (IL-6, IL-8, TNF-α), adipokines like leptin and adiponectin.[16] These cytokines may contribute to the development of PD is altering the response to bacteria in the gingival tissue and another way may be the production of reactive oxygen species that generate oxidative stress is increased in obesity as oxidative stress is increased in PD and it further increases the risk to develop severe COVID-19 illness.[17]

Chronic obstructive pulmonary disease (COPD)

COPD is a chronic inflammatory lung disease caused by exposure to noxious gases or particles, and smoking is the risk factor in developed countries.[18] Recently, it was suggested that the severity of PD increases the risk for COPD mortality in geriatric patients though, causality or involved molecular mechanisms have not been reported. According to my perspective, the increased risk could partly because COPD patients present increased expression of ACE-2 and additional the association of PD with COPD could be helpful to identify risk groups to develop severely COVID-19.[19]

Hypertension and cardiovascular disease

The effect of the local inflammation that occurs during generalized periodontitis might contribute significantly to systemic inflammation. The burden represented by gingival bleeding adds to that of periodontitis and translates into further worsening of the BP profile.[20] As per studies on periodontal diseases, the accumulation of various bacterial species in the subgingival biofilm induces a chronic inflammatory response by inducing the production of cytokines (IL-1, IL-6, IL-8, and TNF-a), which regulate and increase levels of C-reactive protein (CRP).[21] Detection of high-density CRP has been considered a marker in CVD and hypertension. So it can be proved that hypertension is among the main comorbidities in COVID-19 infection.[22]

Cancer

Cancer is a malignant neoplasms disease driven by mutations that cause changes in the genome of normal cells. These mutations are due to exposition to physical, chemical or environmental agents.[23] The PD has been identifying as the main risk factor that increases the development of cancer especially on head and neck, prostate cancer, breast cancer, lung cancer, and haematological cancer. There is no enough evidence about specific mechanisms of interaction between cancer and PD.[24] Studies have already shown induced inflammation, systemic translocation of periodontal pathogens through the weakened periodontal epithelium, systemic immune dysregulation, and the increase in circulating cytokines and chemokines may be associated. So, inflammation can be promoted by microorganisms that increase the risk of developing cancer. Patients with cancer are more susceptible to developing severeCOVID-19 illness especially lung cancer.[24,25]

Respiratory disease

The most common cause of mortality is due to the ability of SARS-CoV-2 to infect the respiratory tract, leading to severe pneumonia. A salient feature of COVID-19 is its ability to trigger an excessive immune reaction in the host, termed a 'cytokine storm' which causes extensive tissue damage, particularly in the connective tissue of the lungs.[26]

Periodontitis and Diabetes

Diabetes mellitus and periodontitis are chronic diseases affecting a large number of the population worldwide. Diabetes mellitus is a group of metabolic disorders characterized by chronic hyperglycemia with disturbances of carbohydrates, fat, and protein metabolism resulting from the defects in insulin secretion, insulin action, or both.[27] Therefore these two diseases need team management by medical and dental health professionals. As diabetes and periodontitis are linked and adversely affecting each other. Bacteria and bacterial products from the periodontal pocket and locally produced inflammatory mediators like TNF-α and IL-6 enter into the systemic circulation, these aggravate low- grade systemic inflammation and worsen glycaemic control and increase development or progression of diabetic complications.[28,29]

Discussion & Recommendations

Dental surgeons must improve their knowledge and clinical exposure to relevant systemic conditions to interact and relate meaningfully with their medical colleagues. A regular dental check-up is strongly advocating in light of current knowledge. The oral healthcare professionals and the medical professionals have to correlate oral hygiene with patient's systemic conditions for better prevention and further transmission of COVID 19 in the future. Periodontal medicine can play a vital role in establishing a link between oral health and systemic condition.

Conclusion

Periodontal disease and poor oral health have direct relationship with systemic disease. Additionally, these co-morbidities, systemic conditions, and additional factors are the common risk factors in patients with COVID-19 patients but still, further research is required to get the clear picture to determine the association between periodontal diseases and systemic disease.

References

1. Li JY, You Z, Wang Q, et al. The epidemic of 2019-novel-coronavirus (2019-nCoV) pneumonia and insights for emerging infectious diseases in the future. Microbes Infect. 2020;22(2):80-85.
2. Ren LL, Wang YM, Wu ZQ, et al. Identification of a novel coronavirus causing severe pneumonia in human: a descriptive study. Chin Med J (Engl). 2020;133(9):1015-1024
3. Park SE. Epidemiology, virology, and clinical features of severe acute respiratory syndrome -coronavirus-2 (SARS-CoV-2; Coronavirus Disease-19). ClinExpPediatr. 2020;63(4):119-124
4. Guan WJ, Ni ZY, Hu Y, et al. Clinical Characteristics of Coronavirus Disease 2019 in China. N Engl J Med. 2020;382(18):1708-1720
5. Chen T, Wu D, Chen H, et al. Clinical characteristics of 113 deceased patients with coronavirus disease : retrospective studyBMJ . 2020;368:m109
6. Varghese HS. Current review on COVID-19 pandemic: a global perspective. Int J Basic ClinPharmacol 2020;9:1159-66
7. Ghezzi EM, Ship JA. Systemic diseases and their treatments in the elderly: impact on oral health. J Public HealthDent. 2000;60(4):289-296

8. Khumaedi AI, Purnamasari D, Wijaya IP, Soeroso Y. The relationship of diabetes, periodontitis and cardiovascular disease. Diabetes MetabSyndr. 2019;13(2):1675-1678
9. Almeida-da-Silva CLC, Alpagot T, Zhu Y, et al. Chlamydia pneumoniae is present in the dental plaque of periodontitis patients and stimulates an inflammatory response in gingival epithelial cells. Microb Cell. 2019;6(4):197-208
10. Azarpazhooh A, Leake JL. Systematic review of the association between respiratory diseases and oral health. J Periodontol. 2006;77(9):1465-1482
11. Paraskevas S, Huizinga JD, Loos BG. A systematic review and meta-analyses on C-reactive protein in relation to periodontitis. J ClinPeriodontol. 2008;35(4):277-290
12. Linden GJ, McClean K, Young I, Evans A, Kee F. Persistently raised C-reactive protein levels are associated with advanced periodontal disease. J ClinPeriodontol. 2008;35(9):741-747
13. Winning L, Linden GJ. Periodontitis and Systemic Disease: Association or Causality?. Curr Oral Health Rep. 2017;4(1):1-7.
14. Sampson V. Oral hygiene risk factor. Br Dent J. 2020;228(8):569
15. Applegate WB, Ouslander JG. COVID-19 Presents High Risk to Older Persons. J Am GeriatrSoc. 2020;68(4):681.
16. Finer N, Garnett SP, Bruun JM. COVID-19 and obesity. ClinObes. 2020;10(3).
17. Ryan PM, Caplice NM. Is Adipose Tissue a Reservoir for Viral Spread, Immune Activation, and Cytokine Amplification in Coronavirus Disease 2019?. Obesity (Silver Spring). 2020;28(7):1191-1194
18. Brandsma CA, Van den Berge M, Hackett TL, Brusselle G, Timens W. Recent advances in chronic obstructive pulmonary disease pathogenesis: from disease mechanisms to precision medicine. J Pathol. 2020;250(5):624-635.
19. Zhao Q, Meng M, Kumar R, et al. The impact of COPD and smoking history on the severity of COVID-19: A systemic review and meta-analysis [published online ahead of print, 2020 Apr 15]. J Med Virol. 2020;10.1002/jmv.25889
20. Del Pinto R, Pietropaoli D, Munoz-Aguilera E, et al. Periodontitis and Hypertension: Is the Association Causal? High Blood Pressure & Cardiovascular Prevention : Journal of the Italian Society of Hypertension. 2020 Aug;27(4):281-289.
21. Leong XF, Ng CY, Badiah B, Das S. Association between hypertension and periodontitis: possible mechanisms. ScientificWorldJournal. 2014;1-11
22. Paraskevas S, Huizinga JD, Loos BG. A systematic review and meta-analyses on C-reactive protein in relation to periodontitis. J ClinPeriodontol. 2008;35(4):277-290.
23. Wang H, Zhang L. Risk of COVID-19 for patients with cancer. Lancet Oncol. 2020;21(4)
24. Zhang L, Zhu F, Xie L, et al. Clinical characteristics of COVID-19-infected cancer patients: a retrospective case study in three hospitals within Wuhan, China. Ann Oncol. 2020;31(7):894-901
25. Pisani P, Parkin DM, Muñoz N, Ferlay J. Cancer and infection: estimates of the attributable fraction in 1990. Cancer Epidemiol Biomarkers Prev. 1997;6(6):387-400
26. Winning L, Linden GJ. Periodontitis and Systemic Disease: Association or Causality?. CurrOral Health Rep. 2017;4(1):1-7.

27. Grossi SG. Treatment of periodontal disease and control of diabetes: an assessment of the evidence and need for future research. Ann Periodontol. 2001;6(1):138-14
28. Li X, Kolltveit KM, Tronstad L, Olsen I. Systemic diseases caused by oral infection. ClinMicrobiol Rev. 2000;13(4):547-558
29. Fernández-Real JM, Ricart W. Insulin resistance and chronic cardiovascular inflammatory syndrome. Endocr Rev. 2003;24(3):278-301.