

**Depression, Short Term Memory and Premenstrual Syndrome  
among Young Adults with Normal Vitamin D levels and with  
Hypovitaminosis D**

A

*Thesis submitted*

*In the partial fulfillment of the requirement for the degree of*

**MASTER OF ARTS  
IN  
PSYCHOLOGY  
(Clinical)**



Submitted by:  
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UNDER THE SUPERVISION OF

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PATIALA  
June, 2017**

## **CERTIFICATE**

This is to certify that the thesis entitled “**Depression, Short Term Memory and Premenstrual Syndrome among Young Adults with Normal Vitamin D levels and with Hypovitaminosis D**” being submitted in partial fulfillment of requirements for the award of degree of **Master of Arts in Psychology**, submitted in **the School of Humanities and Social Sciences, Thapar University, Patiala** is a bonafide work carried out under the supervision of **Dr. Simerpreet Ahuja**, Assistant Professor, School of Humanities and Social Sciences, Thapar University, Patiala and that no part of this project has been submitted for the award of any other degree.



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This is to certify that above statement made by the student concerned is correct and true to the best of my knowledge.



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## **CANDIDATE'S DECLARATION**

I hereby declare that the work presented in this thesis entitled, "**Depression, Short Term Memory and Premenstrual Syndrome among Young Adults with Normal Vitamin D levels and with Hypovitaminosis D**" in partial fulfillment of the requirement for the award of Degree of **Master of Arts in Psychology**, submitted in **the School of Humanities and Social Sciences, Thapar University, Patiala**, is an authentic record of my own work carried out under the supervision and guidance of **Dr. Simerpreet Ahuja**, Assistant Professor, School of Humanities and Social Sciences, Thapar University, Patiala and refers other researcher's work which are duly listed in the reference section.

The matter embodied in this thesis has not formed the basis for the award of any other degree of this or any other university.

Date: 29<sup>th</sup> May, 2017

Place: Patiala



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## ACKNOWLEDGEMENTS

Accomplishment of any project required the hard work and efforts of many people. This project work would not have been possible without the kind support and help of many individuals.

I wish to express my deep sense of gratitude to my supervisor **Dr. Simerpreet Ahuja**, for her invaluable guidance, encouragement, useful suggestions and readiness to resolve any point of confusion by mutual discussion, which helped me gain some key insights about the subject and thus, made my research a great learning experience.

I would also like to thank all the faculty member of **School of Humanities and Social Sciences** of Thapar University, Patiala for their vision and relentless effort, support, and encouragement to provide me with this excellent opportunity to carry out my project work.



Prashant Malik

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## Abstract

The objective of this study is to compare depression, short term memory and premenstrual syndrome in young adults with normal Vitamin D and with Hypovitaminosis D. The study was conducted on patients in IPD of orthopaedics department. HAMD and Digit span test were used to measure depression and short term memory respectively. For premenstrual syndrome however the questionnaire used by doctors for severity of the syndrome was used. The study was conducted on a sample of 60. These 60 subjects were further divided into two group of 30 each. Group A with normal Vitamin D levels and group B was formed of people suffering from hypovitaminosis D. The 15 females were tested on Premenstrual Syndrome. The t values for depression and short term memory have come out to be significant while t value for premenstrual syndrome came out insignificant. The results came out that subjects who suffered from hypovitaminosis D also suffered from depression and had low digit span in short term memory as well. The women who had low Vitamin D levels however did not show any symptoms of premenstrual syndrome. It can be implicated in the dietary supplementation so that depression and the deficits in short term memory can be prevented. This would not only prevent the onset of depression in the first place in many cases it will also improve the quality of life of people who suffer from low short term memory functions and other cognitive functions.

Keywords: Vitamin D, Hypovitaminosis D, Depression, Short term memory, Premenstrual Syndrome

## Chapter 1

### Introduction

In a country as vast as India with the main resource of manpower this country has more than 50% of its population below the age of 25 and more than 65% below the age of 35. It is expected that, in 2020, the average age of an Indian will be 29 years, compared to 37 for China and 48 for Japan. But these young adults are facing problems like poverty, unemployment and what not. Nearly 50% of people in India suffer from hypovitaminosis D and the prevalence age of depression in India is 32 years which will increase to be the second most effecting cause to wellbeing of people in the country by 2020, which means the young adults are most effected from this and hence the sample has been taken from this section only. Short term memory is a factor which helps us in all the day to day tasks and increasing it functions if possible through supplementation then it would be another addition to elevating wellbeing of young adults. The premenstrual syndrome in young women is no less harmful to their mental and physical potential. Worldwide nearly 90% women go through premenstrual syndrome. The prevalence of this syndrome alone shows how much ignored it is while so many are suffering. This study might add to the little text available on how Vitamin D can help in improving the functioning of these women while decreasing the symptoms of this syndrome. This study works to improve the functioning of this section of young adults which will lead to the overall improvement in the lives of people and to a resource rich India. All the dependent and independent variables on which this study is based upon are explained below.

Vitamin D, otherwise called the daylight vitamin, can be synthesised by the body from exposure of the human skin to the sunlight and from various dietary supplements. Maintaining normal Vitamin D levels is critical for the control of calcium and phosphorus assimilation. It also works as a support system for teeth and bone health. Vitamin D also has a defensive impact against different ailments and conditions, for example, tumour and type one diabetes. Regardless of the name of this vitamin, it is viewed as a pro hormone because of its properties and not really a vitamin. This is because of the reason that body forms its own Vitamin D, while other vitamins can't be orchestrated by the human body and can only be gained by the eating regimen or supplements.

It has been evaluated that optimum sun presentation on uncovered skin for at least 10 minutes for more than 3 times a week enables the body the capacity to create adequate levels of Vitamin D, however the lifespan of the previously stored Vitamin D in the body is of two weeks, this means that the levels can take a dip in places where sun exposure is less or in the winters. Latest reviews have shown that the almost 50% of the world population suffers from hypovitaminosis D.

Vitamin D synthesis takes place in human body when sunlight changes the cholesterol present on the skin into calciol (Vitamin D3). This newly synthesised Vitamin D3 is then sent over in the liver to be changed into calcidiol (25-hydroxyVitamin D3). The 25-hydroxyVitamin D3 then change over into a very forward and workable type of Vitamin D also called calcitriol (1, 25-hydroxyVitamin D3) by the kidneys. In that capacity, statins and different pharmaceuticals or the food items that restrain cholesterol union, the capacity of an individual's kidneys or liver can also effect the blend of Vitamin D.

### **1.1 Depression (major depressive disorder or clinical depression)**

Depression is a very common however really a serious issue. It can cause genuine signs that impact how one feels, their thought processes and how they carry out step by step works of a typical day, for instance, resting, eating, or working. To be diagnosed to have depression, the reactions must be accessible for no under two weeks.

Some common types of depression which are generally found in the clinical population are:

1.1.1 Persistent depressive disorder

1.1.2 Perinatal wretchedness

1.1.3 Psychotic discouragement

1.1.4 Seasonal depression

1.1.5 Bipolar confusion

## 1.2 Signs and Symptoms of depression

In the event where one suffers from one or all of the below symptoms either a whole day or most of the time in a typical day, almost every day, for more than two weeks in a month, this may indicate that one is suffering from depression:

Persistent pitiful attitude

Feelings of misery all the time

Irritability

Feelings of self-blame, uselessness, or weakness

Loss of interest in fun loving activities or hobbies

Being exhausted all day

Moving or talking all the more gradually

Restlessness

Difficulty in thinking, remembering and making decisions

Sleep disturbances

Hunger or weight changes

Thoughts of killing themselves

Aches or torments, cerebral pains, issues, or stomach related issues without an unmistakable physical cause or potentially that don't ease even with treatment

The commonness of melancholy is 9%, of significant depressive scene is 36%, and the normal period of onset of sadness is 31.9 years, in India. The nation's emotional wellness spending plan does not surpass 1% of aggregate wellbeing consumptions. The National Psychological well-being System was executed to give administrations to rustic and also urban populaces, yet 80% of individuals in country territories can't get to its administrations.

## 2.1 Short Term Memory

Short Term Memory is the ability to hold however not prepare a little measure of data. It is accessible for a brief timeframe and is accessible effectively. It is additionally called without a moment's hesitation memory or generally called working memory. At this very moment memory grants audit for a period of a few moments to a minute without practice. Its capacity is in like manner to a great degree confined: George A. Miller (1956), when working at Ringer Research offices, drove tests exhibiting that the store of without a moment's hesitation memory has either a capacity of  $7+2$  or  $7-2$  ( $7\pm 2$  is also known as Miller's magical number). The method for remembering 10 digit telephone numbers by chunking the numbers into this magical number i.e.  $7\pm 2$  is the most used way of remembering it. For example a phone number (9646967646) can easily be learned as (96-46-96-76-46). This is how it is practiced in most of the countries and the above example clearly shows why it is done so.

Without further ado memory is seem to be retrieved better from the sound of these memories instead of the information of what it looks like. Conrad in 1964 found that guinea pigs experienced more difficulty checking on gatherings of letters that were acoustically equivalent for example F, L, K. Confusion in assessing the letters which sound identical rather than visually relative letters recommends that the letters were encoded on the basis of their sound. Conrad's (1964) consider, regardless, deals with the encoding of made substance; thusly, while memory of formed lingo may rely on upon acoustic portions, hypotheses to a wide range of memory can't be made.

A strong relation has been found in between the brain and how it works in association with Vitamin D. Researches have also found some evidence of links between hypovitaminosis D and dementias, including Alzheimer's which are major memory dysfunctions.

The receptors in brain have also a part dedicated to Vitamin D receptors, this points out that Vitamin D effects the brain in one way or another and it also has an effect on how a person takes decisions, learns, and acts in the situations. Researchers have also found in people suffering from Alzheimer's disease have a lack of Vitamin D specially in the hippocampus present in the brain, which is localized as the part responsible for creating memories.

### **1.3 Premenstrual syndrome (PMS)**

PMS has a wide assortment of manifestations, including emotional episodes, delicate bosoms, sustenance yearnings, weariness, fractiousness and wretchedness. It's evaluated that upwards of 3 of each 4 discharging ladies have encountered some type of premenstrual disorder. It is a total collaboration of symptoms connected to the monthly cycle of ovulating females. PMS side effects starts showing up 1 to 2 weeks before your monthly cycle begins. PMS can influence ovulating ladies of all ages and the impact is very much based on person to person. For a few people, PMS is only a month to month trouble. For others, it might be so difficult that it makes it difficult for them to try and get over with a day during periods. PMS leaves when your monthly cycle has been completed, for example, when you get pregnant or experience menopause.

Indications have a tendency to repeat in an anticipated example. Be that as it may, the physical and enthusiastic changes you involvement with premenstrual disorder may differ from just marginally recognizable the distance to extraordinary.

### **1.4 Symptoms of PMS**

A woman's menstrual cycle completes on an average of 28 days. Ovulation, the process during which an egg is discharged from the ovaries as a part of the process, happens on day 14 of the cycle. Feminine cycle, or dying, happens on day 28 of the cycle. PMS side effects can start around day 14 and last until seven days after the beginning of feminine cycle.

The side effects of PMS are normally gentle or direct. About 80 percent of ladies report at least one indication that does not significantly influence day by day working, as per the American Doctors. Twenty to 32 percent of ladies report direct to serious manifestations that influence some part of life. Three to 8 percent say that they suffer from PMDD. The seriousness of manifestations can differ from person to person and by month. The side effects of PMS include:

Abdominal bloating

Abdominal torment

Sore bosoms

Acne

Food longings, particularly for desserts

Constipation

Diarrhoea

Headaches

Sensitivity to light or sound

Fatigue

Irritability

Changes in rest designs

Anxiety

Depression

Sadness

Emotional upheaval

### **Relationship between Vitamin D and depression**

Vitamin D assumes an essential part in bone wellbeing and scientists are presently finding that Vitamin D may assume a part in numerous different ranges of wellbeing also.

Vitamin D receptors have been watched exhibit in everywhere throughout the cerebrum. A mixture of signals go to the base of the signals where receptors of the Vitamin D are available. These signals then join and attach themselves to a particular cell which later on help in various functions, for example to act decidedly, or for partition or demise.

The receptors in brain have also a part dedicated to Vitamin D receptors, this points out that Vitamin D is acting by one means or another in the cerebrum. These receptors are found in the zones of the cerebrum that are connected to the improvement of wretchedness. Hence, Vitamin D has been connected with melancholy and with other emotional wellness issues.

It is still not completely clear how Vitamin D functions with brain. One hypothesis effects the level of various hormones present in the brain called as monoamines, for example, serotonin, Vitamin D also effects the working of these hormones in the brain. Numerous energizer meds work by expanding the measure of monoamines in the cerebrum. In this way, scientists have proposed that Vitamin D may likewise build the measure of monoamines, which may help treat despondency.

### **Relationship between Vitamin D and short term memory**

“We were not particularly surprised by our findings because there is a recent and growing literature on the associations between Vitamin D status and risk of Alzheimer's disease/dementia, cognitive decline, and brain atrophy,” Dr. Joshua W. Miller from Rutgers University, New Brunswick, New Jersey

Through various studies, researchers have established relationships between Vitamin D and the way the brain works with it. Many well-known are starting to think if hypovitaminosis D can cause dementias such as Alzheimer’s disease.

The receptors in brain have also a part dedicated to Vitamin D receptors, this points out that Vitamin D effects the brain in one way or another and it also has an effect on how a person takes decisions, learns, and acts in the situations. Researchers have also found in people suffering from Alzheimer’s disease have a lack of Vitamin D specially in the hippocampus present in the brain, which is localized as the part responsible for creating memories.

### **Relationship between Vitamin D and premenstrual syndrome**

A recent study discovered that Vitamin D supplementation significantly reduced anxiety, irritability and low mood in young females with associated mood disorders linked with premenstrual syndrome.

This shows that there is a strong relationship between premenstrual syndrome and Vitamin D and how its supplementation can help reduce its symptoms. This relationship can be understood better by a study conducted by the researchers from the University of Massachusetts who published a study in the Archives of Internal Medicine. This study stated that the women with highest levels of Vitamin D intake had 41% less chances of suffering from premenstrual syndrome while the women with at least 4 servings of dairy products everyday had 30% less chances of suffering from premenstrual syndrome.

## Chapter 2

### Literature Review

This study was conducted H. Burne, F.Féron and Allan to check the effect of Vitamin D deficiency on Schizophrenia. This study also took Depression into account as a side effect of Vitamin D deficiency. While more research should be finished concerning the connections between Vitamin D and schizophrenia, this review introduces its discoveries as a down to earth exhibit of how organized research projects can effectively make an interpretation of pieces of information from the study of disease transmission into neuroscience revelation.

In this study by Y. Figenschau, J. Svartberg and K. Waterloo studied the how the supplementation of Vitamin D effects the symptoms of depression in overweight population. In conclusion, here we can observe a connection between serum 25(OH) D levels and sorrow in overweight and stout subjects, and supplementation with Vitamin D in high measurements for 1 year may beneficially affect depressive manifestations.

This study 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. tries to find out that if Vitamin D Deficiency is Associated With Low Mood and Worse Cognitive Performance in Older Adults or not. In this investigation of more established grown-ups without significant practical handicap, Vitamin D deficiency was related with low temperament and more terrible execution on two measures of subjective capacity. This review likewise found that 58% of the members had Vitamin D levels beneath the sufficient range. Participants in this review with a dynamic mind-set issue had significantly bring down Vitamin D focuses contrasted and those without a state of mind issue. Earlier investigations of Vitamin D and state of mind issue have been conflicting. Melancholy and regular emotional issue have enhanced with Vitamin D supplementation and bright light introduction.

In this study from the New England journal of medicine: Medical Progress: Vitamin D Deficiency by Michael F. Holick, M.D., Ph.D. Hypovitaminosis D has been linked with schizophrenia and depression in this particular study. By taking care of Vitamin D levels during the younger years of age, the subjects may be able to maintain the Vitamin D receptor transcriptional activity in the brain, this can improve the cognition functions of the subjects in elder age.

This study checks the role of Vitamin D in depression by Michael Berk , Kerrie M. Sanders, Julie A. Pasco and Felice N. Jacka, . In this review Vitamin D supplementation has been appeared to positively affect mind-set and prosperity; however past reviews have been constrained by little numbers, short treatment span, or an absence of a fake treatment control. A restorative part for Vitamin D supplementation in the treatment of temperament issue could give a protected, minimal effort treatment with extra points of interest to general and bone wellbeing.

Vitamin D deficiency in elderly persons who are homebound by F. Michael Gloth III, MD, Caren M. Gundberg, PhD and Bruce W. Hollis, PhD. This study found out that although there has been a higher supplementation of the Vitamin D supplements in the elderly people in the United States who stay at home, there had been a constant lack of Vitamin D in the homebound elderly people of U.S.A.

Hypovitaminosis D in rats before birth is associated with slight changes in learning and memory functions in adult rats by Axel Becker, Darryl W. EylesJohn and Gisela Grecksch. This review was done on rats to demonstrate the impacts of transient pre-birth low Vitamin D on inconspicuous and discrete learning and memory weaknesses in the rodent. This intriguing behavioural phenotype, joined with the developing assemblage of trial confirmation disentangling the organic pathways connecting low pre-birth Vitamin D to modified mental health, bolsters the idea that this creature model might be a valuable device for the investigation of neuropsychiatric issue.

The FASEB Journal survey is there persuading organic or behavioural proof connecting Vitamin D inadequacy to mind brokenness? Joyce C. McCann<sup>1</sup> and Bruce N. Ames<sup>1</sup>-The proof base in rodents is bigger, with two research facilities giving charming and plainly suggestive, however as we would see it not conclusive, confirmation of unobtrusive behavioural impacts of Vitamin D

insufficiency. Notwithstanding remaining vulnerability, we trust the confirmation general recommends that supplementation to guarantee amplexness is reasonable, especially for gatherings whose 25OHD3 status is uncommonly low, including nursing new born children, the elderly, and African Americans. Such supplementation is as of now prescribed to ensure against rickets, break hazard, and conceivably a few types of tumour.

This study by David J. Llewellyn, Kenneth M. Langa and David Melzer have worked in the direction to establish a relationship between on Vitamin D and Cognitive Impairment in the Elderly U.S. Population. They found that low levels of Vitamin D were related with expanded chances of intellectual hindrance and that this affiliation stayed in the wake of modifying for an extensive variety of potential confounders. Taken together, the outcomes from a few vast populace based reviews in Europe and the United States recommend that Vitamin D inadequacy is related with intellectual disability. The remedy of Vitamin D insufficiency may have enormous potential for the anticipation of intellectual impedance and dementia, given the high predominance of lack and the simple, economical, and safe route in which Vitamin D can be supplemented.

This study has associated very bad cognitive functions and low mood with hypovitaminosis D 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 investigation of more established grown-ups without critical practical inability, Vitamin D insufficiency was related with low inclination and more terrible execution on two measures of intellectual capacity. This review additionally found that 58% of the subjects in the study had Vitamin D levels underneath the adequate levels.

A cumulative meta-analysis on higher brain functions and memory and its relationship with Vitamin D by Cedric Annweilera,b,c,, Manuel Montero-Odassob, David J. Llewellynd, Stephane Richard-Devantoy , Gustavo Duquef and Olivier Beaucheta - This systematic review and meta-analysis provides evidence that hypovitaminosis D is cross-sectionally related in grown-ups with wordy memory issue and official dysfunctions, specifically mental moving, data refreshing, and handling speed. In prospective studies, baseline hypovitaminosis D precedes decline of mental shifting.

A study on Calcium and Vitamin D Intake and Risk of Incident Premenstrual Syndrome by Elizabeth R. Bertone-Johnson, ScD and Adrienne Bendich, PhD concluded that the risk of PMS can be reduced by giving a high dose of Vitamin D. Calcium and Vitamin D may also reduce the risk of osteoporosis and some cancers, these nutrients should also be recommended to the younger women by the clinicians.

### **Research Gap**

The studies report the impact of Vitamin D on various variables. But being a pro hormone varies with longitudinal and latitudinal aspects of a geographical area. Therefore it is important to study geographical differences. Meanwhile none of these studies has added all these variables in one study as well as no study has concentrated on the short term memory or the premenstrual syndrome. This study has concentrated on these variables exclusively with Vitamin D as independent variable. There are limited studies which highlight the impact of Vitamin D on Depression, Short Term Memory and Premenstrual Syndrome.

## Chapter 3

### Motivation behind the study

There are 43 government-funded mental health hospitals, which provide ailment for an estimated more than 70 million people living with mental diseases. For every 1 million people, there are just 3 psychiatrists in India and even lesser psychologists. If dietary supplements can help us prevent even small percentage of it, it'll bring out great results. In a country as vast as India with such lack of interest towards mental health due to various factors ranging from money, availability and stereotypes providing an alternate which can lower down the prevalence of various disorders such as depression or help in preventing symptoms of premenstrual syndrome as well as improve memory symptoms then this could mean huge.

First thing that motivated the investigator for this study was the nature of Vitamin D as we know it is a pro hormone and not an actual vitamin. It means that our body synthesis this but with the help of sun. There are some dietary supplements especially products from animals which also help in booting its formation such as milk. Beside both these things easily available to most of the population in India except to people with socioeconomic constraints or lactose intolerance. If hypovitaminosis d is linked with the said disorders then it would be a huge step forward in mental health condition of people in countries like India as it is well said that prevention is better than cure.

Secondly, depression has a very high prevalence rate as well and if a concrete relation between Vitamin D and depression could be set then it would be phenomenal to be able to drop its prevalence rate just by using Vitamin D supplementation or increase in sunlight exposure with the help of awareness can do wonders as it can not only improve conditions regarding depression but can also make people's life easier as the second variable in this study is short term memory. If sufficient Vitamin D levels can increase the memory functions then it can also improve the life quality of people a lot specially people in old ages.

Then come the third variable in this study which is the premenstrual syndrome. The prevalence of PMS is 18.4%. Moderate to severe PMS is 14.7% and PMDD is 3.7% according to DSM IV-TR & 91% according to ICD, 10<sup>th</sup> edition criteria. This is very high prevalence and reasons could be various but the motive of this study was to check if Vitamin D also works as a factor, if it does

then further studies can be conducted if Vitamin D supplementation can reduce the symptoms and ease the menstrual process.

### **3.1 Objectives of the study**

The objectives of the current research were as follow:

To compare the incidence of depression in young adults with normal Vitamin D levels and subjects with hypovitaminosis D.

To compare the short term memory functions of young adults with normal Vitamin D levels and subjects suffering from hypovitaminosis D.

To compare the incidence of Premenstrual Syndrome in females with normal Vitamin D levels and hypovitaminosis D.

## 3.2 Hypotheses

Based objectives just provided, the following hypothesis were formulated:

Hypovitaminosis d has been explained in detail in the introduction part of this study and as well as the depression. Here, what we need to understand now is what lead to the H<sub>1</sub>. Articles in medical journals-Armstrong DJ, Meenagh GK, Bickle I, Lee AS, Curran ES, Finch MB (2006). The New England journal of medicine: Medical Progress: Vitamin D Deficiency; Michael F. Holick, M.D., Ph.D (2007). Another study on Vitamin D deficiency in homebound elderly persons by F. Michael Gloth III, MD; Caren M. Gundberg, PhD; Bruce W. Hollis, PhD (1995). These medical journals and studies show that deficiency of Vitamin D may lead to depression. Meanwhile Vitamin D deficiency may play a role in depression by Michael Berk, Kerrie M. Sanders, Julie A. Pasco, Felice N. Jacka, Lana J. Williams, Amanda L. Hayles, Seetal Dodd (2014). This study shows that Vitamin D supplementation can improve moods of a person. All these studies lead to H<sub>1</sub>.

### **H<sub>1</sub>: Hypovitaminosis D leads to depression**

In various studies Vitamin D deficiency has been linked with poorer cognition and with Alzheimer's disease which means poor memory as well as thinking. A meta-analysis a meta-analysis review of Vitamin D, cognition and dementia by Cynthia Balion, PhD Lauren E. Griffith, PhD Lisa Striffler, BSc Matthew Henderson, PhD Christopher Patterson, MD and PhD Parminder Raina, PhD (2012). The consequences of this review proposed that hypovitaminosis D is related with poorer cognitive capacities and higher danger of AD. This study has associated very bad cognitive functions and low mood with hypovitaminosis D in older adults Consuelo H. Wilkins, M.D., Yvette I. Sheline, M.D., Catherine M. Roe, Ph.D., Stanley J. Birge, M.D. and John C. Morris, M.D. This not just gives us enough proof as 37 studies were taken into this meta-examination for conclusion yet it likewise gives us scope for further examination identified with different cognitive capacities.

### **H<sub>2</sub>: Hypovitaminosis D leads to decline in short term memory**

Premenstrual syndrome is one of the most widespread disorder among menstruating women. Calcium and Vitamin D Intake and Risk of Incident Premenstrual Syndrome by Elizabeth R. Bertone-Johnson, ScD; Susan E. Hankinson, ScD; Adrienne Bendich, PhD (2005) in this review the impact of calcium and Vitamin D are appeared on the premenstrual disorder and how these can help us lessening the side effects of premenstrual disorder if not curing it.

**H<sub>3</sub>: Hypovitaminosis D leads to premenstrual syndrome**

### **3.3 Design**

Independent variable in this study is Vitamin D and dependent variable is depression, short term memory and premenstrual syndrome.

## Chapter 4

### METHOD

#### 4.1 Sample

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

Group A is the group of 30 people not suffering from hypovitaminosis D.

Group B is the group of 30 people suffering from hypovitaminosis D.

Both the groups had 15 males and 15 females and the total sample came out to be 60.

Two groups of 15 each with females 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.

Age range of sample was 25 to 35 years where mean age is 29.56 and standard deviation is 2.78.

#### 4.2 Tools Used

Hamilton Depression Rating Scale (HDRS)

HDRS was used in this study instead of BDI and this decision was based on the convergent validity with the BDI has been reported to be extremely variable, ranging between 0.27 and 0.89 while 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 BDI was between 0.65 and 0.72 whereas Test–retest reliability for the HDRS using the Structured Interview Guide has been reported to be as high as 0.81 which is higher for HDRS.

The Vitamin D Questionnaire by Published and edited form as:

Public Health Nutrition. 2009 by Jilaine Bolek-Berquist, Mary E. Elliott, Ronald E. Gangnon, Dessa Gemar, Jean Engelke, Susan J. Lawrence and Karen E. Hansen

Published by national institute of health U.S. and used from the archives of U.S. national library of medicine.

Name of the Test: VITAMIN D 25 – HYDROXY

This is a lab test used by doctors in order to screen the patients with hypovitaminosis d. This test was administered on patients in inpatient ward whose symptoms were not clear to the patients.

Digit span test

It is a very commonly used test for short term memory. It is also a part of WAIS (Wechsler Adult Intelligence Scale). It is one of the most widely used intelligence scale for cognition and intelligence its form I was first published in 1955.

PMS SCREENING QUESTIONNAIRE by Dr. Rikki

#### **4.1 Procedure**

In this study first of all patients diagnosed with Vitamin D deficiency were met at orthopaedics ward in Rajindra hospital Patiala as well as PGI Chandigarh with due permission of ward attendants and orthopaedics on duty in the departments. They were duly informed about this study and that it would be used only for academic purposes. Then a consent form was gotten signed by the patients. After this first only Hamilton depression rating was gotten filled and then the Digit Span Test was administered. I also had one female fellow researcher with me who helped me in getting the questionnaire for premenstrual syndrome being filled. They all were thanked for their cooperation along with wishes of a speedy recovery. The Vitamin D Questionnaire by Published in final edited form as: Public Health Nutrition. 2009 was used to evaluate people with normal Vitamin D levels. These were from general population and same procedure was adopted once they were screened for normal Vitamin D levels.

## Chapter 5

### 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.**

	<i>Group A</i>	<i>Group B</i>
Mean	9.833333	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	

P<0.05

This table 1 shows the results for the t test applied between the two groups of 30 subjects each. In group A the subjects are not suffering from hypovitaminosis D, while the group B is formed of subjects suffering from Vitamin D deficiency. This is the data for the subject on Hamilton Depression Rating Scale. The results show that with df of 58 and t stat value of 2.94 it is significant at 0.05 level. These values show a confidence level of 95%.

**Table 2 shows the t critical value of Digit span test on both groups.**

	<i>Group A</i>	<i>Group B</i>
Mean	7.566667	6.866667
Variance	1.978161	2.395402
Observations	30	30
Pooled Variance	2.186782	
Hypothesized Mean Difference	0	
Df	58	
t Stat	1.833331	
P(T<=t) one-tail	0.035943	
t Critical one-tail	1.671553	
P(T<=t) two-tail	0.071887	
t Critical two-tail	2.001717	

P<0.05

The table 2 above shows the results of t test between Group A with normal Vitamin D levels and Group B with hypovitaminosis d. These results are after the administration of Digit Span Test on subjects to check the short term memory functions of the subjects. The df value is 58 and t stat came out to be 1.833 which is significant at 0.05 level. The confidence level of this is 95%.

**Table 3 shows the t value of females on PMS screening test in both the groups.**

	<i>Group A</i>	<i>Group B</i>
Mean	16.46667	16.46667
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	

The table 3 here is for females who were tested for PMS. In group A the females not suffering from Vitamin D deficiency were taken while in the group B, females with Vitamin D deficiency were taken. In this table the t stat value came out to be 0. It shows that there is no significant difference between the two groups and our hypothesis has been rejected

## Chapter 6

### DISCUSSION

Numerous medical journals and research studies have pointed out the relation between hypovitaminosis and various related abnormalities in the body, whether it is related to physiology or psychology of a person. In this study three factors are taken into account which are depression, short term memory and premenstrual syndrome. Most important thing in this study is that all of these disorders have a very high prevalence rate all over the world and if they cannot be cured then their symptoms can surely be toned down by some dietary supplements and exercise regime that too not very rigorous. The present study has focused on a very limited age range which falls under the range of highest prevalence of depression in India. The age range was taken from 25 to 35 as the prevalence age of depression is 32.5 in India. The further points worth mentioning is that the sample with Vitamin D deficiency was collected from the orthopaedics department's inpatient and outpatient wards in PGI Chandigarh and Rajindra hospital Patiala.

#### **Vitamin D and Depression**

Almost 50% of population in India suffers from severe Vitamin D deficiency which leads to various casualties. Vitamin D has been associated with many other dysfunctions in body as in immunity, calcium depletion and in fractures. This study by F. Holick in the medical journal or England on Vitamin D insufficiency says that it has been connected to an expanded occurrence of schizophrenia and depression (2008). Keeping up Vitamin D adequacy amid early life, to fulfil the Vitamin D receptor transcriptional movement in the cerebrum, perhaps essential for mental health and for support of mental capacity sometime down the road 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. Vitamin D effects the level of various hormones present in the brain called as monoamines, for example, serotonin, Vitamin D also effects the working of these hormones in the brain. Numerous energizer meds work by expanding the measure of monoamines in the

cerebrum. In this way, scientists have proposed that Vitamin D may likewise build the measure of monoamines, which may help treat depression.

### **Vitamin D and Short Term Memory**

The table 2 in the results show that lack of Vitamin D also leads to lack in the short term memory and we can accept our second hypothesis which states that lack of Vitamin D leads to decreased short term memory functions. Vitamin D, cognition, and dementia this is a meta-analysis done by Cynthia Balion, PhD Lauren E. Griffith, PhD Lisa Strifler, MD George Heckman, PhD Parminder Raina, PhD (2012). The receptors in brain have also a part dedicated to Vitamin D receptors, this points out that Vitamin D effects the brain in one way or another and it also has an effect on how a person takes decisions, learns, and acts in the situations. Researchers have also found in people suffering from Alzheimer's disease have a lack of Vitamin D specially in the hippocampus present in the brain, which is localized as the part responsible for creating memories.

### **Vitamin D and Premenstrual Syndrome**

The table 3 in results show 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 our 3<sup>rd</sup> hypothesis gets rejected which suggested that there would be an effect of Vitamin D on the premenstrual syndrome. Calcium and Vitamin D Intake and Risk of Incident Premenstrual Syndrome by Elizabeth R. Bertone-Johnson, ScD; Susan E. Hankinson, ScD; Adrienne Bendich, PhD (2005). Although the H<sub>3</sub> hypothesis has been rejected it could be due to a number of factors which we might have missed in this study and these factors should not be taken as limitations but as things we will be more cautious about during our future expansions.

## Chapter 7

### Summary

This study compared two groups of 30 subjects each; group A with normal Vitamin D levels and group B with lack of Vitamin D. This study compares these two groups for Depression, Short term memory and two groups of females with 15 subjects each for premenstrual syndrome. The hypotheses formed were that H<sub>1</sub>: lack of Vitamin D leads to depression. H<sub>2</sub>: Hypovitaminosis D leads to decline in short term memory. H<sub>3</sub>: Hypovitaminosis D leads to premenstrual syndrome. First and second hypotheses were accepted while the third hypothesis was rejected.

### Conclusion

The present study is a comparison between two groups where group A has normal Vitamin D levels while group B has lack of Vitamin D in relationship with depression, short term memory and Premenstrual Syndrome.

1. The first conclusion of this study as shown in table 1 in the results section is that the subjects with lack of Vitamin D had more depressive symptoms than the subject with normal Vitamin D levels.
2. The second conclusion of this study is as shown in table 2 that people with lack of vitamin have trouble with short term memory functions as compared to people with normal Vitamin D levels.
3. The third conclusion and the third table in the result section of this study shows that Vitamin D has no effect on the premenstrual syndrome in women.

## **Significance of the study**

The first and most vast significance of this study is how a country as vast as India with so much lack of resources should work on improving the conditions of its people by using other methods in preventing these problems in the first place. This is what the present study aims at. In this study we try and relate various disorders like depression, lack of functionality in memory as well as the premenstrual syndrome in women to deficiency of Vitamin D. The application of this study would be to supplement Vitamin D to the deficient and if it leads to prevention of these disorders and in those who are already suffering, does it help in curing or lessening the symptoms. If the supplementation does not help in any of these, can the supplementation help in boosting the treatment? All this leads to various positive points as the cost of supplementation is not very high. Half litre milk with adequate sunlight exposure to the skin. This can be done with awareness alone which can bring down the prevalence of these disorders as well cut the cost of mental health care in the country. It can help in boosting the treatment as well as preventing these problems altogether resulting in better life quality a larger portion of society as doing it is quite simple. A little improvement in lifestyle can be of huge benefit to the mental health and cognitive functions such as Short Term Memory of an individual.

This study can be implicated by raising awareness in the general population about lifetime and formation of the Vitamin D in subjects and how we can increase the Vitamin D levels in our day to day diet and activities. This can help in preventing these disorders as well as bring down the cost of mental health condition in the country. It will also increase the life conditions of the people affected. We all can only imagine the struggle of a depressed woman going through premenstrual syndrome. The consequences of such a situation can be suicidal and this study works with the variables with such variables that can help with these situations and can be implied to a very large population. This study can enhance the wellbeing of young adults which can be beneficial for their optimal level of functioning.

## **Limitations of the Study**

The present study has been focusing on the Vitamin D and its effects only while there can be a number of other dietary supplements could have also been taken into account. The sample of the study is also very small. For premenstrual syndrome a lot of other factors should have taken into account. In this study only self-reporting questionnaires were used, we can use tools of more objective analysis in future.

## **Future Scope**

We can also check if various other dietary supplements and vitamins has an effect on depression, the various other cognitive functions or the premenstrual syndrome. We can also conduct longitudinal studies and analyse the effects of these exposures and supplements on these variables as well as other cognitive factors like intelligence quotient learning, attention, mental abilities or physical factors like metabolism can also be taken into account. Cross cultural studies can be analysed along with gender differences in these variables.

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## Appendix

### CONSENT FORM

I am the student of MA Psychology of School of Humanities & Social Sciences of Thapar University, doing a research project on \_\_\_\_\_. I need your co-operation for the conduct of this study by way of filling up this questionnaire.

I assure you that the information given by you would be used only for academic purposes and will be kept strictly confidential. If you wish to have the feedback about your performance I will provide you.

Thanking you for your cooperation and time.

I, \_\_\_\_\_ hereby give the consent to participate in this research.

Signature of the Participant

Gender \_\_\_\_\_

Age \_\_\_\_\_

**The Vitamin D Questionnaire Published and edited form by: Public Health Nutrition U.S. 2009**

1. Have you received a suntan in the past 12 months?

Yes or No

2. Do you use sunscreen?

Yes or No

3. On average, how much sun exposure have you had in the past week?

Less than 5 minutes per day

5–15 minutes per day

15–30 minutes per day

More than 30 minutes per day

4. Have you used a tanning booth in the past year?

Yes or No

5. How many servings of milk do you get daily? \_\_\_\_

6. Do you take multivitamins?

Yes or No

If yes, how many multivitamin tablets do you take daily? \_\_\_\_\_

7. Do you take Vitamin D supplements or calcium with Vitamin D?

Yes or No

8. Do you take cod liver oil or omega-3 fatty acids (fish oil)?

Yes or No

9. What is your ethnic background? \_\_\_\_\_

10. Have you been diagnosed with Crohn's disease, ulcerative colitis, or celiac sprue?

Yes or No

11. Have you had diarrhoea in the past 2 weeks?

Yes or No

## THE HAMILTON RATING SCALE FOR DEPRESSION

to be administered by a health care professional

Patient's Name \_\_\_\_\_

Date of Assessment \_\_\_\_\_

To rate the severity of depression in patients who are already diagnosed as depressed, administer this questionnaire. The higher the score, the more severe the depression.

**For each item, write the correct number on the line next to the item. (Only one response per item)**

**1. DEPRESSED MOOD** (Sadness, hopeless, helpless, worthless)

0= Absent

1= These feeling states indicated only on questioning

2= These feeling states spontaneously reported verbally

3= Communicates feeling states non-verbally—i.e., through facial expression, posture, voice, and tendency to weep

4= Patient reports VIRTUALLY ONLY these feeling states in his spontaneous verbal and non-verbal communication

**2. FEELINGS OF GUILT**

0= Absent

1= Self reproach, feels he has let people down

2= Ideas of guilt or rumination over past errors or sinful deeds

3= Present illness is a punishment. Delusions of guilt

4= Hears accusatory or denunciatory voices and/or experiences threatening visual hallucinations

**3. SUICIDE**

0= Absent

1= Feels life is not worth living

2= Wishes he were dead or any thoughts of possible death to self

3= Suicidal ideas or gesture

4= Attempts at suicide (any serious attempt rates 4)

**4. INSOMNIA EARLY**

0= No difficulty falling asleep

1= Complains of occasional difficulty falling asleep—i.e., more than 1/2 hour

2= Complains of nightly difficulty falling asleep

**5. INSOMNIA MIDDLE**

0= No difficulty

1= Patient complains of being restless and disturbed during the night

2= Waking during the night—any getting out of bed rates 2 (except for purposes of voiding)

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**6. INSOMNIA LATE**

**0=** No difficulty

**1=** Waking in early hours of the morning but goes back to sleep

**2=** Unable to fall asleep again if he gets out of bed

**7. WORK AND ACTIVITIES**

**0=** No difficulty

**1=** Thoughts and feelings of incapacity, fatigue or weakness related to activities; work or hobbies

**2=** Loss of interest in activity; hobbies or work—either directly reported by patient, or indirect in listlessness, indecision and vacillation (feels he has to push self to work or activities)

**3=** Decrease in actual time spent in activities or decrease in productivity

**4=** Stopped working because of present illness

**8. RETARDATION: PSYCHOMOTOR** (Slowness of thought and speech; impaired ability to concentrate; decreased motor activity)

**0=** Normal speech and thought

**1=** Slight retardation at interview

**2=** Obvious retardation at interview

**3=** Interview difficult

**4=** Complete stupor

**9. AGITATION**

**0=** None

**1=** Fidgetiness

**2=** Playing with hands, hair, etc.

**3=** Moving about, can't sit still

**4=** Hand wringing, nail biting, hair-pulling, biting of lips

**10. ANXIETY (PSYCHOLOGICAL)**

**0=** No difficulty

**1=** Subjective tension and irritability

**2=** Worrying about minor matters

**3=** Apprehensive attitude apparent in face or speech

**4=** Fears expressed without questioning

**11. ANXIETY SOMATIC:** Physiological concomitants of anxiety, (i.e., effects of autonomic overactivity, "butterflies," indigestion, stomach cramps, belching, diarrhea, palpitations, hyperventilation, paresthesia, sweating, flushing, tremor, headache, urinary frequency). Avoid asking about possible medication side effects (i.e., dry mouth, constipation)

**0=** Absent

**1=** Mild

**2=** Moderate

**3=** Severe

**4=** Incapacitating

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**12. SOMATIC SYMPTOMS (GASTROINTESTINAL)**

- 0**= None
- 1**= Loss of appetite but eating without encouragement from others. Food intake about normal
- 2**= Difficulty eating without urging from others. Marked reduction of appetite and food intake

**13. SOMATIC SYMPTOMS GENERAL**

- 0**= None
- 1**= Heaviness in limbs, back or head. Backaches, headache, muscle aches. Loss of energy and fatigability
- 2**= Any clear-cut symptom rates 2

**14. GENITAL SYMPTOMS** (Symptoms such as: loss of libido; impaired sexual performance; menstrual disturbances)

- 0**= Absent
- 1**= Mild
- 2**= Severe

**15. HYPOCHONDRIASIS**

- 0**= Not present
- 1**= Self-absorption (bodily)
- 2**= Preoccupation with health
- 3**= Frequent complaints, requests for help, etc.
- 4**= Hypochondriacal delusions

**16. LOSS OF WEIGHT**

- A.** When rating by history:
  - 0**= No weight loss
  - 1**= Probably weight loss associated with present illness
  - 2**= Definite (according to patient) weight loss
  - 3**= Not assessed

**17. INSIGHT**

- 0**= Acknowledges being depressed and ill
- 1**= Acknowledges illness but attributes cause to bad food, climate, overwork, virus, need for rest, etc.
- 2**= Denies being ill at all

**18. DIURNAL VARIATION**

- A.** Note whether symptoms are worse in morning or evening. If NO diurnal variation, mark none
    - 0**= No variation
    - 1**= Worse in A.M.
    - 2**= Worse in P.M.
  - B.** When present, mark the severity of the variation. Mark "None" if NO variation
    - 0**= None
    - 1**= Mild
    - 2**= Severe
-

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**19. DEPERSONALIZATION AND DEREALIZATION** (Such as: Feelings of unreality;  
Nihilistic ideas)

- \_\_\_\_\_
- 0= Absent
  - 1= Mild
  - 2= Moderate
  - 3= Severe
  - 4= Incapacitating

**20. PARANOID SYMPTOMS**

- \_\_\_\_\_
- 0= None
  - 1= Suspicious
  - 2= Ideas of reference
  - 3= Delusions of reference and persecution

**21. OBSESSIVE AND COMPULSIVE SYMPTOMS**

- \_\_\_\_\_
- 0= Absent
  - 1= Mild
  - 2= Severe

Total Score \_\_\_\_\_

Presented as a service by

**GlaxoWellcome**

Glaxo Wellcome Inc.  
Research Triangle Park, NC 27709  
Web site: [www.glaxowellcome.com](http://www.glaxowellcome.com)

## PMS SCREENING QUESTIONNAIRE

Name \_\_\_\_\_ Age \_\_\_\_\_ Today's Date \_\_\_\_ / \_\_\_\_ / \_\_\_\_

In the following table, please indicate which of these symptoms you experience at least 4 days before your menstrual period. In addition, only list symptoms that are then relieved within the first couple of days of your period and that have been present in at least 3 out of the past 6 cycles.

Please indicate the severity of symptoms as follows:

- 0 = none
- 1 = mild, does not interfere with activities
- 2 = moderate, interferes with activities but is not disabling
- 3 = severe, disabling

Also, list the number of days that each symptom is present.

SYMPTOM	SEVERITY	# DAYS
I feel depressed or hopeless		
I have headaches		
I feel tearful or cry easily		
I feel "on edge", angry, irritable, anxious or "wired"		
I have decreased interest in my usual activities		
I have difficulty concentrating		
I feel easily fatigued; I lack energy		
I have food cravings (salt, foods high in sugar or chocolate)		
I have trouble sleeping or sleep more than usual		
I feel overwhelmed or out of control		
I have breast tenderness		
I have a sensation of bloating or temporary weight gain		