



# **QUALITY IMPROVEMENT IN DENTAL AND MEDICAL KNOWLEDGE, RESEARCH, SKILLS AND ETHICS FACING GLOBAL CHALLENGES**

Edited by

Armelia Sari Widyarman, Muhammad Ihsan Rizal,  
Moehammad Orliando Roeslan & Carolina Damayanti Marpaung



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## Effects of COVID-19 on periodontitis (Scoping review)

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**ABSTRACT:** COVID-19 is caused by SARS-CoV-2 and can be found in periodontal tissue. Based on previous studies, there were similarities between cytokines increased in COVID-19 and periodontitis therefore there is a possibility of a relationship between COVID-19 and periodontitis. This article was made to summarize findings and sort journals exploring research methods to see the relationship of COVID-19 to periodontitis, changes in periodontal parameters, periodontal index that can be used in periodontitis patients with COVID-19 and without. The aim of this study was to describe methods used in research on COVID-19 effects on periodontitis, as well as to describe periodontal parameters and indexes change in periodontitis patients with COVID-19. This research was conducted in accordance with Preferred Reporting Items for Systematic Reviews and Meta-Analyses PRISMA guidelines, used three search engines (PubMed, Google Scholar, and WILEY), and was systematically processed according to PCC. The first article used *Probing Depth* (PD), gingival recession, *Clinical Attachment Loss* (CAL), tooth mobility, *Bleeding On Probing* (BOP), Plaque Index (PI), and Oral Hygiene Index (OHI) as research parameters. The second article discusses periodontal tissue microcirculation consisting of tissue perfusion and hemoglobin oxygen saturation (SO<sub>2</sub>). A research method that can be used for this study is case-control. Periodontal parameters that are different include *probing depth*, gingival recession, clinical attachment loss, teeth mobility, bleeding on probing, and histological parameters that includes tissue perfusion with blood, and hemoglobin saturation with oxygen. Periodontal indexes that are worse in periodontitis patients with COVID-19 are plaque index and oral hygiene index.

## 1 BACKGROUNDS

*Coronavirus Disease 2019* or COVID-19 is an infectious disease caused by the *Severe Acute Respiratory Syndrome Coronavirus 2* or SARS-CoV-2 (Spagnuolo *et al.* 2020). SARS-CoV-2 belongs to the coronavirus or CoVs group that infects the respiratory tract with symptoms such as the flu, fever, pneumonia, acute respiratory syndrome, dry cough, to multi-organ disorders (Peng 2020). This virus is a zoonotic virus originating from bats and was first discovered in 2019 in the city of Wuhan, China. This virus then spread globally and caused a pandemic to date (Mishra & Tripathi 2021). Based on data from the *World Health Organization* (WHO) in March 2021, there were 3.3 million active cases of COVID-19 with 60 thousand deaths worldwide. Globally, the total number of COVID-19 cases from 2019 to March 2021 was 122 million with 2.7 million deaths (Peng 2020). This virus has a high transmission rate because it can be transmitted by asymptomatic individuals and occurs during the incubation period of the virus within the first 11.5 days. This virus is transmitted through oral droplets and respiratory tracts from infected individuals to healthy individuals (Peng 2020). In the oral cavity, the SARS-CoV-2 virus can also be found in the periodontal tissue and gingival crevicular fluid (GCF) (Gupta *et al.* 2021).

Periodontal tissue surrounds, supports, and provides protection to the nervous tissue and blood vessels of the teeth. This tissue consists of four parts: the gingiva, cementum, periodontal ligament, and alveolar bone. These four parts work together to hold the individual teeth in place (Madukwe 2014). Under pathological conditions, the periodontal tissues may become inflamed, which is divided into gingivitis and periodontitis. Gingivitis is a reversible dental and oral disease caused by inflammation of the gingiva and is caused by the accumulation of excess bacterial plaque on the tooth surface. The occurrence of gingivitis is also influenced by individual factors such as smoking, metabolic diseases such as diabetes, and pregnancy. On the other hand, periodontitis is an irreversible dental and oral disease that involves inflammation and destruction of the supporting tissues of the teeth and is one of the most common dental and oral diseases (Mehrotra & Singh 2022). According to the Indonesian Basic Health Research (Kementerian Kesehatan Republik Indonesia) (2018), the prevalence of periodontitis in Indonesia was 74.1%. According to *the American Academy of Periodontology*, there are 2 characteristics of periodontitis, namely *Clinical Attachment Loss* (CAL) or loss of attachment to 2 non-adjacent teeth or attachment loss of 3 mm on the buccal/oral surface of 2 teeth. An etiological factor of periodontitis is a plaque attached to the tooth surface, and is also influenced by the host immune response, the patient's systemic condition, environmental factors, genetics, and lifestyle habits (Mehrotra & Singh 2022).

In previous studies, it has been found that in COVID-19 there is an increase in pro-inflammatory cytokine levels (Parasher 2021). An increase in these cytokines is a sign that the host inflammatory process is ongoing. Periodontitis was also found to increase levels of pro-inflammatory cytokines similar to those of COVID-19 (Parasher 2021). These things motivated the author to find out more about the effect of COVID-19 on periodontal tissue and what measurements are appropriate to see this effect.

## 2 METHODS

The design of this paper is descriptive and observational as a *Scoping Review*. The research location is Trisakti University, Jakarta, and conducted around August–December 2021. The search method used in this *scoping review* is the PCC concept (*population, concept, context*). *Population*: Literature on COVID-19 and periodontal tissues. *Concept*: Effect of COVID-19 on periodontal tissues. *Context*: Global. The inclusion criteria for this study are original articles from PubMed, Google Scholar, and Wiley, randomized controlled trial, cohort, case-control, cross-sectional, journals, and *grey literature* in English or Indonesian. On the other hand, the exclusion criteria for this study are hypothesis articles, case reports, journals, and *grey literature* written outside of English and Indonesian. The data search is carried out on PubMed, Google Scholar, and WILEY. This search is done with a specific search so that it can find the article or journal that will be used. Search using keywords and *Boolean words* ("COVID-19 MANIFESTATION" OR "CORONAVIRUS INFECTION" OR "CORONAVIRUS DISEASE") AND ("PERIODONTAL OUTCOMES" OR "PERIODONTAL SEVERITY" OR "PERIODONTAL DISEASE" OR "MANIFESTATION PERIODONTIS").

The data search yielded 702 articles, consisting of 16 PubMed articles, 57 WILEY articles, 628 Google Scholar articles, and 1 article from the Google database. Of the 702 articles, there were 37 duplications, leaving 665 articles. Journals were selected based on the Population, Context, and Concept (PCC) criteria. The population criteria are literature related to patients with COVID-19, with the concept of the effect of COVID-19 on periodontal tissue, and context as global. The inclusion criteria used were original articles, randomized controlled trials, cohort studies, case-control studies, case report studies, cross-sectional studies, journals, and *grey literature* in English or Indonesian. The exclusion

criteria used were hypothetical articles, journals, and grey literature written outside of English or Indonesian.

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Table 1. Data extraction table.

Title	Author, Year	Region	Study design	Sample amount	Results
A case-control study on the association between periodontitis and coronavirus disease (COVID-19)	Anand <i>et al.</i> (2022)	India	Case-control	150	COVID-19 can worsen periodontitis, increase plaque index and calculus component of oral hygiene index (OHI)
Tissue dental status and features of periodontal microcirculation in patients with new COVID-19 coronavirus infection	Remizova <i>et al.</i> (2021)	Russia	Case control	194	There is a reduction of microcirculation of periodontal tissue in COVID-19 patients and an increase in gingival bleeding in age groups 45–54 and 55–64

### 3 MAIN FINDINGS

Based on research conducted by Anand *et al.* (2022), it appears that there is a relationship between periodontitis and COVID-19. The results in the case group showed the mean percentage level and standard deviation of the probing depth (PD) of 4mm and 5mm of 13.20% 10.67 and 5.89% 6.86 respectively, the results at 3mm, 4mm, and 6mm CAL were 39.71%, 16.48%, and respectively, the plaque index value was 0.77, the OHI calculus component value was 1.26 for mobile teeth 2.95, and the gingival recession was 0.20. In the control group, there were results of the mean percentage level and standard deviation of PD 4mm and 5mm of 1.79% 4.07 and 0.59% 1.72, respectively, the results at the CAL level of 3mm, 4mm, and 6mm were 11.26%, 2.43%, and respectively, the plaque index value was 0.29, the OHI calculus component value was 1.01 for mobile teeth 1.35, and the gingival recession was 0.05.

A case-control study by Remizova *et al.* (2021) found that patients with COVID-19 experienced a decrease in periodontal tissue microcirculation compared to the non-COVID-19 group. Gingival bleeding was also found in the 45-54- and 55-64-years age groups as much as 20% and 18.5% of the total sample in the respective groups (Figure 1).



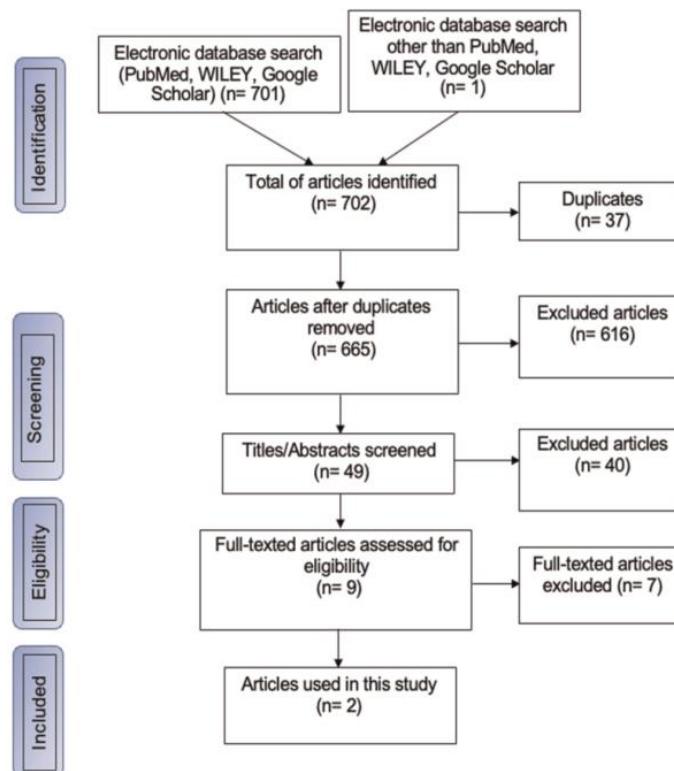


Figure 1. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA).

#### 4 CONCLUSIONS

Based on the results of this *Scoping Review*, the research method that can be used to see the impact of COVID-19 on periodontitis is case-control. Increased periodontal parameters in periodontitis patients with COVID-19 include *Probing Depth* (PD), gingival recession, clinical attachment loss (CAL), tooth mobility, and *Bleeding On Probing* (BOP). There is also a decrease in the periodontal tissue microcirculation consisting of tissue perfusion and oxygen saturation (SO<sub>2</sub>). In addition, an increase in plaque index and oral hygiene values was also found among periodontitis patients with COVID-19.

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# covid 19 scoping review

*by* Richard Somawihardja

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## EFFECTS OF COVID-19 ON PERIODONTITIS (*SCOPING REVIEW*)

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<sup>1</sup> Department of Periodontology, Faculty of Dentistry Trisakti University, Indonesia

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## ABSTRACT

[Abstract contains no more than 300 word and the manuscript should have an unstructured abstract representing an accurate summary of the article]

### Background(s):

COVID-19 is caused by SARS-CoV-2 and can be found in periodontal tissue. Based on previous studies, there were similarities between cytokines increased in COVID-19 and periodontitis therefore there is a possibility of a relationship between COVID-19 and periodontitis. This article was made to sort journals exploring research methods to see the relationship of COVID-19 to periodontitis, changes in periodontal parameters, periodontal index that can be used in periodontitis patients with COVID-19 and without.

### Objective(s)

The aim of this study was to describe methods used in research of COVID-19 effects on periodontitis, also to describe periodontal parameters and indexes change in periodontitis patient with COVID-19.

### Method(s):

This research was conducted in accordance with Preferred Reporting Items for Systematic Reviews and Meta-Analyses PRISMA guidelines, used three search engines (PubMed, Google Scholar, and WILEY) and were systematically processed according to PCC.

### Main finding(s):

Seven hundred and two articles were initially obtained. After deletion of duplications, abstracts screening, a inclusion also exclusion criteria screening, 2 articles were finally selected. The first article used Probing Depth (PD), gingival recession, Clinical Attachment Loss (CAL), tooth mobility, Bleeding On Probing (BOP), Plaque Index (PI), and Oral Hygiene Index (OHI) as research parameters. The second article discusses the periodontal tissue microcirculation consisting of tissue perfusion and haemoglobin oxygen saturation (SO<sub>2</sub>).

### Conclusion(s):

A research method that can be used for this study is case control. Periodontal parameters that are different includes probing depth, gingival recession, clinical attachment loss, teeth mobility, bleeding on probing, and histological parameters that includes tissue perfusion with  $\text{SO}_2$ , and haemoglobin saturation with oxygen. Periodontal indexes that are worse in periodontitis patients with COVID-19 are plaque index and oral hygiene index.

### Keywords:

COVID-19, periodontal tissue, periodontal parameters, periodontal index, research methods

## BACKGROUND(s)

<sup>4</sup> *Coronavirus Disease 2019* or COVID-19 is an infectious disease caused by the *Severe Acute Respiratory Syndrome Coronavirus 2* or SARS-CoV-2.<sup>1</sup> SARS-CoV-2 belongs to the corona virus or CoVs group that infects the respiratory tract with symptoms such as the flu, fever, pneumonia, acute respiratory syndrome, dry cough, to <sup>7</sup> multi-organ disorders.<sup>2</sup> This virus is a zoonotic virus originating from bats and was first discovered in 2019 in the city of Wuhan, China. This virus then spread globally and caused a pandemic to date.<sup>3</sup> Based on data from the *World Health Organization* (WHO) in March 2021, there were 3.3 million active cases of COVID-19 with 60 thousand deaths worldwide. Globally, the total number of COVID-19 cases from 2019 to March 2021 was 122 million with 2.7 million deaths.<sup>2</sup> This virus has a high transmission rate because it can be transmitted by asymptomatic individuals and occurs during the incubation period of the virus within the first 11.5 days. This virus is transmitted through of <sup>12</sup> droplets and respiratory tract from infected individuals to healthy individuals.<sup>2</sup> In the oral cavity, SARS-CoV-2 virus can also be found in the periodontal tissue and gingival crevicular fluid (GCF).<sup>6</sup>

Periodontal tissue surrounds, supports, and provides <sup>2</sup> protection to the nervous tissue and blood vessels of the teeth. This tissue consists of 4 parts, namely <sup>2</sup> the gingiva, cementum, periodontal ligament, and alveolar bone. These four parts work together to hold the individual teeth in place.<sup>8</sup> Under pathological conditions, the periodontal tissues may become inflamed, which is divided into gingivitis and periodontitis. Gingivitis is a reversible dental and oral disease caused by inflammation of the gingiva and is caused by the accumulation of excess bacterial plaque on the tooth surface. The occurrence of gingivitis is also influenced by individual factors such as smoking, metabolic diseases such as diabetes, and pregnancy. On the <sup>17</sup> other hand, periodontitis is an irreversible dental and oral disease that involves inflammation and destruction of the supporting tissues of the teeth and is one of the most common dental and oral diseases.<sup>12</sup> According to the Indonesian Basic Health Research (Riskesdas), in 2018 the prevalence of periodontitis in Indonesia was 74.1%.<sup>13</sup> According to the *American Academy of Periodontology*, there are 2 characteristics of periodontitis, namely *Clinical Attachment Loss* (CAL) or loss of attachment to 2 non-adjacent teeth or attachment loss of 3 mm on the buccal/oral surface of 2 teeth. An etiological factor of periodontitis is plaque attached to the tooth surface, and is also influenced by the host immune response, the patient's systemic condition, environmental factors, genetics and lifestyle habits.<sup>12</sup>

In previous studies, it has been found that in COVID-19 there is an increase in pro-inflammatory cytokine levels.<sup>15</sup> An increase in these cytokines is a sign that the host inflammatory process is ongoing. Periodontitis was also found to increase levels of pro-inflammatory <sup>8</sup> cytokines similar to those of COVID-19.<sup>15</sup> These things motivated the author to find out more about the effect of COVID-19 on periodontal tissue and what measurements are appropriate to see this effect.

## METHOD(s)

The design of this paper is descriptive observational as a *Scoping Review*. The research location is Trisakti University, Jakarta on August - December 2021. The search method used in this scoping review is the PCC concept (*population, concept, context*). *Population*: Literature on COVID-19 and periodontal tissues. *Concept*: Effect of COVID-19 on periodontal tissues. *Context*: Global. The

Inclusion criteria for this study are original articles from PubMed, Google Scholar, and Wiley, randomized controlled trial, cohort, case control, cross-sectional, journals and grey literature in English or Indonesian. On the other hand, the exclusion criteria for this study are hypothesis articles, case report, journals and grey literature written outside of English and Indonesian. The data search is carried out on PubMed, Google Scholar, and WILEY. This search is done with a specific search so that it can find the article or journal that will be used. Search using keywords and Boolean words ("COVID-19 MANIFESTATION" OR "CORONAVIRUS INFECTION" OR "CORONAVIRUS DISEASE") AND ("PERIODONTAL OUTCOMES" OR "PERIODONTAL SEVERITY" OR "PERIODONTAL SEVERITY" OR "PERIODONTAL DISEASE" OR "MANIFESTATION PERIODONTIS").

## MAIN FINDING(s)

The data search yielded 702 articles, consisting of 16 PubMed articles, 57 WILEY articles, 628 Google Scholar articles, and 1 article from the Google database. Of the 702 articles there were 37 duplications, leaving 665 articles. Journals were selected based on the Population, Context, and Concept (PCC) criteria. The population criteria are literature related to patients with COVID-19, with concept as the effect of COVID-19 on periodontal tissue, and context as global. The inclusion criteria used were original articles, randomized controlled trials, cohort studies, case control studies, case report studies, cross-sectional studies, journals, and grey literature English or Indonesian. The exclusion criteria used were hypothetical articles, journals, and grey literature written outside of English or Indonesian.

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<sup>16</sup> A case-control study by Remizova AA, et al found that patients with COVID-19 experienced a decrease in periodontal tissue microcirculation compared to the non-COVID-19 group. Gingival bleeding was also found in the 45-54- and 55-64-years age groups as much as 20% and 18.5% of the total sample in the respective groups. (Figure 1)

## CONCLUSION(s)

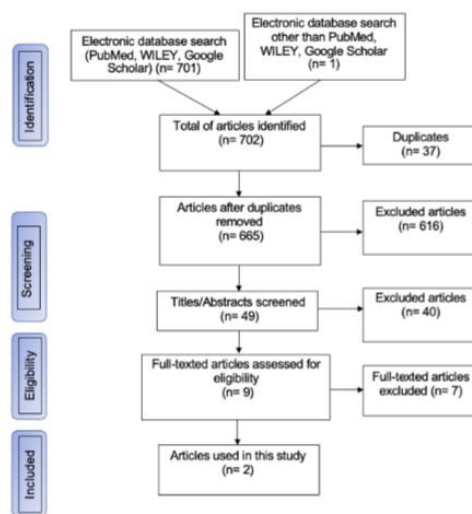
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Figure 1. Preferred Reporting Items for Systematic Reviews and Meta-Analyses



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