

Seasonal Affective Disorder (SAD), Vitamin D Deficiency and Diabetes Mellitus

This article was published in the following Scient Open Access Journal:

Journal of Global Diabetes & Clinical Metabolism

Received July 19, 2017; Accepted August 05, 2017; Published August 11, 2017

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Seasonal affective disorder (SAD) is seasonal depression and can be defined as a mood disorder subset in which people that have normal mental health throughout most of the year experience depressive symptoms in the winter.

It has been suggested that the cause of SAD may be related to these hormonal changes during this time of the year and can occur during any season but it's more common during seasons when sunshine is very limited and vitamin D levels are likely to be lower. It's been estimated that as many as 20 percent of Americans are affected by Seasonal Affective Disorder (SAD) each winter, suffering from the blues, fatigue, and in some cases, more serious depression as sunlight duration becomes shorter [1].

The symptoms of SAD include increased appetite, weight gain, declined energy levels, and increased sleep desire, loss of interest in usually pleasurable or fulfilling activities, cravings for some food items, irritability, ruminations of guilt and suicidal thoughts.

During winter, when vitamin D levels are low, serotonin levels decline, mood plunge and people often experience cravings for carbohydrates as a means to increase serotonin levels [2].

The fact that SAD occurs when the days start to darken and sunlight is at a minimum is not a coincidence. The health and mood is intricately tied to exposure to sunlight and serotonin an important role here.

Vitamin D affects the brain through its receptors which are found in many parts of the brain on the surface of a cell where they receive chemical signals. These chemical signals and after attaching themselves to a receptor, direct a cell to act which means that these receptors are found in the areas of the brain that are linked to the development of depression and therefore, vitamin D has been associated with depression and with other mental health problems [3].

Melatonin level also rises and falls (inversely) with light and darkness. When it's dark, melatonin levels increase, causing individual to feel tired when the sun begins to set. Light and darkness also control your biological clock, or circadian rhythm, which impacts hormones that regulate appetite and metabolism.

It appears to be a relation between serum levels of 25(OH) D and symptoms of depression. Supplementation with high doses of vitamin D seems to ameliorate these symptoms indicating a possible causal relationship.

People with diabetes experience SAD. Diabetic retinopathy may play a role by reducing the light signal sent to the brain. Both diabetes and depression may see their likelihood increased by a common factor like a sedentary lifestyle. Whatever the cause or combination of causes, people with diabetes have reason to take extra precautions to recognize, prevent, and fight SAD [4].

Since people with diabetes may experience symptoms similar to those of depression when their blood glucose levels are out of target range or are fluctuating greatly, this is a good area to examine first. Pay attention to whether your low moods, cravings, or feelings of irritability are accompanied by out-of-range blood glucose levels, whether they resolve when blood glucose levels return to normal, and whether they last minutes or hours versus weeks or months [5].

It was observed that SAD sufferers tend to produce a surplus of insulin during

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winter season; this excessive insulin production “appears to subside” with bright light therapy and with the advent of summer.

Studies have shown that around 85% of adolescents with type 1 diabetes have inadequate levels of vitamin D. Mathieu et al. found in a research published in *Diabetologia* 2005, that Vitamin D deficiency predisposes individuals to type 1 and type 2 diabetes and can impair insulin synthesis and secretion in humans [6]. There is a strong evidence of vitamin D effect on type 1 DM risk comes from experiments in the non-obese diabetic (NOD) mouse. The NOD mouse experiences disease pathogenesis similar to the human, including autoimmune destruction of β -cells. It was also found that administration of 1-25 (OH) 2D (the active form of vitamin D) prevented the development of diabetes.

Hyponen, et al. (2001) in the *Lancet* confirmed that there is a new evidence that children who get plenty of vitamin D either from supplements or sun exposure, have a reduced risk of developing type 1 diabetes. Supplementation with 50 $\mu\text{g}/\text{day}$ (2000 IU/day) or higher may have a strong protective effect [7].

In another study, it was confirmed that daily supplementations of 2000 IU of vitamin D for 90 days to diabetics, lowered their serum HbA1c values especially among those who had HbA1C values higher than 9, and also improved concentration of serum 25(OH) vitamin D in both healthy and diabetic group upgrading their vitamin D status from deficiency to sufficiency[8].

Therefore, diabetics during winter should count on Vitamin D supplementations or to depend on light therapy in order to improve their Vitamin D levels and consequently reduce their SAD symptoms and improve their glucose levels and this can be considered as a cheap and effective therapeutic tool in the management of type 2 diabetes, SAD and vitamin D deficiency.

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