

Vitamin D Deficiency and Oral Health

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Abstract

Usually, people think that diet and lousy maintenance of teeth will affect their dental health and cause tooth decay. However, the foods you consume may also affect your teeth and gums, but that is not the primary reason. Based on various clinical studies, multiple dental issues will be linked to the Vitamin deficiencies, particularly Vitamin D will be the primary reason for the oral health damage. Vitamin D deficiency affects persons irrespective of any age. Any part of the body may affect because of Vitamin D deficiency. Some initial symptoms include muscle weakness, low back pain, proximal muscle aches, and throbbing bone pain. When it comes to oral health, Vitamin D deficiency will negatively impact dental health like tooth decay, tooth loss, gingivitis, tooth formation, and loss of tooth enamel. Apart from gum problems and tooth decay, some of the other symptoms that can be observed if you suffer from Vitamin D deficiency, particularly in adults, are tiredness, not feeling well, body aches, and severe bone and muscle pains. If you notice some of the above symptoms, your healthcare provider can diagnose Vitamin D deficiency by performing a simple blood test. If your blood test results show that you are suffering from Vitamin D deficiency, your healthcare provider will order X-rays to check your bones' strength. One can manage the Vitamin D levels by changing lifestyle habits and dietary changes to keep your levels up and spending some time under the sun, inculcating Vitamin D foods daily in your diet, and taking Vitamin D supplements suggested by your healthcare provider. They will recommend you the proper dosage based on your Vitamin D levels. In this article, we will discuss the actual linkage between Vitamin D deficiency and oral health, how Vitamin D deficiency affects dental health, and how to manage Vitamin D deficiency, etc.

Introduction

Vitamins are an essential part of our human health, and they act as a fuel to keep our body functioning. To maintain good oral and overall health, vitamins play a vital role. Vitamin D is an essential nutrient for our body, and it is a kind of steroid hormone which mainly obtained from sunlight, but one can also get the Vitamin D from diet and dietary supplements as well⁽¹⁾. But foods which naturally contain Vitamin D are scarce, and you can find Vitamin D in fishes like salmon and mackerel. The generic name of Vitamin D comprises Vitamin D2 & D3. Mainly Vitamin D deficiency will result if you are not getting enough exposure to the sunlight, not

consuming food rich in vitamins and having trouble absorbing the Vitamin D in your food. There are specific lifestyle changes which can be followed to increase your Vitamin D levels usually, it can be treated with supplements, exposing to sunlight and managed with some dietary changes⁽¹⁾.

Supplements should be taken. If your results show insufficient Vitamin D, your healthcare provider will suggest the correct dosage based on your Vitamin D levels. Excess Vitamin D levels also cause damage to the blood vessels and organs. Hence exact dosage is required to maintain your Vitamin D levels⁽²⁾.

Vitamin D Uses and Deficiency in Connection with Dental Health

Vitamin D is very important for building up of healthy bones, because it allows digestive system to absorb calcium which comes from your diet.

- Vitamin D plays a main role in stimulating dental health, and also help in preventing from tooth decay and various types of gum diseases. Both calcium and phosphorus creates a bony structure which makes up the tooth enamel.
- Dentin is present under the tooth enamel, which contains live cells, and these cells are used by the body to protect all vital nerves and blood supply inside the tooth. Dentin consists of "guardian" cells which present at the border of the tooth enamel and the main function of this dentin is to release immune factors. These immune factors are able to repair the damaged dentin with the help of Vitamin D⁽³⁾. But if your Vitamin D levels are low, then defense system won't be able to protect and repair the infected or decayed teeth.
- Teeth are a living and functioning part of the body which usually requires good, constant and superficial maintenance. Managing of minerals in our body is completely guided by the calcium balance and the immune system, which are completely regulated by Vitamin D.
- According to dental health, bleeding gums and tooth decay are the two most common problems. Tooth decay is a chronic condition that usually happens in kids and elder people. When comes to bleeding gums, it is a chronic inflammatory disorder, this dental issue will be the first symptom of gum or periodontal disease⁽³⁾. Various clinical studies revealed that bleeding gums is not just the symptom of your gum health, but also a major sign of your gum health. Hence, it states that what goes in the other parts of the body may also have serious impact on the dental health. To resolve and avoid both the above problems, Vitamin D plays a vital role in preventing tooth decay and gum disease, and it helps in promoting good dental health.
- Various clinical studies stated that kids who are having deficiency in Vitamin D will have greater risk of developing tooth decay. Usually, Vitamin D level in blood should be 25(OH)D, when it decreases to lower than 20ng/ml it is considered as Vitamin D deficiency and insufficiency in body. Still more studies are required to ensure that you are getting required amounts of Vitamin D and lower your risk of dental problems⁽⁴⁾.
- Insufficiency of Vitamin D may affect both gum health, tooth development, chipping of tooth, prone to more cavities, and damaged tooth enamel. Particularly in children, Vitamin D deficiency affect tooth development and causing weaker tooth in their later stages. In adults, insufficiency of Vitamin D can lead to various periodontal diseases besides gingivitis disease⁽⁴⁾. Not only deficiency of Vitamin D effects gum health and tooth development, but also deficiency of this Vitamin can show up as yellow teeth. Very low levels of Vitamin D may also result in brown spots on teeth which are the serious symptom of a disease called rickets.
- Teeth are surrounded by alveolar bone and is formed by 3 different and unique hard tissues by enamel, cementum and dentin. The mineralization process of the teeth simultaneously occurs along with skeletal mineralization. As the process occurs similar to the bone tissue, Vitamin D plays major role in mineralization of teeth as well. Hence when the Vitamin D levels are unregulated, the teeth will become hypomineralised and defective⁽⁵⁾. This makes them more vulnerable for fracture and decay. There are many evidences from studies which suggest from the above basis that the Vitamin D

Deficiency (VDD) have an impacts on the mineralization of teeth and leads to occurrence of mineralization defects. Vitamin D plays a chief role in tooth and bone mineralization, and when the Vitamin D levels are up to the mark, then it may lead to “rachitic tooth.” Rachitic tooth refers to defective and hypo mineralized organ in which bones or tooth would be highly susceptible to decay or damage or even bone fractures.

- The main cause for development of periodontitis is inducing of plaque with chronic inflammation. There are intense investigation studies carried out to find the impact of nutrition deficiency (Vitamin D) in specific on the periodontal health. The observations of the study conducted in the USA noted that the patients with high levels of Vitamin D comparatively less bleeding (20% less) than those with lower levels⁽⁵⁾. Further, these studies have also noted that there is a lower level of gingival inflammation in people without periodontitis. It is observed that the salivary low levels of Vitamin D cause increased levels of inflammation markers in the patients suffering with periodontitis when compared with healthy people. Further, it is also observed that using of Vitamin D supplements caused in reduced salivary cytokine levels and it is considered beneficial before non-surgical treatment of periodontitis. Further the gingival tissues of patients suffering from periodontitis showed lower levels of Vitamin Receptors (VDR). It shows that the Vitamin D levels play significant role in periodontal health, and the VDD is associated with chronic periodontitis⁽⁶⁾.

Several clinical and pre-clinical studies noted that the metabolic pathway of Vitamin D is involved in the periodontitis pathogenesis. Also, there is an increased evidence from the studies on non-surgical treatment of periodontitis that supplements of

Calcium and Vitamin D showed moderately positive impact on the periodontal health⁽⁶⁾.

- In recent times, there remains a growing requirement of micro and macro facial aesthetics. It has led to the increased orthodontic treatments especially in the younger people. Several clinical studies noted that Vitamin D might be having a major role in the movement of tooth during the orthodontic treatment. In the cases of hypovitaminosis, the intake of Vitamin D supplements during the orthodontic treatment improved the resorption in the remodeling of alveolar bone during orthodontic teeth movement⁽⁷⁾.

How to Identify Vitamin D Deficiency?

Vitamin D deficiency affects persons irrespective of any age. Any part of the body can be affected because of Vitamin D deficiency. Muscle weakness, low back pain, proximal muscle aches and throbbing bone pain are common. Also, Vitamin D deficiency will negatively impact dental health, like tooth decay, tooth loss, and gingivitis. Also, in some studies, it was revealed that with an insufficient Vitamin D level, it can stop and reduce the tooth formation and loss of tooth enamel⁽⁸⁾.

One of the initial symptoms of Vitamin D deficiency observed regarding your tooth is gums problem and tooth decay. Most of the patients reported with any dental disease will also have Vitamin D deficiency. Apart from gum problems and tooth decay, some of the other symptoms that can be observed if you suffer from Vitamin D deficiency, particularly in adults, are tiredness, not feeling well, body aches, and severe bone and muscle pains. Difficulty in climbing steps and tiredness in performing small household work can be other indications.

Another primary function of Vitamin D is to increase the production of antimicrobial proteins, which fight against bacteria causing tooth decay. Hence, one of the significant signs of a Vitamin D deficiency is an increase in caries⁽⁸⁾.

Another vital sign that can be identified when a person is suffering from Vitamin D deficiency is a change in a tooth's pulp horns, which can be observed in the radiograph. The pulp horns of a tooth will change from U-shaped to a chair-shaped pattern that resembles a skinny H-shape. Moreover, the absence or deficiency of Vitamin D may also cause hypo-mineralization and abnormal alveolar bone patterns, compromising tooth integrity.

How to Diagnose Vitamin D Deficiency?

If any person faces some of the above symptoms, the healthcare provider can diagnose Vitamin D deficiency by performing a simple blood test. The blood test results show if the person is suffering from Vitamin D deficiency. In some cases, healthcare providers may also require X-rays to check the strength of bones in the people with deficient levels of Vitamin D⁽⁹⁾.

How to Manage Vitamin D Deficiency?

Any nutritional or vitamin deficiency leads to various disorders, but these deficiencies can be managed by following simple lifestyle and dietary changes to keep your levels up. Some of the critical ways to increase your Vitamin D intake are:

1. **Spend some time in the sun** - We all know that the primary source of Vitamin D is made in our human body when sunlight hits our skin. Daily 30 minutes of natural daylight will be a great source of Vitamin D, while you are exposed to the sunlight, your face and arms are exposed to the sunlight. Otherwise, our human body won't convert and produce Vitamin D. The exact amount of time may differ depending on your skin tone, how much your skin is exposed to sunlight, time of day and time of year (season) also matters. But be cautious that too much exposure to the sunlight may lead to skin cancer and rashes too⁽¹⁰⁾.
2. **Consume foods which are rich in vitamin D** - Vitamin D-rich foods should be taken at least one to two servings per day for Vitamin D. Rich sources of Vitamin D include eggs, fatty fish, cod liver oil, organ meats, cheese, butter, and yoghurt. Particularly, foods

like cod liver oil, salmon and trout provide maximum Vitamin D levels per serving.

3. Try to take Vitamin D supplements –

If you are detected with Vitamin D deficiency, along with the above two ways, you will be suggested to take Vitamin D supplements by your healthcare provider. They will recommend you the proper dosage based on your Vitamin D levels⁽¹¹⁾.

Conclusion

Lack or deficiency of Vitamin D may lead to various serious health issues like muscular disorders, cardiovascular diseases, skeletal and neurological syndromes, and even some cancers are prone to the lack of Vitamin D in the human body. Based on several clinical studies, The Institute of Medicine has stated that to prevent Vitamin D deficiency, people should take 200-600 International Units of Vitamin D/day. Getting a daily healthy dose of Vitamin D uplifts our immunity and keeps us healthier. When it comes to dental health, our teeth are made of similar mineralization as bones, and hence the amount of Vitamin D that humans consume must be also vital for oral health. If not, it may cause several dental issues like weak tooth development and brittle, cracked and chipped teeth. A controlled study of 2,827 children found a reduction of 47% in cavities of the children who received Vitamin D supplements. It is extremely important because it shows how by protecting your teeth from the inside by giving your body everything it needs, you can prevent cavities, preventing possible tooth loss and subsequent dental issues.

There has been an increased awareness of Vitamin D deficiency among the global population in the past few years due to the higher prevalence among younger people. In this scenario, the public oral health awareness programs should be designed to highlight the role of Vitamin D deficiency in bad oral health, and its relation to chronic dental conditions. It will increase the awareness among people about

the relationship between Vitamin D and oral health.

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