

## Frequency of Vitamin D Deficiency in Patient with Depression

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### ABSTRACT

**Background:** There has been some growing evidence that Vitamin D deficiency is also a causative factor in the etiology of depression, but there hasn't been much work done on this topic and the evidence is inconsistent. The objective of this research is to find the association between blood 25-hydroxyvitamin D [25(OH)D] concentrations and depression among patients with depression in our local population.

**Objective:** To determine frequency of vitamin D deficiency in patient with depression.

**Study design:** Cross-sectional study

**Place and Duration of Study:** Department of Psychiatry, Institute of Psychiatry, Benazir Bhutto Hospital, Rawalpindi from 3<sup>rd</sup> August 2017 to 2<sup>nd</sup> February 2018.

**Methodology:** One hundred and forty-two clinically diagnosed cases of depression gender between age 18 to 60 years were enrolled. Serum Vitamin D levels were estimated in each patient and frequency of vitamin D deficiency was determined.

**Results:** 51 (35.9%) patients reported to have vitamin-D deficiency.

**Conclusions:** We recommend effective screening tests for early detection vitamin D deficiency in clinically diagnosed patients of depression.

**Keywords:** Depression, Vitamin D, Vitamin D deficiency

### INTRODUCTION

Recently, there has been growing interest in the association between nutritional deficiencies and mental health. Studies have shown that low levels of essential nutrients may pre-dispose individuals to several psychiatric illnesses.<sup>1</sup>

Among the psychiatric disorders which mostly present in medical settings, depression ranks among the top diagnosis and is rapidly increasing among the population of world. With an estimate of 3.8% population affected at the given time. Clinical depression has different symptoms, but most common ones are sadness, hopelessness, loss of interest or pleasure, lack of motivation, disturbed sleep or appetite and poor focus or concentration.

An individual suffering from depression has impaired ability to function at work school or even at home. The capacity to deal with daily life work is badly affected depending upon the severity of the symptoms. Generally, depression can be divided into 3 types mild moderate and severe. At its most severe depression can lead to suicide.<sup>2</sup>

Humans naturally produced vitamin D in skin by sun exposure, but diet can also provide different sources of vitamin D. The ideal intake of vitamin D supplements daily can vary from 200 international units to 1000 per day depending upon the demand and age of the patient. Vitamins and minerals especially (vitamin D) are important for the maintenance of calcium hypostatises and for bone health in body. It has been found that vitamin D receptors are also present in many areas of brain that involve in the development of psychiatric disorders like depression.<sup>3</sup>

Numerous researchers have studied the relationship vitamin D deficiency holds in the causation of depression. Hoang et al studied a cross-section of 12,594 participants presenting to the outpatient department of a hospital in USA and assessed their vitamin D levels and depression status. They concluded that greater the vitamin D levels, lesser was the risk (OR, 0.92) of depression.<sup>4</sup> In another similar study by Milaneschi et al<sup>5</sup> found that that decreased vitamin D levels played a role in development of depression ( $p=0.001$ ).

Only a handful of local studies have looked at the association of vitamin D and medical and psychiatric disorders in the Pakistani population. In a study conducted in Karachi from February 2005 to December 2006, Baig et al<sup>6</sup> looked at the serum vitamin D levels of 79 patients. Their results showed that 92% of the participants had low Vitamin-D level which was irrespective of age or comorbid illnesses. In a study conducted between April and

June 2009, participants with medical illnesses presenting to the outpatient were assessed by Haque et al<sup>7</sup> who also studied their vitamin D levels. They found that patients with depression 17.5% had mild and 35% had severe vitamin D deficiency had depression or anxiety symptoms.

There has been no study conducted in Pakistan that has exclusively looked at the association between vitamin D levels and depression. This study will help us to find the presence of depression in patients with vitamin D deficiency, so that appropriate management strategies can be made for early detection of depression and prompt treatment leading to significant decrease in disease burden, early recovery, and rehabilitation.

### MATERIALS AND METHODS

This cross-sectional study was conducted at Department of Psychiatry, Institute of Psychiatry, Benazir Bhutto Hospital Rawalpindi from 3<sup>rd</sup> August 2017 to 2<sup>nd</sup> February 2018 and comprised 142 patients. All patients aged between 18 to 60 years, diagnosed cases of depression and capable of giving informed verbal consent were included. All patients with any neurodegenerative brain disease i.e. Alzheimer disease, Parkinson disease or with any cerebrovascular accident i.e. stroke and patients unable to communicate were excluded.

After getting approval from hospital ethics committee patients were selected from the OPD of institute of psychiatry, Benazir Bhutto hospital using the inclusion and exclusion criteria given above and informed consent was obtained from each. The presence of depression was assessed by using Hamilton rating scale for depression. A predesigned Performa given as Annexure A was used to collect demographic details of the patient like age, gender, educational status, and marital status. Blood samples were taken after assessment of depression to determine the level of vitamin D. Blood samples were sent to a local authenticated laboratory verified by standardized ranges. The data was entered and analyzed through SPSS-25.

### RESULTS

Mean age (years), duration of depression (years), HAM-D score and vitamin D levels (ng/ml) in the study population is shown in Table 1. Distribution of gender, employment status, education status, marital status and severity of depression are represented in Table 2. Fifty-one (35.9%) patients were diagnosed with vitamin-D deficiency (Table 3).

Table 1: Descriptive statistics of population according to gender

Variable	Gender	
	Male	Female
Age (years)	39.3±12.1	40.1±11.6
Duration (years)	5.9±2.2	5.4±2.7
HAM-D Score	13.6±5.1	14.7±4.8
Vit D levels (ng/ml)	25.7±14.8	24.9±13.5

Table 2: Demographic profile of the study population (n=142)

Variable	No.	%
Gender		
Males	53	37.3
Females	89	62.7
Educational status		
No formal education	18	12.7
Up to class 5	17	12.0
Up to class 8	31	21.8
Matric	32	22.5
Graduation	25	17.6
Postgraduation	19	13.4
Marital status		
Married	93	65.5
Single	20	14.1
Widowed	14	9.9
Divorced	15	10.6
Severity of depression		
Mild	69	48.6
Moderate	37	26.1
Severe	36	25.4

Table 3: Frequency of vitamin D deficiency (n=142)

Vitamin D deficiency	No.	%
Present	51	35.9
Absent	91	64.1

## DISCUSSION

Research has showed that vitamin D receptor is present in brain, and it has various functions to perform for normal brain activity. There is evidence that 1,25-dihydrovitamin D (3) (1,25(OH) (2)D(3)) is an active element of brain and is highly involved in brain development.<sup>8-10</sup>

Research suggests that low levels of vitamin D deficiency is higher in older adults as compared to younger ones and is one of the common symptoms in psychiatric and neurologic disorders.<sup>9</sup>

Vitamin D plays a key role in the early onset of life, many psychiatric disorders like Schizophrenia and depression can be reduced by higher intake of vitamin d supplements. People with hypovitaminosis in early age can lead to many psychological disorders. Furthermore; it has been showed that vitamin D deficiency can also lead to brain structural abnormalities, cognitive dysfunctions and in some cases incident dementia.<sup>9</sup>

Vitamins are considered essential nutrients for the normal brain activity which is why their deficiency has been linked with psychiatric disorders like depression. Researchers have showed that supplementation of vitamins can improve the symptoms of depressive illness and should be a vital part of treatment plan.<sup>9-11</sup>

Addition of vitamin D supplements ( $\geq 800$  I.U) in the daily routine of patients with depressive illness can lead to early recovery. It can increase the reliability of anti-depressants.<sup>9</sup>

Human body contains many vitamins and minerals and decrease in any of these vitamins is associates with different disorders, especially the deficiency of vitamin D. It has been proven with research that blood 25-hydroxyvitamin D [25(OH)D] concentrations is linked with depression.<sup>12-15</sup>

Serum vitamin D levels were administered in each patient and level of vitamin D deficiency was determined.<sup>16,17</sup>

Our results showed that 51 (35.9) patients were diagnosed with vitamin-D deficiency. This study confirms the findings of previous study on this subject by Ju et al.<sup>18</sup> They aimed to find out the association between serum 25-hydroxyvitamin D (25(OH)D) levels and development of depression.

Their results exhibited that low 25(OH)D levels were considerably linked with depression in 5 of 11 case-control studies and 2 of 5 cohort studies. The estimated adjusted OR of depression in 11 cross-sectional studies (n = 43,137) was 0.96 (95% CI = 0.94-0.99, I<sup>2</sup> = 63%) for a 10 ng/ml increase in 25(OH)D levels. The pooled adjusted OR of depression was 0.92 (95% CI = 0.87-0.98, I<sup>2</sup> = 50%) for a 10 ng/ml increase in 25(OH)D levels in 5 cohort studies. Hence, it was concluded that decreased serum 25(OH)D levels were associated with an increased risk of depression.

Furthermore, Armstrong DJ conducted a study on seventy five Caucasian participants who were assessed for fibromyalgia and vitamin D levels using the Fibromyalgia Impact Questionnaire (FIQ) and Hospital Anxiety and Depression Score (HADS). The study concluded that there were 13.3 % patients with vitamin D deficiency and 56.0 % had insufficient amount and only 30.7 % patients reported normal levels.<sup>9</sup> Another study in accordance with our results by Schneider et al<sup>19</sup> showed that patients with major depression had significantly lower levels 25-Hydroxyvitamin D3 than in normal controls.<sup>20</sup> Another study suggested that older African American had lower levels of vitamin D in their bodies and connected it with their worse cognitive performance and lower BMD of the hip.<sup>10</sup>

Zhao et al<sup>21</sup> studied how serum 25-hydroxyvitamin D (25(OH)D) and parathyroid hormone (PTH) levels were linked with the presence of depression in US adults. 3916 participants aged  $\geq 20$  were involved in this cross-sectional study from 2005-6 of National Health and data was gathered through nutrition examination survey. The depressive symptoms of participants were checked through the Patient Health Questionnaire-9 diagnostic algorithm. The association of 25(OH)D and PTH with depression was assessed by multivariate logistic regression models. Their results indicated that the prevalence of depression decreased linearly with increasing quartiles of 25(OH)D (P < 0.05 for trends).<sup>21</sup>

A cross sectional study was done on Japanese workers by Mizoue et al<sup>22</sup> in which 1786 employees (9% women), aged 19-69 y were included. They were all assessed through nutrition and health survey and their serum concentration of 25-hydroxyvitamin D [25(OH)D] was measured using competitive protein binding assay. Presence of depression was checked using Center for Epidemiologic Studies Depression (CES-D) scale and it was found that there were low serum vitamin D[25(OH)D <30  $\mu$ g/L] levels in 92% of study population. The study also concluded that low vitamin D level was associated with increased risk of depression.

Lee et al<sup>23</sup> found out the same inverse relation between 25(OH)D levels (p < 0.001) ,PTH and (p=0.004) depression.

Jaddou et al<sup>24</sup> did a study on 4,002 Jordanian subjects aged  $\geq 25$  years to examine the relation between serum 25(OH)D and PTH levels and depression. Serum 25(OH)D and PTH levels were assessed using radioimmunoassay and DASS21 depression scale was used for assessing depression. No significant association was found between serum PTH levels and depression. However, a considerable decreased risk of depression was associated with increased serum 25(OH) D levels.

These results can be used to find out the required level of serum 25(OH)D necessary to prevent and treat depression. Hoogendijk et al<sup>25</sup> and Nanri et al<sup>26</sup> performed similar studies and their results also confirmed the above findings.

A study done on Chinese population by Pan et al<sup>27</sup> showed Vitamin D deficiency was linked with depression in middle-aged and elderly participants. Hence, it was found that, patients with mental illnesses usually have a poor diet and lack of exposure to sunlight. These factors lead towards the development of vitamin D deficiency. However, it is still very difficult to state the exact role vitamin D plays in treatment of depression as research done in this area is not noteworthy. In addition, these studies done to determine efficacy of Vitamin D in managing depression show inconsistent results.

Some studies show positive association between two factors while others show negative or no association.<sup>23-25</sup> To have conclusive evidence in this regard, we suggest routine assessment of serum vitamin D levels in all clinically diagnosed cases of depression.

## CONCLUSION

35.9% of patients with depression had vitamin D deficiency was found. We recommend effective screening tests for early detection vitamin D deficiency in clinically diagnosed patients of depression.

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