

# Effect of Deficiency of Vitamin D on Depression and Premenstrual Syndrome.

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## Abstract

Vitamin D, otherwise called the daylight vitamin, is critical for the control of calcium and phosphorus assimilation. Deficiency of it is also associated with many medical problems like multiple sclerosis, cancer, cardiovascular disease and can also lead to psycho somatic issues. The study was conducted on 80 subjects who were further divided into 2 groups of 40 each. Group A with normal Vitamin D levels and group B was formed of people suffering from hypovitaminosis D, 20 females were tested on Premenstrual Syndrome as well. Hamilton Depression Rating Scale was used to measure level of depression. It was hypothesized that hypovitaminosis D would be positively related to depression, and premenstruation syndrome.

**Keywords:** Vitamin D, Hypovitaminosis D, Depression, , Premenstrual Syndrome.

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## I. Introduction

Vitamin D is a vital nutrient that plays a multifaceted role in maintaining overall health. It is commonly known as the "sunshine vitamin" because the body can produce it when the skin is exposed to sunlight. It is produced when sunlight converts cholesterol on the skin into calcitriol (vitamin D<sub>3</sub>). Vitamin D<sub>3</sub> is then converted into calcidiol (25-hydroxyvitamin D<sub>3</sub>) in the liver. The kidneys then convert calcidiol into the active form of vitamin D, called calcitriol (1, 25-hydroxyvitamin D<sub>3</sub>). Adequate vitamin D intake is important for the regulation of calcium and phosphorus absorption, maintenance of healthy bones and teeth, and is suggested to supply a protective effect against multiple diseases and conditions such as cancer, type 1 diabetes. In spite of the name, vitamin D is considered a pro-hormone and not actually a vitamin. This is because the body is capable of producing its own vitamin D through the action of sunlight on the skin, while vitamins are nutrients that cannot be synthesized by the body and must be acquired through the diet or supplements. It is estimated that sensible sun exposure on bare skin for 5-10 minutes 2-3 times per week allows the body the ability to produce sufficient vitamin D, but vitamin D has a half-life of only two weeks, meaning that stores can run low, especially in winter. Some studies have suggested that up to 50% of adults and children worldwide are vitamin D deficient. There are several likely factors contributing to vitamin D deficiency. As such, statins and other medications or supplements that inhibit cholesterol synthesis, liver function or kidney function can impair the synthesis of vitamin D. whereas Depression (major depressive disorder or clinical depression) is a common but serious mood disorder. It causes severe symptoms that affect how you feel, think, and handle daily activities, such as sleeping, eating, or working. To be diagnosed with depression, the symptoms must be present for at least two weeks.

Some forms of depression are slightly different, or they may develop under unique circumstances, such as:

- **Persistent depressive disorder** (also called dysthymia) is a depressed mood that lasts for at least two years. A person diagnosed with persistent depressive disorder may have episodes of major depression along with periods of less severe symptoms, but symptoms must last for two years to be considered persistent depressive disorder.
- **Perinatal depression** is much more serious than the "baby blues" (relatively mild depressive and anxiety symptoms that typically clear within two weeks after delivery) that many women experience after giving birth. Women with perinatal depression experience full-blown major depression during pregnancy or after delivery (postpartum depression). The feelings of extreme sadness, anxiety, and exhaustion that accompany perinatal depression may make it difficult for these new mothers to complete daily care activities for themselves and/or for their babies.
- **Psychotic depression** occurs when a person has severe depression plus some form of psychosis, such as having disturbing false fixed beliefs (delusions) or hearing or seeing upsetting things that others cannot hear or see (hallucinations). The psychotic symptoms typically have a depressive "theme," such as delusions of guilt, poverty, or illness.
- **Seasonal affective disorder** is characterized by the onset of depression during the winter months, when there is less natural sunlight. This depression generally lifts during spring and summer. Winter depression,

typically accompanied by social withdrawal, increased sleep, and weight gain, predictably returns every year in seasonal affective disorder.

• **Bipolar disorder** is different from depression, but it is included in this list is because someone with bipolar disorder experiences episodes of extremely low moods that meet the criteria for major depression (called “bipolar depression”). But a person with bipolar disorder also experiences extreme high – euphoric or irritable – moods called “mania” or a less severe form called “hypomania.”

#### Signs and Symptoms

If you have been experiencing some of the following signs and symptoms most of the day, nearly every day, for at least two weeks, you may be suffering from depression:

- Persistent sad, anxious, or “empty” mood
- Feelings of hopelessness, or pessimism
- Irritability
- Feelings of guilt, worthlessness, or helplessness
- Loss of interest or pleasure in hobbies and activities
- Decreased energy or fatigue
- Moving or talking more slowly
- Feeling restless or having trouble sitting still
- Difficulty concentrating, remembering, or making decisions
- Difficulty sleeping, early-morning awakening, or oversleeping
- Appetite and/or weight changes
- Thoughts of death or suicide, or suicide attempts
- Aches or pains, headaches, cramps, or digestive problems without a clear physical cause and/or that do not ease even with treatment

Not everyone with depression exhibits all possible symptoms; some may show only a few, while others may experience many. To diagnose major depression, multiple persistent symptoms in addition to a low mood are usually required. In our country depression affects 9% of the population, with major depressive episodes impacting 36%. The average age at which depression begins is 31.9 years. Despite these figures, the mental health budget in the country is less than 1% of total health expenditures. Although the National Mental Health Programme aims to provide services to both rural and urban areas, 80% of individuals in rural regions still lack access to these services.

Premenstrual syndrome (PMS) encompasses a range of symptoms, including mood swings, tender breasts, food cravings, fatigue, irritability, and depression. It is estimated that up to 75% of menstruating women have experienced some form of PMS. This condition is associated with the menstrual cycle, with symptoms typically appearing 1 to 2 weeks before menstruation begins and usually subsiding once bleeding starts. PMS can affect women of any age, and its severity varies from person to person. For some, PMS is a minor inconvenience, while for others, it can be debilitating. The symptoms of PMS generally disappear once menstruation ends, such as during pregnancy or menopause. Symptoms often follow a predictable pattern, but the intensity of physical and emotional changes can range from mild to severe

#### Symptoms of PMS

A woman’s menstrual cycle lasts an average of 28 days. Ovulation, the period when an egg is released from the ovaries, occurs on day 14 of the cycle. Menstruation, or bleeding, occurs on day 28 of the cycle. PMS symptoms can begin around day 14 and last until seven days after the start of menstruation.

The symptoms of PMS are usually mild or moderate. Nearly 80 percent of women report one or more symptom that does not substantially affect daily functioning, according to the journal *American Family Physician*. Twenty to 32 percent of women report moderate to severe symptoms that affect some aspect of life. Three to 8 percent report PMDD. The severity of symptoms can vary by individual and by month. The symptoms of PMS include:

- abdominal bloating
- abdominal pain
- sore breasts
- acne
- food cravings, especially for sweets
- constipation
- diarrhea
- headaches
- sensitivity to light or sound
- fatigue

- irritability
- changes in sleep patterns
- anxiety
- depression
- sadness
- emotional outbursts

## II. Literature Review

- Effects of vitamin D supplementation on symptoms of depression in overweight and obese subjects; by R. Jorde, M. Sneve, Y. Figenschau, J. Svartberg, K. Waterloo. *Journal of Internal Medicine*.

In conclusion, there appears to be a relation between serum 25(OH)D levels and depression in overweight and obese subjects, and supplementation with vitamin D in high doses for 1 year may have a beneficial effect on depressive symptoms.

- Vitamin D Deficiency Is Associated With Low Mood and Worse Cognitive Performance in Older Adults; by Consuelo H. Wilkins, M.D., Yvette I. Sheline, M.D., Catherine M. Roe, Ph.D., Stanley J. Birge, M.D., John C. Morris, M.D.

In this study of older adults without significant functional disability, vitamin D deficiency was associated with low mood and worse performance on two measures of cognitive function. This study also found that 58% of the participants had vitamin D levels below the sufficient range. Participants in this study with an active mood disorder had significantly lower vitamin D concentrations compared with those without a mood disorder. Prior studies of vitamin D and mood disorders have been conflicting. Depression and seasonal affective disorders have improved with vitamin D supplementation and ultraviolet light exposure.

- FIBROMYALGIA: ARTICLES IN MEDICAL JOURNALS-Armstrong DJ, Meenagh GK, Bickle I, Lee AS, Curran ES, Finch MB (Vitamin D deficiency is associated with anxiety and depression in fibromyalgia)

Low levels of vitamin D have been frequently reported in fibromyalgia, but no relationship was demonstrated with anxiety and depression. Seventy-five Caucasian patients who fulfilled the ACR criteria for fibromyalgia had serum vitamin D levels measured and completed the Fibromyalgia Impact Questionnaire (FIQ) and Hospital Anxiety and Depression Score (HADS). Deficient levels of vitamin D was found in 13.3% of the patients, while 56.0% had insufficient levels and 30.7% had normal levels. Patients with vitamin D deficiency had higher HADS than patients with insufficient levels or than patients with normal levels. There was no relationship with global measures of disease impact or musculoskeletal symptoms. Vitamin D deficiency is common in fibromyalgia and occurs more frequently in patients with anxiety and depression.

- *The new England journal of medicine: Medical Progress:*

Vitamin D Deficiency; Michael F. Holick, M.D., Ph.D.

Vitamin D deficiency has been linked to an increased incidence of schizophrenia and depression. Maintaining vitamin D sufficiency during early life, to satisfy the vitamin D receptor transcriptional activity in the brain, maybe important for brain development as well as for maintenance of mental function later in life.

- Vitamin D deficiency may play a role in depression

Michael Berk \*, Kerrie M. Sanders, Julie A. Pasco, Felice N. Jacka, Lana J. Williams, Amanda L. Hayles, Seetal Dodd. Vitamin D supplementation has been shown to have a positive effect on mood and wellbeing; however previous studies have been limited by small numbers, short treatment duration, or a lack of a placebo control. A therapeutic role for vitamin D supplementation in the treatment of mood disorders could provide a safe, low cost therapy with additional advantages to general and bone health.

- Vitamin D Deficiency in Homebound Elderly Persons by F. Michael Gloth III, MD; Caren M. Gundberg, PhD; Bruce W. Hollis, PhD – Despite a relatively high degree of vitamin supplementation in the United States, homebound elderly persons are likely to suffer from vitamin D deficiency.

- Transient prenatal vitamin D deficiency is associated with subtle alterations in learning and memory functions in adult rats Axel Becker a,\*, Darryl W. Eyles b,c, John J. McGrath b,d, Gisela Grecksch- Transient prenatal low vitamin D is associated with subtle and discrete learning and memory impairments in the rat. This interesting behavioural phenotype, combined with the growing body of experimental evidence unravelling the biological pathways linking low prenatal vitamin D to altered brain development, supports the notion that this animal model may be a useful tool for the study of neuropsychiatric disorders.

- The FASEB Journal • Review Is there convincing biological or behavioral evidence linking vitamin D deficiency to brain dysfunction? Joyce C. McCann<sup>1</sup> and Bruce N. Ames<sup>1</sup>- The evidence base in rodents is larger, with two laboratories providing intriguing and clearly suggestive, though in our opinion not definitive, evidence of subtle behavioral effects of vitamin D inadequacy. Despite residual uncertainty, we believe the evidence overall suggests that supplementation to ensure adequacy is prudent, particularly for groups whose 25OHD<sub>3</sub> status is exceptionally low, including nursing infants, the elderly, and African Americans. Such supplementation is already recommended to protect against rickets, fracture risk, and possibly some forms of cancer.

- Vitamin D and Risk of Cognitive Decline in Elderly Persons  
David J. Llewellyn, PhD; Iain A. Lang, PhD; Kenneth M. Langa, MD, PhD- It is estimated that between 40% and 100% of older, community-living adults in the United States and Europe are vitamin D deficient. Animal and in vitro experiments suggest that vitamin D is neuroprotective. However, several small clinical studies provide equivocal evidence linking low serum 25-hydroxyvitamin D (25[OH]D) levels to cognitive dysfunction. No cross-sectional association between serum 25(OH)D levels and verbal memory was observed in older adults from the Third National Health and Nutrition Examination Survey. However, cross-sectional associations between 25(OH)D levels and cognitive dysfunction in older adults were observed using data from the Health Survey for England, the European Male Aging Study, and the Nutrition and Memory in Elders Study.

- Vitamin D Deficiency Is Associated With Low Mood and Worse Cognitive Performance in Older Adults  
Consuelo H. Wilkins, M.D., Yvette I. Sheline, M.D., Catherine M. Roe, Ph.D., Stanley J. Birge, M.D., John C. Morris, M.D.- In this study of older adults without significant functional disability, vitamin D deficiency was associated with low mood and worse performance on two measures of cognitive function. This study also found that 58% of the participants had vitamin D levels below the sufficient range.

### **Objectives of the study**

- Lack of vitamin D is associated with an increased risk of depression.
- Lack of vitamin D leads to premenstrual syndrome in women.

### **Hypotheses**

- H1: Hypovitaminosis D leads to depression  
H2 : Hypovitaminosis D does not lead to depression  
H3: Hypovitaminosis D leads to premenstrual syndrome  
H4: Hypovitaminosis D does not lead to premenstrual syndrome

### **Design**

- Independent variable in this study is Vitamin D.
- Dependent variables are depression and premenstrual syndrome.

### **Sample**

The sample in this study will be divided into two groups:

Group A is the group of 40 people not suffering from hypovitaminosis D.

Group B is the group of 40 people suffering from hypovitaminosis D.

Both the groups had 20 males and 20 females and the total sample came out to be 80.

Two groups of 20 each with females only were taken for the part of study which works with PMS. One group with lack of vitamin D and one with normal levels of vitamin D.

### **Measures Used**

- Hamilton Depression Rating Scale (HDRS)

The test used for depression is HDRS the validity of the HDRS has been reported to range from 0.65 to 0.90 with global measures of depression severity. Test-retest reliability for the HDRS using the Structured Interview Guide has been reported to be as high as 0.81.

- VITAMIN D 25 – HYDROXY

Designed by the public health nutrition.

### III. Results

The results of this study were computed using t test and the significance value of the t test of all the variables on both the groups i.e. with hypovitaminosis D and with normal vitamin D levels is as below:

**Table 1 shows the t critical value of Hamilton Depression rating scale on both groups.**

	Group A	Group B
Mean	9.933333	14.53333
Variance	34.83333	41.49885
Observations	30	30
Hypothesized Mean Difference	0	
Df	58	
t Stat	-2.94649	
P(T<=t) one-tail	0.002311	
t Critical one-tail	1.671553	
P(T<=t) two-tail	0.004622	
t Critical two-tail	2.001717	

**Table 2 shows the t value of females on PMS screening test in both the groups.**

	Group A	Group B
Mean	17.46667	17.46667
Variance	27.8381	23.40952
Observations	15	15
Pearson Correlation	-0.09308	
Hypothesized Mean Difference	0	
Df	14	
t Stat	0	
P(T<=t) one-tail	0.5	
t Critical one-tail	1.76131	
P(T<=t) two-tail	1	
t Critical two-tail	2.144787	

### IV. Discussion

This study has been conducted on various factors which have emerged as very common problems in our day to day life. Hypovitaminosis D, depression and in women on Premenstrual syndrome. Almost 50% of population in India suffers from severe vitamin D deficiency which leads to various casualties. Vitamin D has been associated with various other dysfunctions in body as in immunity, calcium depletion and in fractures. The review also suggest that depression, schizophrenia and many other cognitive dysfunctions have been linked to hypovitaminosis D in the past. The current study looks forward to establishing this link. In table 1 the t value is significant and hence our first hypothesis has been accepted. Which states that hypovitaminosis D leads to depression. However Table 2 shows that the t value is not significant in this case and hence vitamin D alone has no effect on premenstrual syndrome as the t value was not significant. With this hypothesis 4 gets accepted which suggested that there would be no affect of vitamin d on the premenstrual syndrome. Apparently there are lots of other factors to be taken into account and controlled.

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