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The Effect of Vitamin D Supplementation in Psoriasis: A Systematic Literature Review

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A B S T R A C T

One of the key factors in the development of psoriasis is inflammation. In people with psoriasis, the immune system mistakenly attacks healthy skin cells, causing them to grow too quickly. This leads to the buildup of dead skin cells on the surface of the skin. Vitamin D can help to reduce inflammation by suppressing the production of pro-inflammatory cytokines. This study aimed to conduct a systematic review to explore the potential of vitamin D supplementation in psoriasis. The literature search process was carried out on various databases (PubMed, Web of Sciences, EMBASE, Cochrane Libraries, and Google Scholar) regarding the potential of vitamin D supplementation in psoriasis. This study follows the preferred reporting items for systematic reviews and meta-analysis (PRISMA) recommendations. Vitamin D inhibits the inflammatory process in psoriasis by inhibiting the production of pro-inflammatory cytokines, activating anti-inflammatory, immune cells, and protecting cells from damage caused by inflammation.

1. Introduction

Psoriasis is a chronic autoimmune disease that causes the rapid buildup of skin cells. This buildup leads to the formation of thick, scaly patches of skin called plaques. The plaques can be red, pink, or purple, and they are often covered with silvery scales. Psoriasis is not contagious. It is caused by a combination of genetic and environmental factors. The exact cause of psoriasis is not fully understood, but it is thought to be related to a problem with the immune system. The immune system normally helps the body fight infection, but in people with psoriasis, the immune system mistakenly attacks healthy skin cells. Psoriasis can affect any part of the body, but it most commonly affects the scalp, elbows, knees, and lower back. The severity of psoriasis can vary from mild to severe. In some cases, psoriasis can be very painful and can interfere with daily activities. According to the World Psoriasis Day consortium, psoriasis affects about 2% of the world's population or about 125 million people. It is more common in developed countries, and the prevalence is higher in men than in women. The age of onset is typically between the ages of 15 and 25, but it can occur at any age.[1-3]

One of the key factors in the development of psoriasis is inflammation. In people with psoriasis, the immune system mistakenly attacks healthy skin cells, causing them to grow too quickly. This leads to the buildup of dead skin cells on the surface of the skin. T cells are a type of white blood cell that plays a central

role in the immune system. In people with psoriasis, T cells become activated and release a number of inflammatory cytokines, which can lead to the rapid growth of skin cells. Dendritic cells are another type of white blood cell that helps to activate the immune system. In people with psoriasis, dendritic cells may become activated by certain triggers, such as infections or stress. This can lead to the release of inflammatory cytokines and the development of psoriasis. Chemokines are small proteins that help to attract other immune cells to the site of inflammation. In people with psoriasis, chemokines are produced by a number of different cells, including T cells, dendritic cells, and keratinocytes. This can lead to the accumulation of immune cells in the skin, which can further contribute to inflammation.[4,5]

Vitamin D is a fat-soluble vitamin that is essential for many bodily functions, including the health of the skin. It is also known to have anti-inflammatory properties. Inflammation is a natural immune response to injury or infection. However, chronic inflammation can lead to a number of health problems, including heart disease, cancer, and autoimmune diseases. Vitamin D can help to reduce inflammation by suppressing the production of pro-inflammatory cytokines. Cytokines are small proteins that help to regulate the immune system. Pro-inflammatory cytokines promote inflammation, while anti-inflammatory cytokines reduce inflammation. There is some evidence that vitamin D supplementation can help to reduce inflammation in people with a number of different conditions, including psoriasis, rheumatoid arthritis, and inflammatory bowel disease.[6-8] This study aimed to conduct a systematic review to explore the potential of vitamin D supplementation in psoriasis.

2. Methods

The literature search process was carried out on various databases (PubMed, Web of Sciences, EMBASE, Cochrane Libraries, and Google Scholar) regarding the potential of vitamin D supplementation in psoriasis. The search was performed using the terms: (1) "vitamin D" OR "vitamin D supplementation" OR"psoriasis" OR" inflammatory" AND (2) "vitamin D" OR "Psoriasis." The literature is limited to observational studies and published in English. The literature selection criteria are articles published in the form of original articles, an experimental study about the potential of vitamin D supplementation in psoriasis, studies were conducted in a timeframe from 2013-2023, and the main outcome was the potential of vitamin D supplementation in psoriasis. Meanwhile, the exclusion criteria were the studies that were not related to the potential of vitamin D supplementation in psoriasis, the absence of a control group, and the duplication of publications. This study follows the preferred reporting items for systematic reviews and meta-analysis (PRISMA) recommendations.

3. Results and Discussion

Vitamin D is a fat-soluble vitamin that is essential for many bodily functions, including bone health, muscle function, immune system health, and cell growth. It is also known as the "sunshine vitamin" because our bodies can produce it when our skin is exposed to sunlight. The main role of vitamin D is to help the body absorb calcium and phosphorus, which are essential for bone health. Vitamin D deficiency can lead to bone deformities in children, such as rickets, and bone pain and weakness in adults, such as osteomalacia. In addition to its role in bone health, vitamin D also plays a role in muscle function, immune system health, and cell growth. It is thought to help the body fight off infections and may also play a role in preventing some types of cancer. There are two main forms of vitamin D: vitamin D2 and vitamin D3. Vitamin D2 is found in some foods, such as fortified milk and cereals, and vitamin D3 is produced by the skin when it is exposed to sunlight.[9]

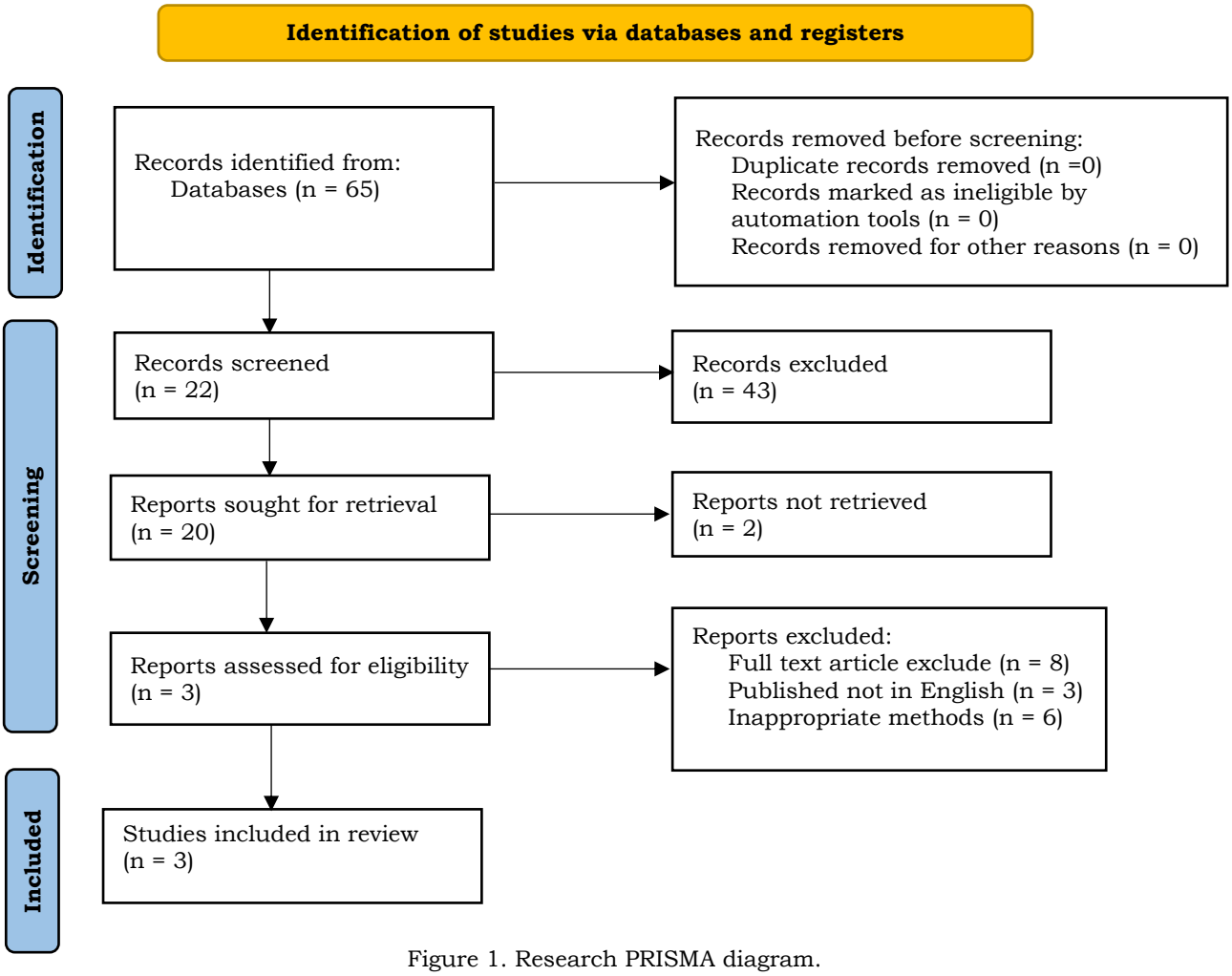

Figure 1. Research PRISMA diagram.

Vitamin D has been shown to play an important role in the modulation of the immune system, and it has been hypothesized that it may have anti-inflammatory effects. Inflammation is a natural response of the body to injury or infection. It is characterized by the release of inflammatory molecules, such as cytokines, which can cause pain, swelling, and redness. Vitamin D can help to regulate the production of these inflammatory molecules. It can also help to suppress the activity of immune cells that promote inflammation. There is some evidence that vitamin D deficiency may be associated with an increased risk of inflammatory diseases, such as rheumatoid arthritis, inflammatory bowel disease, and multiple sclerosis. However, more research is needed to confirm this association and to determine the optimal levels of vitamin D for preventing and treating these diseases.[10,11]

Vitamin D can help to inhibit the production of pro-inflammatory cytokines by upregulating the expression of anti-inflammatory cytokines. Anti-inflammatory cytokines are cytokines that help to reduce inflammation. They can do this by blocking the production of pro-inflammatory cytokines, suppressing the activity of immune cells, or by repairing damage caused by inflammation. One way that vitamin D can upregulate the expression of anti-inflammatory cytokines is by activating the vitamin D receptor (VDR). The VDR is a protein that is found in many cells of the body, including immune cells. When vitamin D binds to the VDR, it activates a series of genes that are involved in the production of anti-inflammatory cytokines. Another way that vitamin D can upregulate the expression of anti-inflammatory cytokines is by inhibiting the activity of enzymes that are involved in the production of pro-inflammatory

cytokines. For example, vitamin D can inhibit the activity of the enzyme NF-κB, which is involved in the production of TNF-alpha. Studies have shown that vitamin D can upregulate the expression of anti-inflammatory cytokines in a variety of cell types, including immune cells, endothelial cells, and epithelial cells. This suggests that vitamin D may have a role in the prevention and treatment of inflammatory diseases.[12,13]

Vitamin D can help to inhibit the production of pro-inflammatory cytokines by downregulating the expression of these cytokines. Downregulation is the process of reducing the amount of a gene that is expressed in a cell. When the expression of a pro-inflammatory cytokine is downregulated, it means that there will be less of that cytokine produced by the cell. There are a few different ways that vitamin D can downregulate the expression of pro-inflammatory cytokines. One way is by activating the vitamin D receptor (VDR). The VDR is a protein that is found in many cells of the body, including immune cells. When vitamin D binds to the VDR, it activates a series of genes that are involved in the downregulation of pro-inflammatory cytokines. Another way that vitamin D can downregulate the expression of pro-inflammatory cytokines is by inhibiting the activity of enzymes that are involved in the production of these cytokines. For example, vitamin D can inhibit the activity of the enzyme NF-κB, which is involved in the production of TNF-alpha. Studies have shown that vitamin D can downregulate the expression of pro-inflammatory cytokines in a variety of cell types, including immune cells, endothelial cells, and epithelial cells.[14,15]

Vitamin D can help to inhibit the production of pro-inflammatory cytokines by inhibiting the activity of enzymes that are involved in the production of these cytokines. One enzyme that vitamin D can inhibit is NF-κB. NF-κB is a transcription factor that is involved in the production of a number of pro-inflammatory cytokines, including TNF-alpha, IL-1 beta, and IL-6. When vitamin D binds to the VDR, it activates a series of genes that are involved in the inhibition of NF-κB. This leads to the decreased production of pro-inflammatory cytokines. Another enzyme that vitamin D can inhibit is MAPK phosphatase-1 (MKP-1). MKP-1 is an enzyme that dephosphorylates MAPKs, which are involved in the production of pro-inflammatory cytokines. When vitamin D inhibits MKP-1, it leads to the increased phosphorylation of MAPKs, which in turn leads to the decreased production of pro-inflammatory cytokines. Studies have shown that vitamin D can inhibit the activity of NF-κB and MKP-1 in a variety of cell types, including immune cells, endothelial cells, and epithelial cells. This suggests that vitamin D may have a role in the prevention and treatment of inflammatory diseases.[16,17]

Psoriasis is a chronic autoimmune disease that causes the rapid buildup of skin cells. This buildup leads to the formation of thick, scaly patches of skin known as plaques. Inflammation is a natural response of the body to injury or infection. However, in psoriasis, the body's immune system mistakenly attacks healthy skin cells. This leads to the rapid buildup of skin cells and the formation of plaques. Vitamin D has been shown to have anti-inflammatory effects. It can inhibit the production of pro-inflammatory cytokines, such as TNF-alpha and IL-1 beta. It can also activate anti-inflammatory, immune cells. In addition, vitamin D can protect cells from damage caused by inflammation. This is because vitamin D can help to regulate the expression of genes that are involved in the repair of damaged cells. Studies have shown that people with psoriasis tend to have lower levels of vitamin D than people without psoriasis.[18-20] This suggests that vitamin D deficiency may be a risk factor for psoriasis. However, more research is needed to confirm this association and to determine the optimal levels of vitamin D for preventing and treating psoriasis.

4. Conclusion

Vitamin D inhibits the inflammatory process in psoriasis by inhibiting the production of pro-inflammatory cytokines, activating anti-inflammatory, immune cells, and protecting cells from damage caused by inflammation.

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