

Relationship Between Vitamin D And Dental Caries- Review

Preetha Parthasarathy
IBDS, Biochemistry Department
Saveetha Dental College
Chennai-600077

Dr. Vishnu Priya
HOD, Department of Biochemistry
Saveetha Dental College
Chennai-600077

R. Gayathri
Faculty, Department of Biochemistry
Saveetha Dental College
Chennai-600077

Abstract:

Aim: The aim of this review is to assess the relationship between vitamin D status and dental caries.

Objective: This review shows the relationship between vitamin D status in the body and its effect on dental caries.

Background: Children, these days are more prone to dental caries. This review aims at evaluating the vitamin D status in the body which has shown significant effects on dental caries. If mineral breakdown is greater than build up from sources such as saliva, caries occurs. By improving the vitamin D status in the body, the risk of caries can be minimized.

Reason: This review is done to check for the awareness about effects of vitamin D in dental caries among people. Since dental caries is a common and most prevalent problem, improving vitamin D status in the body, helps to reduce the risk of dental caries.

INTRODUCTION :

Dental caries which is also known as tooth decay is one of the most common and prevalent problem that can occur in the mouth. This is usually caused by bacteria which causes deterioration of hard tissues of the teeth.

These bacteria stick to the surface of the tooth that has the capability to turn certain sugars into acids, which causes demineralization of the hard tissues, such as the enamel and the dentin in the tooth. (1)

Research shows that vitamin D supplements can help reduce the occurrence of dental caries.

Vitamin D is a fat soluble vitamin. It resembles sterols in structure and functions like a hormone. Vitamin D is synthesized in the skin by UV rays of the sun.(2)

Cholecalciferol is first hydroxylated at 25th position to 25-hydroxy cholecalciferol by a specific hydroxylase present in the liver, 25-OH D3 is the major storage and circulatory form of vitamin D.(2)

Biologically, calcitriol which is the active form of Vitamin D is produced in kidney. The synthesis of calcitriol is self regulatory by a feedback mechanism.(2)

DENTAL CARIES AND ITS CAUSE :

Dental caries or tooth decay-an infection which is due to the action of bacteria which sticks to the surface of the tooth and cause deterioration of the hard tissues such as the enamel and the dentin.

Dental caries is a post eruptive pathological process of external origin involving softening of hard tissues and leading to cavity formation.

SIGNS OF DENTAL CARIES :

Dental caries may be manifested in various forms such as in :

- Opaque enamel surface which may be chalky or pigmented.
- Rough tooth surface especially in case of smooth surface caries
- Sticky fissure where the dental caries sticks to the fissure on light pressure.
- Hole in the tooth due to cavitation of carious lesions.

SYMPTOMS :

When the caries begin to develop, it doesn't show any symptom until there is a decay formation. As the tooth decays more and more, it causes severe pain. This pain can be due to various reasons such as consumption of snacks or due to sensitivity to heat and cold.(1)

CAUSE :

As mentioned earlier, dental caries is usually caused due to the action of bacteria on the surface of the tooth. The bacteria forms a sticky layer on the surface of the tooth. The enamel gets demineralized at the onset of caries, by the action of bacteria which secrete acids that demineralize the enamel. As the enamel gets demineralized, the enamel becomes thin and translucent leading to the spread of the effect of bacteria till dentin, hence causing demineralization of it which eventually leads to cavity formation.

VITAMIN D

Vitamin D is a fat soluble vitamin. Vitamin D is also called as "sun-shine vitamin". Vitamin D acts like a prohormone. Exposure of skin to sunlight causes vitamin D synthesis.(3) On exposure to sunlight- 7 dehydro cholesterol is converted to cholecalciferol in the skin which is then hydroxylated at 25th position to 25-hydroxy cholecalciferol which is the major storage and circulatory form of vitamin D. Calcitriol is the biologically active form of vitamin D in body.

FUNCTIONS :

Bones :

- Vitamin D plays an important role in regulation of calcium and maintenance of phosphorus levels in the blood, which is required to maintain a healthy bones.(2)
- Deficiency of vitamin D can cause bone loss that leads to osteoporosis and fractures, demineralisation which eventually leads to osteomalacia and muscle weakness causing fractures.(4)

Cancer prevention :

- Vitamin D plays a major role in regulation of cell growth and also in cell to cell communication.
- Research shows that calcitriol can reduce cancer progression by reducing cell proliferation and metastases.
- Studies show that women having breast cancer are likely to have decreased amount of vitamin D in their body.
- Vitamin D receptors are present in breast cells and tissues, that binds to vitamin D to form a complex that causes the oncogenes to stop growing and prevents the cancer cell from spreading to other parts of the body.(5)

Kidney :

- In kidney, calcitriol helps in minimizing the excretion of calcium and phosphate through it by decreasing their excretion and by enhancing reabsorption
- Decrease in vitamin D status in body causes chronic kidney disease. Due to chronic kidney disease, the patient will be unable to maintain the levels of vitamin D, despite of increasing levels of parathyroid hormone.(6)

Infertility :

- Receptor for vitamin D is present in many female organs that includes the ovary, uterus and placenta.
- The receptor binds to vitamin D and controls the secretion and production of estrogen that is required during menstruation and implantation.
- Decrease in vitamin D can cause complications in pregnancy such as gestational hypertension and diabetes.(7)

Auto-immune disease :

- Decrease in vitamin D can also lead to several auto immune disorders such as diabetes mellitus, multiple sclerosis and rheumatoid arthritis.(8)

RELATION BETWEEN VITAMIN D AND DENTAL CARIES

The enamel is the most mineralized substance in the body. It is made of calcium and phosphorus.

Vitamin D plays an important role in absorption of calcium and phosphorus from the food that is consumed.

Absorption of calcium and phosphorus helps improve the strength of the teeth and bones surrounding it.

Also, receptors for vitamin D are found in cells of the immune system which binds to vitamin D and increases the production of antimicrobial protein which helps to fight against the bacteria that cause dental caries. (1)

The cells forming enamel and dentin, ameloblast and odontoblast respectively, has vitamin D receptors which help to reduce the risk of dental caries. (9)

DISCUSSION :

Vitamin D plays a vital role in tooth development and protects it from the risk of getting dental caries.

Studies shows that when vitamin D status in the body is less, there is a chance of occurrence of dental caries, usually in late winter and early spring.

Studies also shows that when mother is given vitamin D supplements during her pregnancy, it reduces the risk of dental problems in their children.

A significant reduction in occurrence of dental caries was seen when vitamin D supplement was given and occurrence of dental caries when no supplement was given. (10)

Decrease in vitamin D status has shown a significant increase of periodontal disease. Also, vitamin D deficiency can lead to maternal periodontal disease during pregnancy.(11)

Reports states that vitamin D supplementation in childhood can help prevent caries. Also, it is seen that caries free children are likely to have twice optimal concentration of vitamin D .(12)

Another study confirms that mother who are deficient in vitamin D gave birth to child suffering from hypocalcaemia, tetanic convulsion and enamel defects of teeth.(13)

Hence, studies and research shows that with a significant reduction in vitamin D status in body which is associated with increased risk of dental problems such as caries, enamel defects, etc.

Studies also states that a pregnant mother who is deficient of vitamin D can give birth to a child that may suffer from periodontal disease and also is at risk of getting dental caries.

People having correct amount of vitamin D status in the body are less likely to suffer from dental problems, bone related problems also from cancer.

Thus, vitamin D plays a major role in human body. Its deficiency can cause some severe outcomes and problems in the body. Correct amount of vitamin D is being advised, to avoid dental and other problems.

REFERENCE :

1. VITAMIN D AND DENTAL CARIES- VITAMIN D COUNCIL
2. U SATYANARAYANA, U CHAKRAPANI- textbook of biochemistry
3. D M VASUDEVAN, SREEKUMARI S, KANNAN VAIDYANATHAN-textbook of biochemistry
4. LIPS P, VAN SCHOOR NM- THE EFFECT OF VITAMIN D ON BONE AND OSTEOPOROSIS
5. VITAMIN D COUNCIL-BREAST CANCER
6. WISAM AL-BADR, KEVIN J.MARTIN- VITAMIN D AND KIDNEY DISEASE
7. VITAMIN D IN INFERTILITY- USC FERTILITY
8. CLAUDIA DINIZ LOPEZ MARQUES, ANDREA TAVARES DANTAS, THIAGO SOTERO FRAGOSO, ANGELA LUZIA BRANCO PINTO DUARTE- THE IMPORTANCE OF VITAMIN D LEVELS IN AUTOIMMUNE DISEASES
9. ANTONIO NACI- TEN CATE'S ORAL HISTOLOGY
10. PP Hujoel on Vitamin D and dental caries in controlled clinical trials: systematic review and meta-analysis
11. William.B.Grant - A REVIEW OF ROLE OF SOLAR ULTRAVIOLET-B IRRADIANCE AND VITAMIN D IN REDUCING RISK OF DENTAL CARIOS
12. Robert J Schroth, Jeremy A Levi, Elizabeth A Sellers, James Friel, Eleonore Kliewer and Michael EK Moffatt in VITAMIN D STATUS OF CHILDREN WITH SEVERE EARLY CHILDHOOD CARIOS. A CASE-CONTROL STUDY.
13. F COCKBURN, N R BELTON, R J PURVIS, MM GILES, J K BROWN, T L TURNER, E M WILKINSON, J O FORFAR, W J BARRIE, G S McKAY, S J POCOCK -MATERNAL VITAMIN D INTAKE AND MINERAL METABOLISM IN MOTHERS AND THEIR NEWBORN INFANTS