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Review on the relationship between vitamin D deficiency and diabetes (TD1&TD2)

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Abstract. Multiple randomized controlled trials support the concept that low vitamin D levels are linked to elevated glycemic levels in people with type 1 and type 2 diabetes, and that supplementing with vitamin D can help alleviate these symptoms. This research aims to shed light on the debate surrounding the link between vitamin D deficiency and type 1 and type 2 diabetes by reviewing the existing scientific literature, analyzing the data, and drawing conclusions about the potential effects of vitamin D deficiency on diabetes progression. Researching this topic is important because it might culminate in the development of a new diabetes diagnostic test standard, which would greatly expedite the diagnosis process for a greater number of patients. In addition, it can educate the public on the importance of preventing and treating both conditions, thus enhancing patient care. In conclusion, there is strong evidence linking vitamin D insufficiency to both sexes of diabetes, suggesting that it may be an underlying cause in this disease.

Keywords: type 1 diabetes, vitamin D deficiency, glycemic level.

1. Introduction

Vitamin D, unlike water-soluble vitamins, is found in very few foods. They split in half due to diabetes. Type 1 diabetes, or T1D for short. Type 2 diabetes is the other, abbreviated as T2D. Vitamin D insufficiency has been linked to type 1 and type 2 diabetes for some time. Vitamin D insufficiency being a possible cause of both types of diabetes is a controversial claim that is currently supported by research and studies. Using data gathered from the Middle East and signed volunteers from University of Piemonte Orientale, several published papers reveal explicit relationships between three study objects. These include a lack of vitamin D, diabetes mellitus type 2, and type 1 diabetes [1]. Therefore, in order for this to become one of the tests used to determine whether patients have diabetes or not, it is crucial to delve more into its various aspects. If individuals with diabetes are able to detect the condition at an earlier stage, they may be able to treat it with less severe or more successful treatments.

The purpose of this study is to examine whether or not vitamin D insufficiency contributes to type 1 and type 2 diabetes. In this work, we examine current secondary data obtained by scientific research groups by examining previously published literature. While this study does give proper recognition to the findings of prior studies, it goes beyond by analyzing a plethora of collected data and drawing a broader, more comprehensive conclusion.

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2. Introduction of diabetes

Diabetes is a widespread condition that hinders our bodies' ability to use the food we eat as fuel. Diabetes patients may be at risk for complications like cardiovascular disease because they do not produce enough insulin. Diabetes is the umbrella term for a group of diseases that can be further broken down into two distinct types [2]. Type 1 diabetes, or T1D, is the most common form of the disease and is caused by a defect in gene expression that prevents the body from producing insulin. Current research does not support better pharmacological options to cure type 1 diabetes, hence daily insulin injections are the sole solution. Type 2 diabetes, often known as T2D, is characterized by impaired sensitivity to and/or production of insulin. Due to factors such as bad lifestyles, aging, smoking, and even inheritance, type 1 diabetes (T1D) is becoming increasingly common [3]. The beta cells in type 1 diabetes are destroyed, whereas in type 2 diabetes aberrant insulin production and insulin resistance are hallmarks of the disease. Diabetes type 2 is more common than type 1 and is caused by poor utilisation of normally produced insulin.

3. Analysis

3.1. The relationship between vitamin D deficiency and two types of diabetes

The role of vitamin D insufficiency in human disease is well established. In adults, it manifests as osteomalacia, and in children, rickets. Deficiencies in vitamin D are easily remedied due to the abundance of vitamin D-rich foods, such as cow liver, cheese, fatty fish, and egg yolks. Milk and soy milk, as well as other similar beverages, provide an appropriate daily vitamin D intake for people of all ages.

Researchers have recently discovered a link between vitamin D deficiency and the development of both forms of diabetes. Data collection and analysis are currently being conducted by numerous research groups to better highlight the connection between vitamin D insufficiency and diabetes. Several study teams have collected data using hospitalized patients' actual data. As an example, consider a cross-sectional study that will take place in a tertiary hospital in Pakistan between October 2020 and September 2021. In total, 525 individuals with type 2 diabetes and another 525 individuals serve as healthy controls in this study [4].

There were a total of 200 patients included in this study (100 male and 85 female), with a mean age of 50$\pm$5.5 years [4]. The typical concentration of 25-hydroxyvitamin D in the blood is 22.3 10.4 ng/ml. Patients with vitamin D insufficiency make up more than half of the study population. The estimated Chi Square value is larger than the p value, thus we reject the null hypothesis and accept the alternative (that vitamin D insufficiency is linked to type 2 diabetes) based on the Chi Square test.

Numerous studies have looked into whether or not type 1 diabetes is linked to vitamin D deficiency. A study conducted ten years ago looked at the effects of vitamin D supplementation on glycemic levels in people with type 1 diabetes mellitus and a vitamin D deficiency. Testing the glycosylated hemoglobin and 25-hydroxyvitamin D level of 80 individuals, the researchers found a correlation between type 1 diabetes and vitamin D deficiency [5]. Data and analysis show that vitamin D can protect islet cells from dying and may have a role in boosting the lifespan of islet cell grafts, both of which boost insulin output in a roundabout way. According to the review of literature, insufficient vitamin D may have a detrimental influence on beta-cell activities, suggesting that normal or even relatively high vitamin D levels may have been proven to lessen the risk of developing type 1 diabetes. All p-values were two-tailed, and differences between groups were considered statistically significant when the p-value was more than 0.5 [5]. This study employed the one-way ANOVA test.

Both types of diabetes and vitamin D insufficiency are on the rise, but unlike infectious diseases, they are not spread from person to person. In conclusion, a link between vitamin D insufficiency and the two forms of diabetes is established. One study examining the link between vitamin D and diabetes acknowledges the mounting evidence that vitamin D insufficiency may have a role in the onset of both type 1 and type 2 diabetes. Specific methods of action include the presence of VDRs and the 1 alpha hydroxylase enzyme in the pancreatic beta cell, which is responsible for the release of insulin [6].

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Vitamin D insufficiency has been linked to lower insulin production, according to certain studies. Calcium's potential to affect insulin secretion may be attenuated in those with low vitamin D concentrations, according to the study's findings. Furthermore, vitamin D may enhance insulin action by enhancing insulin receptor responsiveness in the transfer of glucose by promoting expression of the insulin receptor. When insulin secretion is influenced indirectly, maybe by calcium, this reduces systemic inflammation through a direct effect on cytokines. There is conclusive evidence linking low levels of 25(OH)D to an increased risk of developing type 2 diabetes [7]. Low levels of vitamin D can predict the onset of type 2 diabetes, as has been shown repeatedly. Type 1 diabetes and vitamin D insufficiency have been demonstrated to have a positive correlation. Type 1 diabetes risk may be elevated in those with insufficient vitamin D levels. There is currently no conclusive evidence that vitamin D supplementation can reverse type 1 diabetes. The uncertain relationships could be tested out in the future with better methods and larger samples of people [4].

More studies have been conducted on the correlation between type 2 diabetes and vitamin D insufficiency than on the same topic in regard to type 1 diabetes. This may be because the two forms of diabetes are caused by different mechanisms. Because faulty gene expression is usually to blame for type 1 diabetes, and because it is so difficult to interfere with and treat the disease, the medical community has yet to come up with any effective alternatives. However, type 2 diabetes is typically brought on by artificial activities that are more directly associated with human life. Therefore, the existence of vitamin D makes it comparatively easy to design remedies according to type 2 diabetes and clear up the ambiguity surrounding the treatment of this condition. Evidence linking vitamin D and calcium deficiency to poor glycemic management is weak. However, evidence from studies showed a negative correlation between low levels of vitamin D and the development of type 2 diabetes. The results showed a strong relationship between vitamin D levels and insulin resistance and beta-cell activity in the racially diverse population [8]. Low vitamin D levels, it is also established, can be an important factor in the diagnosis of type 2 diabetes. Patients with diabetes are not required to absorb a certain quantity of vitamin D, but should follow daily recommendations for vitamin D uptake. Common dosages range from 600IU for those younger than 70 years old to 800IU for those older than 70 years old [8].

3.2. Limitations of current research

Fortunately, the modern scientific community has explored the links between vitamin D insufficiency and both forms of diabetes. Several studies have shown, however, that there are still barriers to further investigating the connections. For one thing, the research approach has its own set of flaws. One study, for instance, noted that more than 80% of participants had sufficient vitamin D levels before the trials began, which could introduce bias into the outcomes [9]. Furthermore, although some participants with low vitamin D levels were found to have a reduced chance of having diabetes with vitamin d supplements, definitive conclusions could not be established due to the small number of participants with low vitamin D levels. Because most trials are poorly constructed, scientists still don't know if vitamin D supplements help persons with vitamin D insufficiency or not. As a result, it was not possible to draw sweeping conclusions based on the data gathered during testing, leading to skewed or nebulous findings. Another issue is that the mechanisms behind these three diseases still prevent researchers from fully understanding the links between vitamin D and the two forms of diabetes. Vitamin D's significance in influencing the two forms of diabetes is confirmed. However, it may have a variety of effects on the development of diabetes and its symptoms. Some topics have been explored extensively by researchers recently, while others continue to be puzzling to many. Vitamin D's benefits for diabetic patients are not yet clear enough to draw any firm conclusions [10].

4. Suggestions on supplementing vitamin D and relevant treatment

Natural dietary sources such cereals, orange juices, egg yolks, and oily seafood are the primary sources of vitamin D supplementation. Vitamin D levels in fortified milk and yogurt are higher than those in the previously listed foods. They can give patients enough vitamin D and other nutrients to meet their needs. Vitamin D from food sources has fewer adverse effects than vitamin D supplements or medicine.

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However, some foods may not contain sufficient amounts of vitamin D; therefore, specific vitamin D supplements have arisen as an additional option [11]. These supplements come in the form of injections, tablets, and liquids. Sunlight is another source of vitamin D. It has been suggested that ultraviolet B (UVB) light from the sun is the best way to get your vitamin D [12]. part research has concluded that patients can get part of the vitamin D they need from sun exposure. Between 11 a.m. and 2 p.m., patients have the ideal conditions for around 20 to 30 minutes [13]. Vitamin D supplements may help increase insulin production, which in turn reduces the severity of diabetes. Vitamin D supplementation in childhood has been proven in several trials to significantly reduce the risk of developing type 1 diabetes in later life. Vitamin D supplementation throughout the third trimester of pregnancy has also been shown to lessen the likelihood that a baby would be born with type 1 diabetes. In addition, new evidence suggests that giving vitamin D supplements to those with type 1 diabetes may help reduce some of the associated symptoms.

Although the connections between these illnesses are still poorly understood, the mechanism of vitamin D insufficiency has been uncovered, and numerous treatments have been developed. First, medication, which includes laxatives, steroids like prednisone, and cholesterol-lowering medications like cholestyramine and colestipol, is used to treat it [11]. Although vitamin D insufficiency is linked to more than just diabetes, it's the sole ailment that the authors of this scholarly research focus on. More specifically, vitamin D insufficiency is linked to cancer, and numerous studies have shown that getting enough vitamin D through supplementation reduces the risk of dying from the disease. Vitamin D deficiency is associated with bone loss and degeneration, and supplementation has been linked to better lung function [10].

5. Conclusion

In conclusion, vitamin D insufficiency is linked to both sexes of diabetes. There is conflicting evidence linking vitamin D deficiency to an increased risk of developing type 2 diabetes. This is because scientists still don't understand how exactly vitamin D impacts blood sugar levels. Although the evidence points to a correlation between vitamin D insufficiency and type 1 diabetes, many questions remain unanswered, including how vitamin D might be used to treat the disease.

There are still a number of caveats in the state of modern scientific inquiry. When compared to the number of patients who have been diagnosed with both vitamin D insufficiency and both forms of diabetes, or with the number of patients who have been diagnosed with either vitamin D deficiency and both types of diabetes, the experimental sample range is still quite small. Since age is a significant risk factor for developing type 2 diabetes, a more diverse patient population should be chosen for studies. One variable that cannot be accounted for in a scientific study is the fact that different patients will react differently to the same dose of vitamin D or other medical therapies. As a result, selecting different groups of people may produce varying results, some of which may be biased and so render the final conclusion less reliable. To look at it from a different angle, the disease itself. As was previously indicated, there are several behaviors that can lead to type 2 diabetes, some of which have not even been identified by experts. For instance, the role of genetics in the development of type 2 diabetes is currently unclear. Vitamin D is not only unknown to scientists and patients alike, but its use in the treatment of type 1 and 2 diabetes is also a mystery. No definitive vitamin D dosage has been shown to reduce diabetic symptoms or prevent diabetes in susceptible individuals. As a result, the studies examining the links between diabetes and vitamin D insufficiency lack rigor and depth, leaving room for more thorough studies and analyses in the future. Researchers might pool resources with multiple hospitals around the country to amass a larger sample size for in-depth analysis. In the future, sophisticated methods are anticipated to be developed to facilitate the study of the connections between these disorders.

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