Evaluating the Impact of Vitamin D Supplementation on Depression Severity Using PHQ-9

Dr. Uzma Umair[*c], Prof. Dr. Syed Mehboob Alam[**], Dr. Farah Asad[***], Prof. Dr. Muhammad Azhar Mughal [****], Dr. Jawed Akbar Dars[*****]

***Department of Pharmacology, JSMU**

****Department of Pharmacology, BMSI, JPMC**

*****Department of Pharmacology, JSMU**

******Department of Pharmacology, JSMU**

*******Department of Psychiatry and Behavioral Sciences, JPMC**

ABSTRACT

According to WHO depression will be the foremost cause of morbidity by 2030. It is a severe neuropsychiatric ailment which can lead to increased morbidity with considerable impairment in social functioning and mortality. Low vitamin D levels contributes to the pathophysiology of depressive symptoms.

Objective of study: To evaluate the Impact of Vitamin D Supplementation on Depression Severity Using PHQ-9

Materials and Methods

It is an interventional study. Duration of study was 9 months after the approval of thesynopsis. It was conducted in the psychiatric ward 21 of JPMC. Eighty (80) diagnosed patients of depressive disorder were randomly assigned into two groups to be given 600,000 IU of vitamin D intramuscularly plus Escitalopram or Escitalopram only for 08 weeks. Depression intensity was gauged at 02 weeks intervals using Hamilton Depression RatingScale (HDRS) as a principal result.

Results

The result revealed that there was a notable decrease in depressive symptoms in interventional group with vitamin D as compared to only Escitalopram group. There was also a decline in PHQ-9 scoring from 11.48± 4.42 to 8.55± 3.53 in interventional group before and after receiving vitamin D respectively with a verysignificant p value (0.002), while in control group receiving only Escitalopram it was 9.37±4.60.

1. INTRODUCTION:

Depression and anxiety disorders are the most prevalent psychiatric illnesses globally. Depression frequently occurs alongside other chronic conditions, contributing to various health issues. According to a study, depression was the most common diagnosis among patients, around 88.6% of patient diagnosed with depression also have a low vitamin D levels. (1). Unfortunately, about 50% of patients with depression do not respond to initial antidepressant treatment, and the response rate drops to around 30% with second-line therapy (2). Many clinical studies have demonstrated that vitamin D can alleviate symptoms of depression and anxiety, especially in individuals with depression, even though preclinical research provides less evidence about the possible mechanisms behind these benefits (3).Several pieces of evidence support this connection, including the increased presence of vitamin D receptors in various brain regions that are crucial for mood regulation, as well as the anti-inflammatory properties of vitamin D, which contribute to its neuroprotective effects (4).

Vitamin D is a fat-soluble vitamin that also plays a role in cell proliferation, neuromuscular and immune function, as well as in maintaining calcium and phosphate balance. Numerous preclinical studies have found that vitamin D influences inflammatory cytokines in animal models of various neurodegenerative diseases, such as multiple sclerosis and Parkinson's disease. It can improve neurodegeneration by regulating specific molecules and signaling pathways, including calcium homeostasis, reducing oxidative stress, and inhibiting inflammation (5). Vitamin D help to regulate mood by affecting the levels of neurotransmitters in the brain, which are chemical messengers responsible for transmitting signals between nerve cells. Low levels of neurotransmitters like serotonin and dopamine have been associated with depression and other mood disorders (6).

Conventional treatment for depression includes SSRIs (selective serotonin reuptake inhibitors), TCA (tricyclic antidepressants), serotonin-norepinephrine reuptake inhibitors (SNRIs), lifestyle modifications and different therapies like Cognitive-behavioral therapy (CBT). It was evident in many studies that people who are suffering from depression shows considerable low levels of vitamin D and after being treated with conventional medications they do not show a

considerable change in symptoms. Hence making it plausible that supplementing vitamin D with the conventional treatment of depression may bring a more effective outcome.

2. MATERIALS AND METHODS

Study Design: The proposed study is an interventional study.

Study Setting: This study was conducted in the Psychiatry ward of Jinnah Postgraduate Medical Center in collaboration of Basic Medical Sciences Institute, Karachi. This study was approved from the Ethical Review Board of JPMC.

Sample Size: A total of 80 patient with diagnosed depressive disorder were taken and divided into two groups (40 each). Sample size was calculated by OpenEpi Version 2.

Group A: Control group including 40 patients on Escitalopram alone.

Group B: Interventional group including 40 patients receiving 600,000 IU of vitamin D intramuscularly plus Escitalopram

Data Collection Procedure: Patients visiting the Psychiatry Outpatient Department at JPMC, Karachi, who exhibited mild to severe symptoms of depression, were between the ages of 18 and 65, and had vitamin D levels below 20 ng/ml, were selected for the study. Each patient underwent a clinical assessment, which included a thorough history and physical examination. The severity**.** Vitamin D levels were assessed at baseline and after four weeks. Patients having vitamin D lower than 20 ng/ml were given 6 lac IU intramuscularly. Vitamin D was measured by using Chemiluminescence Immuno Assay on Liason XL (7).

Sample Selection: Patients who were attending OPD with the diagnosis of depression with the age range of 18-65years and having vitamin D levels below 20ng/ml were included while any patient not falling in this criteria were excluded. The data was recorded and analyzed using SPSS version 22.0. Frequencies and percentages were calculated for categorical variables. Numerical parameters, such as age (in years), were expressed as mean ± standard deviation. The "t" test was used to compare means across different age groups, if necessary. A p-value of

0.05 or less was considered statistically significant, with calculations performed at a 95% confidence interval.

3. RESULTS

As depicted in table 1 vitamin D levels of depressed patient attending the OPD was around 13.83ng/ml ± 2.84 SD in interventional group which shows a marked increase in levels after administrating 6 lac IU of vitamin D i.e. 42.46 ng/ml ± 8.61 SD with a p value of 0.001. The control group shows vitamin D level of 29.29 ng/ml ± 5.19 SD which is also on lower limit of vitamin D level.

Table 1. Change in Vitamin D levels

Variable	Group	Mean ± SD	t-value	p-value
Vitamin D level (ng/ml)	Before Intervention (Esitalopram+Vit-D)	13.83 ± 2.84	22.064	0.001
	After Intervention (Escitalopram+Vit-D)	42.46 ± 8.61		
	Escitalopram alone (Control)	29.29 ± 5.19	-	0.04

Table 2. Mean Change in PHQ-9 Score

Variable	Group	Mean ± SD	t-value	p-value

Patient Health Score	Before Intervention (Esitalopram+Vit-D)	11.48 ± 4.42	3.27	0.002
	After Intervention (Escitalopram+Vit-D)	8.55 ± 3.53		
	Escitalopram alone (Control)	9.37 ± 4.60	-	0.06

In table 2 PHQ scoring has been compared in before and after interventional group receiving vitamin D. It was noted that PHQ scoring decreases from 11.48± 4.42 to 8.55± 3.53 in interventional group before and after receiving vitamin D respectively with a very significant p value (0.002), while in control group receiving only Escitalopram it was 9.37± 4.60.

4. DISCUSSION

Depression is a multifaceted mental health disorder influenced by a variety of factors, including genetics, environment, and lifestyle. Vitamin D deficiency is one potential contributing factor. Numerous studies have found that low levels of vitamin D are associated with worsening symptoms of depression (8).

One hypothesis suggests that vitamin D may play a role in mood regulation by affecting the levels of neurotransmitters in the brain. These neurotransmitters, which are chemical messengers responsible for transmitting signals between nerve cells, are crucial for maintaining mood. Low levels of neurotransmitters like serotonin and dopamine have been associated with depression and other mood disorders (9).

Vitamin D deficiency has emerged as a significant health concern in recent years and has been associated with the pathophysiology of various diseases (10). This current interventional study aimed to explore the relationship between vitamin D supplementation and depression, as well as the factors influencing this relationship in the Pakistani population.

In Table 1 concluded that there was a remarkable increase in vitamin D levels after intervention

that is from mean 13.790+2.874 to 42.470+8.616 ng/ml in deficient patients ($p<0.001$), while in control group mean vitamin D level was found to be 29.29 $\pm$ 5.19.

Similarly in Table 2 PHQ (patient health questionnaire) was compared between two groups as in control group i.e. in Escitalopram alone group shows scoring of 11.48 ± 4.42SD while in interventional group with vitamin D and Escitalopram shows a decline in PHQscoring of 8.55± 3.5 SD with p value 0.002, significantly showing a decline in PHQ scoringin interventional group.

All in all, vitamin D when given to deficient patient with depression shows a remarkable decrease in PHQ scoring resulting in improvement in symptoms.

5. CONCLUSION

Vitamin D supplementation appears to have a positive impact on reducing the severity of depressive symptoms, as reflected in PHQ scores. Patients who received vitamin D supplements showed improvement in their PHQ-9 scores, indicating a reduction in the severity of their depression. These findings suggest that addressing vitamin D deficiency could be a beneficial adjunctive treatment in managing depression. However, further research with larger sample sizes and controlled variables is necessary to fully understand the extent of this relationship and to determine the most effective dosage and duration of supplementation.

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