

# Assessment of Serum 25-OH Vitamin D Levels in Patients with Schizophrenia and Comparing With Healthy Controls

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**Abstract:** *Background:* Schizophrenia is a serious psychiatric disorder characterised by positive, negative and cognitive symptoms. A cohort study of 33,000 women from the general population in Sweden showed that Vitamin-D intake was associated with a significantly decreased relative risk of psychotic-like symptoms.[1] *Aim:* To assess serum 25-OH Vitamin D levels in patients with Schizophrenia and compare with healthy controls. *Material and Methods:* This research study consisted of 30 patients diagnosed with Schizophrenia as per International Classification of Diseases (ICD-10 DCR) – Diagnostic Criteria for Research and a sample of 30 healthy controls were taken who did not have any medical or psychiatric illness. Severity of symptoms was assessed using CGI-S scale. *Results:* Out of 30 schizophrenia patients, 28 patients were found to have subnormal 25-OH Vitamin D levels, as compared to 13 healthy controls, who were found to have subnormal 25-OH Vitamin D levels.

**Keywords:** 25-OH Vitamin D, Schizophrenia, CGI-S, Hypovitaminosis

## 1. Introduction

Vitamin D plays a vital role in many aspects of human health, and researchers are now discovering that vitamin D may play a role in many other areas of health as well. Vitamin D receptors have been found in many areas of the brain, which means that vitamin D is acting in some way in the brain.<sup>[1]</sup> Vitamin D deficiency has been found to be associated with major mental disorders such as depression, schizophrenia, and alcoholism but the causation is not well established yet.<sup>[2]</sup> Furthermore, vitamin D activity it is considered to be involved in the modulation of the hypothalamic-pituitary-adrenal (HPA) axis which regulates the production of the neurotransmitters epinephrine, nor-epinephrine, and dopamine in the adrenal cortex, and also protects against the depletion of dopamine and serotonin.<sup>[3-5]</sup>

The present study thus aims to assess serum 25-OH Vitamin D levels in patients with Schizophrenia and compare them with healthy controls.

## 2. Materials and Methods

This cross sectional study was conducted at a tertiary hospital with a full-fledged Department of Psychiatry, associated to a Medical College having daily outpatient services, indoor facility of 40 beds with private and semi-private rooms, round the clock emergency services and vibrant consultation -liaison psychiatry.

**Sample Size:** This research study included 30 patients diagnosed with Schizophrenia as per International Classification of Diseases (ICD-10 DCR) – Diagnostic Criteria for Research and a sample of 30 healthy controls were included who did not have any medical or psychiatric illness.

**Inclusion Criteria:**

- 1) Those diagnosed with a definitive psychiatric diagnosis as per International Classification of Diseases and Health Related Problem (ICD 10-DCR Version- Diagnostic Criteria for Research) and willing to participate in the study by means of written informed consent.
- 2) Patient age group >18 years.
- 3) Both male and female patients.
- 4) Both IPD and OPD patients.

### Exclusion Criteria

- 1) Patients previously diagnosed with Vitamin D Deficiency and on treatment.
- 2) Patients suffering from other ongoing medical/ surgical illnesses.
- 3) Patients suffering from any organic mental disorders / no other psychiatric disorder.
- 4) Patients suffering from substance use disorders.
- 5) Patients refusing to give sample for serum 25-OH Vitamin D as the test is slightly expensive and not done routinely.

## 3. Methodology

All patients attending Psychiatry Out-patient as well as those admitted in the wards were provided with patient information sheet and consent form. After the diagnosis of schizophrenia and major depressive disorder using ICD-10 DCR, patients were provided with patient information sheet and consent form with details entered in a specially designed proforma. Severity of symptoms were assessed using CGI-S Scale. Serum 25-OH Vitamin D levels in patients falling in test group were estimated and compared with healthy controls.

**Statistical Analysis:** The collected data was coded and entered in Microsoft Excel sheet. The data was analyzed using SPSS (Statistical Package for social sciences) version 20.0 software. The results have been presented in a tabular and graphical format. For Quantitative data Mean, SD,

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Median etc. were calculated. For Qualitative data various rates, ratios and percentage (%) were calculated. As applicable: (For quantitative data test like t-test/ANOVA and for Qualitative data test like z-test, Chi-square test were used for comparison of variables.) **A two tailed test with P-value <0.05 was considered as significant.**

Deficiency 0-5 ng/ml	Insufficiency 5-20 ng/ml	Hypovitaminosis 20-40 ng/ml	Sufficiency 40-100 ng/ml	
20	5	3	2	30

Out of 30 schizophrenia patients, 20 were found to have Vitamin D deficiency, 5 were found to have Vitamin D insufficiency and 3 were found to have Hypovitaminosis.

**Table 2:** Vitamin D levels in healthy controls

Serum 25 OH Vitamin D levels				Total
Deficiency 0-5 ng/ml	Insufficiency 5-20 ng/ml	Hypovitaminosis 20-40 ng/ml	Sufficiency 40-100 ng/ml	
0	3	10	17	30

Out of 30 healthy controls, none had Vitamin D deficiency, 3 were found to have Vitamin D insufficiency, while 10 were found to have Hypovitaminosis.

#### 4. Results

**Table 1:** Vitamin D levels in schizophrenia patients

Serum 25 OH Vitamin D levels (ng/ml)	Total
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**Table 3:** Association between Vitamin D levels in Schizophrenia and healthy controls

Disorder	Serum 25-OH Vitamin D levels				P value
	Deficiency	Insufficiency	Hypovitaminosis	Sufficiency	
Controls	0	3	10	17	P<0.05, Highly significant
Schizophrenia	20	5	3	2	

When serum vitamin D levels were compared between the two groups, we found p <0.05 (highly significant). One-way ANOVA showed significant differences in vitamin D levels of patients with schizophrenia and healthy controls.

Vitamin D Receptors have been found in the hippocampus, cerebellum, and substantia nigra, which are the areas of the brain responsible for depression, schizophrenia, and other mood disorders.<sup>[6-11]</sup>

**Table 4:** Clinical Global Impression scale among disease groups

CGI-S	Schizophrenia
Not Ill	0
Very Mild	2
Mild	2
Moderate	8
Marked	7
Severe	6
Extremely Severe	5
Total	30

The present study aimed to assess serum 25-OH Vitamin D levels in patients with Schizophrenia and compare with healthy controls.

Total of 86% schizophrenia subjects were having CGI score mild and above.

In this study, total of 86% schizophrenia subjects were having CGI score of mild and above.

**Table 5:** Correlation of severity of schizophrenia and Serum 25-OH Vitamin D levels

Severity of schizophrenia	Serum 25 OH Vitamin D levels	Correlation coefficient
Mild	22.27 ± 3.4	r=0.84 P<0.05
Moderate	12.33 ± 5.2	
Severe	4.9 ± 7.3	

There was significant association between severity of schizophrenia disease and vitamin D levels in study subjects with moderate and severe severity of illness having lower levels of Serum 25 OH Vitamin D.

When we compared serum vitamin D levels in between the two groups (schizophrenia cases and controls), we found p <0.05 highly significant. Similar results were seen in Yüksel RN et al<sup>[8]</sup> 2014 study with significantly lower total vitamin D levels compared with healthy controls median values were 7.18, 15.02, respectively and p < 0.001.

#### 5. Discussion

Vitamin D deficiency has been found to be associated with major mental disorders such as schizophrenia.<sup>[2]</sup>

One-way ANOVA showed significant differences in vitamin D levels of patients with schizophrenia and healthy controls; similar was seen with Yüksel RN et al<sup>[8]</sup>, which was in accordance with our study. Larger portion of schizophrenia patients fell in vitamin D deficiency category (< 5 ng/ml) next common category was vitamin D insufficiency (5-20 ng/ml). Similar was seen with Yüksel RN et al<sup>[8]</sup> 2014 with 26/40 (60%) were fell in vitamin D deficiency category and vitamin D insufficiency was seen in 12/40 (30%). Similar was seen in other studies Belvederi Murri et al<sup>[12]</sup>, Itzhaky et al<sup>[10]</sup>, Jamilian et al<sup>[13]</sup>

In our study schizophrenia with vitamin D deficiency was seen in 67% patients while insufficiency was seen in 17%.

Similar was seen In Itzhaky D et al<sup>[10]</sup> study of all vitamin D-deficient patients and vitamin D-insufficient patients were 28/49 (57.1%) and 20/49 (40.8%) respectively.

We in our study found a correlation coefficient of  $r=0.84$  which was highly significant for Schizophrenia cases when we compared their disease severity with serum vitamin D levels in both the groups.

## 6. Recommendations

Low serum vitamin D levels may play a role in the pathogenesis of schizophrenia. Based on our findings, we advocate routine testing of vitamin D concentrations in these patients and supplementation as needed.

Given that vitamin D is neuro-protective, adequate serum vitamin D concentrations may be effective to prevent new acute episodes in the course of schizophrenia. Nevertheless, it is not known what dose of vitamin D is neuro-protective. So, future trials of vitamin D supplementation are needed to focus on dosing and tolerability in patients with schizophrenia.

## 7. Limitations

The limitations of this study for the understanding of whether serum 25-OH vitamin D deficiency is a state marker or trait marker for schizophrenia, follow up should be conducted after the treatment of acute episodes.

Because this is cross sectional study, it is not possible to understand if the vitamin D deficiency is a cause or result of schizophrenia.

Also we cannot generalize these findings in population. Schizophrenia is also known to have multifactorial causation.

Future cohort, case controls and randomized control trials would investigate the association with longer follow up.

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