



# Examination of Dental Problems and Radiological and Cardiac Evaluations in Patients Affected by Covid-19

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## Abstract

This study investigated dental problems and radiological and cardiac evaluations in patients affected by Covid-19. Heart disease is related to the health of the teeth, and people who have damaged and decayed teeth are more prone to cardiovascular disease. Researchers have concluded that poor dental hygiene is a sign of acute heart disease risks. In the report presented by Tarje Imna service, a group of researchers examined almost 65 thousand people infected with the corona virus in order to evaluate the effects of the covid 19 virus on the oral and dental health of the affected people. According to the results of this research, one of the effects of the corona virus on the body is the reduction of oral moisture. Almost 43% of patients accepted this effect. In general, dry mouth is one of the causes of oral and dental diseases, especially bad breath. Corona virus also increases the risk of tooth decay by reducing the moisture in the mouth. Another effect of the corona virus on the mouth and teeth is to cause ulcers in the gums and tongue. Of course, in this case, researchers do not comment with certainty, because they believe that other factors are also effective in causing these wounds. Some experts say that considering that more than 47 percent of adults who are 30 years old or older have periodontal diseases, such as gum infection, inflammation of the gums and bone around the teeth. We should expect that the existing dental and oral problems will become more acute in case of infection with Covid-19.

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## Introduction

Some research shows that people with gum disease are more likely to suffer from heart disease than people with healthy gums [1-3]. Of course, researchers still do not have detailed information about this relationship, and it has not yet been proven whether gum disease causes other diseases or not. However, common sense dictates that we all take oral and dental health seriously in order to prevent any particular disease [4-6]. With this introduction, we take a look at the most common diseases that can be related to oral and dental

problems [7]. Diabetes can weaken the body's resistance to diseases. On the other hand, this disease increases the risk of gum disease due to the increase in blood sugar level, and gum disease itself creates conditions that basically make it harder to control blood sugar at the desired level [8]. Statistics show that 4 million people in the United States have Sjogren's syndrome, and this characteristic makes them more susceptible to oral and dental problems. In Sjogren's syndrome, the body's immune system mistakenly attacks the tear ducts and salivary glands, and this causes chronic dry eyes and dry mouth [9].

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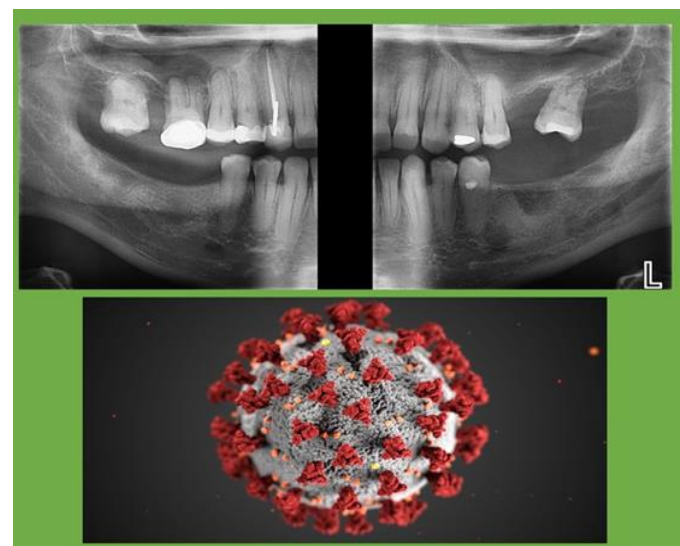


This is while oral saliva helps to protect the teeth and gums and prevents the activity of bacteria involved in the formation of cavities or tooth decay and gingivitis. Therefore, it is clear that dry mouth in the long term basically increases the chances of gum disease and tooth decay [10-12]. In a study from 2014, researchers looked at people who had both gum disease and heart disease. They found that people who took good care of their gums paid 10-40% less for cardiovascular care than people who did not follow oral hygiene. These findings support the theory that gum health affects heart health. Experts have concluded that the underlying mechanism of cardiovascular disease is related to gingivitis. Some types of bacteria live normally in your mouth, but if you don't brush or floss regularly to remove plaque, your risk of developing gum disease increases, and once it spreads in fact, you've created an environment for bacteria that wouldn't normally grow that way [13]. Also, because gum disease causes it to bleed, bacteria can enter your bloodstream and cause inflammation of the blood vessels. [14]. Bacteria can increase your risk of heart disease by helping blood clot or build up plaque in the blood vessels that lead to the heart. According to research, half of people over 55 years old have gum disease. This disease is also the main cause of tooth loss in people over 35 years old. With the spread of the Covid-19 virus, almost all aspects of human life have changed. Dentistry is one of the cases that have been affected by this pandemic [15]. Although Covid-19 has affected different groups in the society, those who suffer from oral and dental diseases are more susceptible to it than other people. Therefore, the more oral and dental hygiene people have, the less they will suffer from oral and dental diseases, the less they will need to see a dentist and the less they will be exposed to covid-19. Regular use of toothbrushes, dental floss and mouthwash can help reduce the risk of oral and dental diseases. Failure to observe oral and dental hygiene increases the possibility of contracting covid-19, because some types of viruses such as covid-19 have the ability to be absorbed into the body through the mouth and nose [16].

**Treatment of gum disease and help with rheumatoid arthritis**

People with rheumatoid arthritis are eight times more likely to develop gum disease than people without the disease. The common denominator between these two diseases is inflammation and it causes the exponential escalation of both problems

[17]. On the other hand, it is possible that people with rheumatoid arthritis have problems in brushing and flossing due to damage to the finger joints. However, the good news is that treating gingivitis and gum disease can also reduce joint pain and inflammation caused by rheumatoid arthritis. Adults without teeth are usually more likely to develop chronic kidney disease than adults with teeth [18]. Of course, it is still not completely clear what exactly kidney disease and periodontal disease have to do with each other, but researchers say that chronic inflammation could be the connecting thread that connects these two diseases [19]. Therefore, proper care of teeth and gums can reduce the risk of chronic kidney problems. (Figure 1 and 2)



**Figure 1. The effect of covid-19 in Wisdom Teeth Extraction Cambridge**

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**Figure 2. Diagnosis's Artificial Intelligence Cloud Based Software for Dental X-Rays and 3D/CBCT**

**Examining the relationship between heart and dental problems**

Maintaining oral and dental hygiene increases the



life of teeth and prevents them from decaying. Of course, you must have enough information about this and you know that the best way to prevent tooth and gum problems is brushing and flossing [20]. Tooth decay is one of the most common diseases that people get over time. In addition to being accompanied by pain, this problem also destroys the beautiful appearance of the teeth [21]. On the other

hand, tooth decay or gum infection often cause problems in the heart and blood vessels. Since the heart is a very sensitive organ, we want to provide you with comprehensive information by examining the relationship between heart and dental problems so that you can maintain your heart health by preventing tooth decay [22].

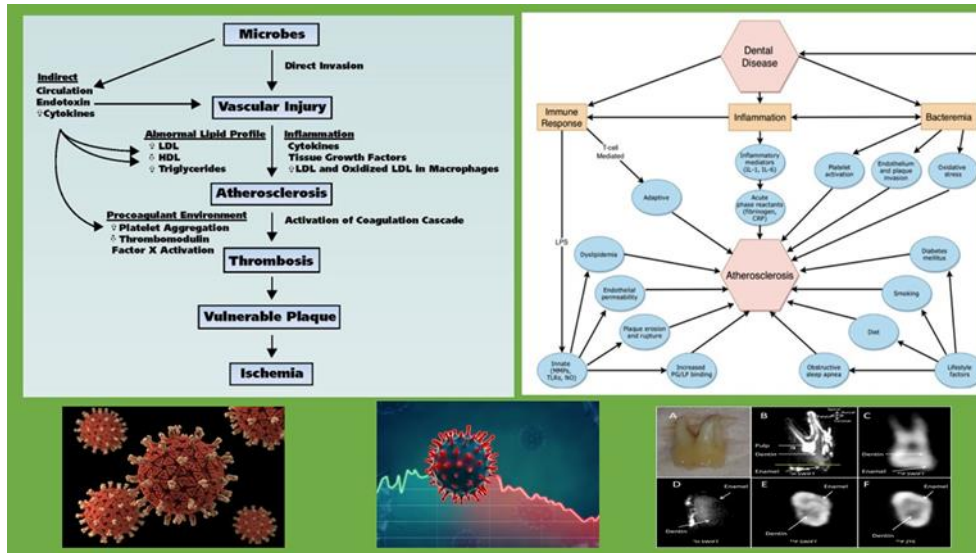


Figure 3. Oral health and atherosclerotic cardiovascular disease

### Tooth decay and heart diseases

Tooth decay in the early stages consists of several small surface spots that gradually grow and become deeper. Usually, people who don't brush their teeth properly and sufficiently, see their teeth decay, and unfortunately, many of them are negligent about the treatment of tooth decay. The fact is that treatment of caries in the early stages will save more teeth and pay less [23]. Anyway, when the decayed tooth is left alone, after some time we should expect wider and deeper decay. When the bacteria that cause caries destroy the tooth enamel and dentin and reach the pulp chamber, the person will feel severe pain. The pulp chamber is the soft tissue of the tooth that contains a large number of blood vessels and nerves. It is obvious that the presence of infection in this

part brings other complications besides pain [24].

### Acute coronary syndrome disease

When decay reaches the pulp chamber of the tooth, it causes an infection, and then the bacteria find their way to the root of the tooth [25]. We said that the pulp chamber contains a large number of blood vessels and nerve fibers that become inflamed due to infection. Since the body fights infection to defend itself, severe inflammation is observed in the root of the tooth. If the infection and inflammation in the pulp chamber is severe, bacteria and infectious agents may be directed to the heart and surrounding vessels through the blood vessels [26]. Acute coronary syndrome is one of the diseases that can be caused by tooth decay and infection. (Figure 4)





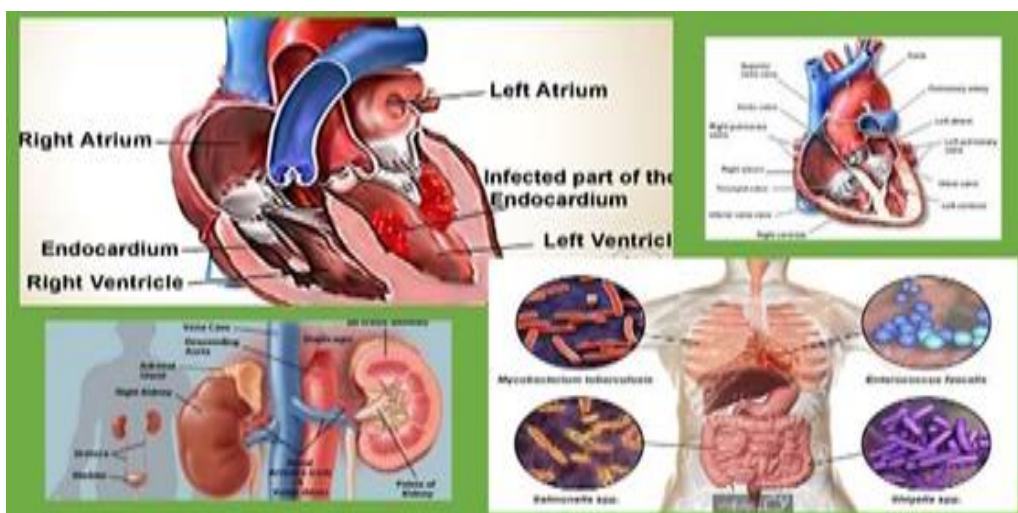
**Figure 4. Direct MRI of Human Teeth, COVID-19 and Evaluation of dental caries, tooth crack, and age-related changes in tooth structure**

**Blood pressure disease and narrowing of heart arteries**

If the bacteria and germs in the root of the tooth enter the heart and surrounding vessels through the blood vessels, they destroy the walls of the heart arteries. In a short period of time, this destruction causes blockage of heart vessels and stroke. Also, the bacteria causing decay are transferred to the whole body through the veins and destroy the vessel wall. This issue has caused an increase in blood pressure,

and as you know, blood pressure is considered a serious threat to the heart [27].

1- Endocarditis: bacteria and microbial agents present in tooth decay, if they reach the pulp chamber, they go to the heart through blood vessels and can cause a dangerous disease of endocarditis there. Endocarditis is a bacterial disease in which the entire inner surface of the heart is covered with infection. This disease causes death if not treated quickly [28].



**Figure 5. Prevention of infective endocarditis**

**Is toothache related to heart attack?**

In many cases when a heart attack occurs, before the stroke, a person feels a severe pain in his lower jaw, which is similar to a toothache. Note that this has nothing to do with tooth decay and is only a sign of stroke in some cases. If the person has no teeth and still feels severe pain in the lower jaw, take him to

the emergency room immediately. It can be said that lower jaw pain without dental cause is one of the important symptoms of heart attack [29].

**Does brushing prevent heart disease?**

Research and statistics have proven that the higher the level of oral and dental hygiene, the lower the



incidence of heart diseases. In other words, by maintaining oral and dental hygiene, you can prevent heart diseases and eliminate at least one of the harmful factors.

2- Diabetes: Diabetes and tooth decay have an important relationship and sometimes they are caused by each other. It is possible that tooth decay gradually causes infection in the root, and when the infection enters the blood, it has an important effect on blood sugar control, and if this situation continues, the possibility of diabetes increases. Also, diabetes can cause various gum and tooth diseases.

3- Dementia: No detailed research has yet been done on the relationship between tooth decay and dementia diseases such as Alzheimer's, but statistics show that more than half of Alzheimer's sufferers have some kind of bacterial disease in the mouth and gums. Also, people suffering from dementia usually suffer from chronic tooth decay.

4- respiratory diseases: It is clear that the bacteria causing tooth decay remain in the mouth until the treatment is done. In a person suffering from tooth decay, a large number of bacteria and microbes enter the lungs with each breath. In some cases, these bacteria may multiply in the lungs and cause rare respiratory diseases. People who have asthma or lung failure should try harder than others to maintain oral and dental hygiene. As you know, by brushing your teeth and using dental floss, you can easily maintain oral hygiene and significantly prevent heart disease and other dangerous diseases. Some cardiovascular diseases may affect your oral health. These diseases may also affect how you are treated and how you receive dental services. Recent studies have shown a connection between periodontal disease and the risk of heart artery blockage and heart attack, but not enough studies have been done to determine how and why periodontal disease affects these conditions. Treating periodontal disease can reduce overall inflammation in the body, although there is no evidence that treating periodontal disease prevents heart disease and heart attack [30].

5- Periodontal disease and cardiovascular conditions: Periodontal disease can affect your overall health. Over time, this disease can increase the risk of heart disease and attack. There are studies that show that people with blocked arteries are more likely to develop periodontal disease than people with healthy mouths and teeth. Now scientists have mentioned two possible reasons for this connection. First, the bacteria that cause periodontal disease can introduce toxic substances

into the bloodstream and help to create fatty plaques that block the arteries. This deposited plaque and sediment can lead to serious problems such as the formation of blood clots that lead to the closure of blood flow. Second, these bacteria cause the liver to have high levels of certain proteins that swell the blood vessels. Swelling of the blood vessels eventually leads to a heart attack or stroke [31].

Symptoms of gum disease include:

Constant bad smell.

Red and swollen gums.

Bleeding gums when brushing.

Decayed gums.

Tooth loss.

Changes in the overlapping of the teeth during chewing.

6- heart disease and dental treatment: People with certain heart conditions are prone to heart inflammation. This is a heart infection that can threaten a person's life. This happens when bacteria in the bloodstream damage the heart valves or other heart tissues. Such people may need to take antibiotics before some special dental treatments. Taking antibiotics after dental treatment is recommended in people with a history of heart disease [32].

It is not necessary to take antibiotics to do the following:

Injection of anesthesia in non-infected tissues.

Taking x-rays.

Installation of artificial teeth.

Installation of orthodontic appliances.

7- High blood pressure: Some blood pressure medications lead to dry mouth and change the sense of taste. Some other blood pressure medications may lead to a stent when in position on a dental unit. Excessive gum growth may be one of the side effects of high blood pressure. The gums of some such people become so large that it becomes difficult to chew. In some cases, surgery may be needed to remove the extra parts of the gum.

8- Angina: Angina is a pain that starts in the chest. Sometimes this pain is transferred to your lower jaw. Some people with angina take medications called calcium channel blockers. These medications can lead to overgrowth of the gums. This starts one month after starting the medication. The gums of some such people become so large that chewing becomes difficult. In some cases, surgery may be needed to remove the extra parts of the gum [33].

Reasons for oral and dental radiology

Dental X-rays are usually taken during the annual dental check-up to determine the condition of the



teeth and their roots. In some people, dental photos should be taken more often. Of course, if you want to do implants, you must take radiographs before starting the work and during the work. How often you should get radiographs depends on the following factors:

Age.

Oral and body health status.

Symptoms of oral and dental diseases.

History of tooth decay or gum disease

### Types of dental radiology with intraoral imaging

There are different types of dental x-ray imaging methods, each of which captures different views of the tooth. The most famous intraoral imaging methods are as follows:

1- Bitewing dental radiography: in this technique, the patient bites a special piece of paper and imaging is done. With this method, the dentist can see the crowns of the teeth well. This type of imaging is very suitable for examining the cavities of the teeth. (Figure 6) [34].



Figure 6. Conventional bitewing radiography

2- Occlusal dental radiography: Occlusal imaging shows all the teeth in one shot and is performed when the patient's jaw is closed. With this imaging, the dentist is able to clearly see the overlap of the

upper and lower teeth. Also, the dentist can clearly observe the anatomical abnormalities of the floor or arch of the mouth.



Figure 7. Cusps, marginal ridges, and occlusal surface boundary

3- Periapical dental radiography (single tooth): In each periapical imaging, all parts of a tooth from the upper jaw or dental jaw from the root to the crown

are depicted. With this type of imaging, any unusual changes in the root and its bone structures are shown [35].

### Types of dental radiology with extraoral imaging

**Panoramic dental radiography:** in this type of imaging, the device rotates around the patient's head and with only one exposure of the entire oral environment, including all upper and lower jaw teeth, images are taken. Dentists use this technique to check damaged teeth, wisdom teeth, plan for implant placement, diagnose tumors or jaw problems.

**Tomographic dental radiography:** Tomography shows a specific layer or slice of the mouth by blurring other layers. This technique examines structures that are difficult to see due to the presence of other surrounding structures.

**Cephalometric dental radiography:** in the cephalometric technique, one side of the patient's head is completely imaged. With cephalometric images, the connection of the teeth with the jaw and the characteristics of each tooth can be seen alone. Orthodontists usually use this view to obtain specific information about the dental structure of each patient.

**Dental X-ray sialogram:** In this imaging, a dye is injected into the salivary glands, and as a result, these glands are seen in the X-ray film. It should be noted that salivary glands are a part of soft tissue and therefore cannot be seen in radiographs without injection of contrast material. Dentists may request this test to check for problems with the salivary glands, such as blockage or syndrome, which is a disorder with symptoms of dry eyes and mouth. This disorder can contribute to tooth decay.

**Computed Tomography dental radiography (dental CT scan):** Computer tomography is a type of imaging that shows the inside of the teeth in three dimensions. This imaging is used to check problems in facial bones such as cysts, tumors and fractures [36].

**Dental radiography with CT scan:** CBCT is a type of X-ray imaging that creates three-dimensional images of the structure of teeth, soft tissues, nerves and bones. This imaging helps to place the implants in the right place and to evaluate the cysts and tumors in the mouth and face. It can also diagnose problems with the gums, tooth roots, and jaws. CBCT is similar to a routine dental CT scan in many ways, but the imaging method is different. In CBCT, the device rotates around the patient's head and creates all the information in one rotation. In a normal CT scan, flat slices are created during several rotations of the device around the patient's head.

**Digital dental radiography:** Digital imaging is one of the types of two-dimensional imaging that provides

the possibility of sending images directly to the computer. These images can be displayed on the monitor within a few seconds and saved or printed. Digital imaging has several advantages compared to conventional imaging. For example, there is the ability to enhance and enlarge the image in digital imaging. This allows the dentist to easily see the smallest changes that cannot be seen with an oral examination. Also, if needed, he can send the images electronically to another dentist. The important thing here is that the patient receives less radiation in digital imaging than in conventional radiographs [37].

### Preparation before performing oral and dental radiology

Usually, preparation before going to the imaging centers makes you waste less time. Therefore, it is better to know that it is forbidden to bring metal objects with you at the time of visit, because it interferes with the radiology process. On the other hand, you must inform all the information based on your medical history or the presence of a pacemaker or hearing aid when you are admitted. If you are pregnant or suspect that you are pregnant, be sure to bring this up as well.

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### Side effects of radiology

The amount of radiation used in dental x-rays is very low, but there is always a small risk to the tissues and cells that are exposed to the radiation. Although there is still no proof that X-rays are harmful to the developing fetus, it is better for pregnant women to undergo X-rays after giving birth [38].

### Conclusion

Bacteria go from inside the mouth to the blood circulation system that is in the gum tissue. These bacteria are like the bacteria in intravascular plaques. Oral bacteria adhere to the plaques of the circulatory system and participate in the formation of intravascular plaques and blood clotting. Studies have shown that 25% of people who have gum disease also have heart disease, and this problem is more common in men under 50 years of age. People who are worried about heart diseases should pay more attention to risk factors, that is, brushing your teeth is not enough to prevent these diseases, but they should also avoid smoking and eating very fatty foods. People who have heart disease or have undergone heart surgery must take antibiotics before hard dental work, and finally, it is essential



that prevention is better than cure, and the correct use of toothbrushes, dental floss, and toothpastes containing fluoride is possible. Help prevent severe dental problems.

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