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**Original Research Article**

# Correlation between Serum Vitamin D Levels and Disease Activity (SLEDAI Score) In Systemic Lupus Erythematosus Patients: A Study from a Tertiary Care Hospital in Southern Assam

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**Conflict of interest: Nil**

**Abstract:**

**Background:** A growing number of autoimmune and chronic conditions are associated with low vitamin D (Vit D) levels. This study aims to ascertain the incidence of vitamin D in patients with systemic lupus erythematosus (SLE) and its correlation with the SLEDAI score, a tool used to quantify disease activity.

**Methodology:** A long-term study involving 50 confirmed SLE patient's attended the departments of dermatology, and medicine at Silchar Medical College & Hospital was included. All of the samples underwent immunofluorescence testing for ANA, dsDNA, and ANCA, radioimmunoassay testing for vitamin. D levels, and SLEDAI scoring was used to gauge the severity of the illness.

**Results:** The patients of SLE had mean Vitamin. D amounts of 18.07 with a standard deviation of 4.65. Following vitamin. D administration, the mean serum levels of the vitamin were 45.05, with a standard deviation of 14.05. A paired sample t test was run using the SLE patients' pre- and post-vitamin. D data, and the p value was considered statistically significant at <0.001. Initial vitamin. D levels and the first SLEDAI (disease activity score) were found to be correlated; a very strong negative link was indicated by the Pearson link coefficient of -0.8755. p- Value for the same was found to be <0.001 which indicated that the finding is highly significant. Furthermore, a relationship between the improved disease activity score and the final levels of Vitamin. D after supplementation was examined. The Pearson correlation coefficient was -0.924 which suggested of a strong negative correlation. P value for the same was found to be <0.001 hence marking its significance.

**Conclusion:** Patients with SLE had statistically reduced serum vitamin. D amounts. Additionally, a statistically significant rise was seen in vitamin. D amounts following the same. Furthermore, a substantial negative Pearson's correlation coefficient was found between the disease activity score, or SLEDAI, & the vitamin. D amounts. Consequently, all the patients of SLE should have their vitamin. D levels checked, and supplements should be recommended as per need.

**Keywords:** SLE, Disease activity, Vitamin D.

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## Introduction

Antibodies act as a mediator in the chronic auto immune disease known as SLE. It can present with hematological, articular, cutaneous, or visceral symptoms. The etiopathogenesis of SLE is still unclear owing to its complex multifactorial nature. [1] There is now enough information available to demonstrate how SLE behaves differently in various groups. The development and course of this

illness have been related to environmental, genetic, and hormonal variables. [2] Interest in the part played by vitamin. D in the pathophysiology of SLE has been piqued by the expression of vitamin. D receptors by a range of innate and adaptive immune system cells. [3] Apart from maintaining phosphocalcic equilibrium, vitamin D has other biological functions, particularly in the immune system. Among its other immune-modulatory actions on lymphocyte cells, it prevents T lymphocyte proliferation, the Ig production by B lymphocytes, & the ability of NK cells to cause cytotoxicity [4,5]. It has been demonstrated that individuals with SLE exhibited lower levels of 25-hydroxyvitamin D3 when compared to healthy controls. [6] Finding out how common aberrant serum vitamin. D levels are in SLE patients and how they correlate with the disease activity index is the aim of this study.

**Objectives:** To determine the prevalence of vitamin. D deficiency in people with SLE & whether low vitamin. D levels are associated with disease activity.

**Materials & Methods**

**Study design:** Longitudinal study.

**Study setting:** The study was conducted in Northeastern India at the Silchar Medical College & Hospital in Assam.

**Study population:** It included fifty confirmed SLE patients who were enrolled in the dermatology and medicine departments of Silchar Medical College & Hospital and had verified diagnoses (confidence level: 95%, margin of error: 5%, population proportion: 3.2).

At Silchar Medical Collage, a long-term study was conducted from January 2022 to December 2023. The study comprised 50 SLE patients, either active or inactive, who were seen in the dermatology and medicine departments. For every diagnosis, the most recent American College of Rheumatology (ACR) categorization criteria were applied. [5]

After obtaining research consent, patients who meet the ACR's SLICC criteria[5] and are at least 18-year-olds were involved in the research.

**Inclusion Criteria**

1. Four or more criteria, at least one of which is clinical and one of which is immunologic
2. Alternatively, the only clinical need when anti-ds DNA antibodies are present or ANA would be lupus nephritis.
3. A minimum of one week spent in the hospital.
4. Having the ability to understand & communicate.
5. Give informed consent in writing.

**Exclusion Criteria**

1. Individuals with acute cancers and other known chronic infectious and inflammatory diseases, such as HIV.
2. Individuals in septic shock or sepsis.
3. Patients with consciousness & communication difficulties.
4. Individuals taking psychotropic medications, including tranquilizers & antidepressants.
5. Those suffering from neuropsychiatric SLE.
6. Individuals with severe SLE-related dyslexia.

Following the acquisition of informed consent, each participant underwent a clinical evaluation that included a systemic and local examination as well as a history collection. Among the features that were identified were age, sex, duration of SLE, photosensitivity, skin abnormalities, and active arthritis. SLEDAI score was used to determine the SLE disease activity [7,8]. Using Hep 2 cells at twofold dilutions ranging from 1:40 to 1:1280, all samples were immunofluorescently tested for ANA, dsDNA, and ANCA in accordance with evidence-based guidelines for the use of immunologic tests—antinuclear antibody testing [9]. For vitamin. D assays, samples were gathered, spun for 4 minutes at 4000 rpm, and then quantified using an ELISA. Inadequate vitamin. D was defined as a shortfall of less < 30 ng/ml, with deficiency at levels < 20 ng/ml. [6] For statistical purposes, we took into account any concentration of vitamin. D below 30 ng/ml. SLE patients who had low vitamin. D amounts took a 60000 I.U. supplement for 6 weeks. Vitamin. D levels in serum assessed in each of these cases at the 6-week point in order to ascertain whether there had been any appreciable increase in its levels and whether this had connected with the SLEDAI score.

**Collection of data:** Medical records provided extensive demographic data, including age and gender. Biochemical information was obtained from the institute's LIS, including of vitamin. D amounts in serum & ANA.

**Statistical analysis:** Evaluation of data was conducted utilizing the SPSS software. While the quantitative variables were defined as mean, SD, & range, the qualitative variables were expressed as percentages & numbers. To rank the variables, the Spearman Correlation Coefficient test was employed in relation to each other either favorably or unfavorably, and the Wilcoxon test was used to compare quantitative variables within the same group. P values were classified as very significant below 0.05, significant below 0.05, and irrelevant below 0.01%.

**Ethical consideration:** The institutional ethics committee gave its approval for this work vide no SMC/98/07/11864 dated 24/10/2019

## Results

Forty of the fifty SLE patients that were confirmed were female (n = 40), and ten were male (n = 10) [Figure 1, Table 1] and 56% (n=28) of the sample's members were female reproductive age group members, aged 20 to 30 [Figure 2, Table 2]. Vit. D levels were found to be deficient in 60% of cases (n = 30), insufficient in 40% of cases (n = 20) with values between 20 and 30 ng/ml, and sufficient in none of the cases (n = 0). [Table 3; Figure 3].

The baseline mean Vit. D levels in the SLE patients were calculated to be 18.07 with a standard deviation of 4.65. Following Vit. D administration, the mean increased to 45.05 with a 14.05 standard deviation [Table 4]. A paired sample t test was conducted using serum Vit. D levels measured both before and after Vit. D treatment. The results showed that the test was statistically significant, with a p-value of less than 0.001 [Table 4]. When the initial Vit. D levels and the SLEDAI score were correlated, a very high negative correlation was shown by the Pearson Correlation coefficient of -0.8755 [Figure 4, Table 6].

The P value for the same was determined to be less than 0.001, indicating a very significant finding [Table 5]. Research was conducted to evaluate the correlation between the final amounts of Vit. D following supplementation & the improved disease activity score. [Figure 5, Table 6]. A substantial negative association was indicated by the Pearson correlation coefficient of -0.924. The same was determined to have a P value of less than 0.001, indicating its significance [Table 5].

**Table 1: Participants in the study were distributed according to gender**

| Gender | Frequency | Percentage |
|---|---|---|
| Female | 40 | 80 % |
| Male | 10 | 20 % |

**Table 2: Participants in the study are distributed as per age**

| Age | Frequency | Percentage |
|---|---|---|
| 20 - 30 Years | 28 | 56 % |
| 30 - 40 Years | 12 | 24 % |
| 40 - 50 Years | 6 | 12 % |
| 50 - 60 Years | 4 | 8 % |

**Table 3: Participants' serum Vit. D levels distributed across the study**

| Serum Vit. D levels | SLE Cases |
|---|---|
| <20 ng/ml (deficiency) | 30 (60%) |
| 20 - 30 ng/ml (insufficiency) | 20 (40%) |
| >30 ng/ml (sufficiency) | 0 (0%) |

**Table 4: Variations in Vit. D levels both before & after taking supplements**

| Variables | Mean +/- SD | P value |
|---|---|---|
| Initial Vit. D at baseline | 18.07 +/- 4.65 | <0.001 |
| Vit. D levels after supplementation | 45.05 +/- 14.05 | |

**Table 5: Changes in disease activity/ SLEDAI Score at baseline and after Vit. D supplementation**

| Variables | Mean +/- SD | P value |
|---|---|---|
| SLEDAI at baseline | 4 (2-6) | <0.001 |
| SLEDAI after Vit. D supplementation | 2 (0-4) | |

**Table 6: Correlation between disease activity/ SLEDAI versus Vit. D levels**

| Variables | R-value |
|---|---|
| SLEDAI at baseline | -0.8755 |
| SLEDAI after Vit. D supplementation | -0.924 |

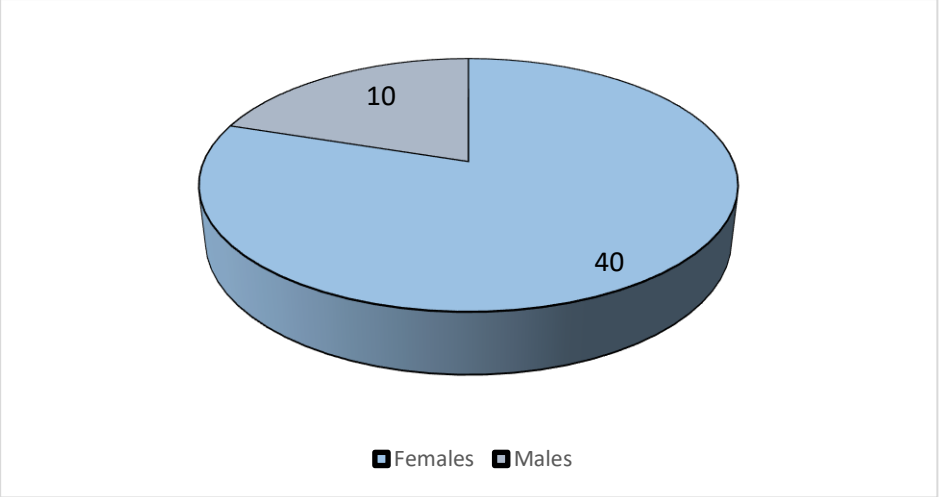


**Figure 1: Pie diagram showing distribution of gender**

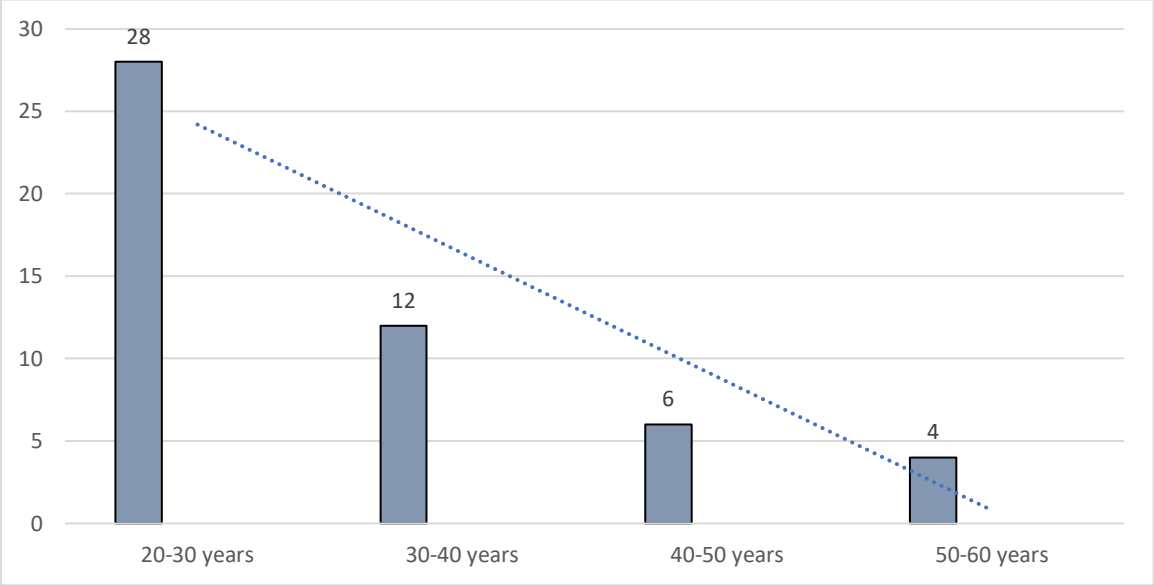


**Figure 2: Column chart with trendline showing distribution of age**

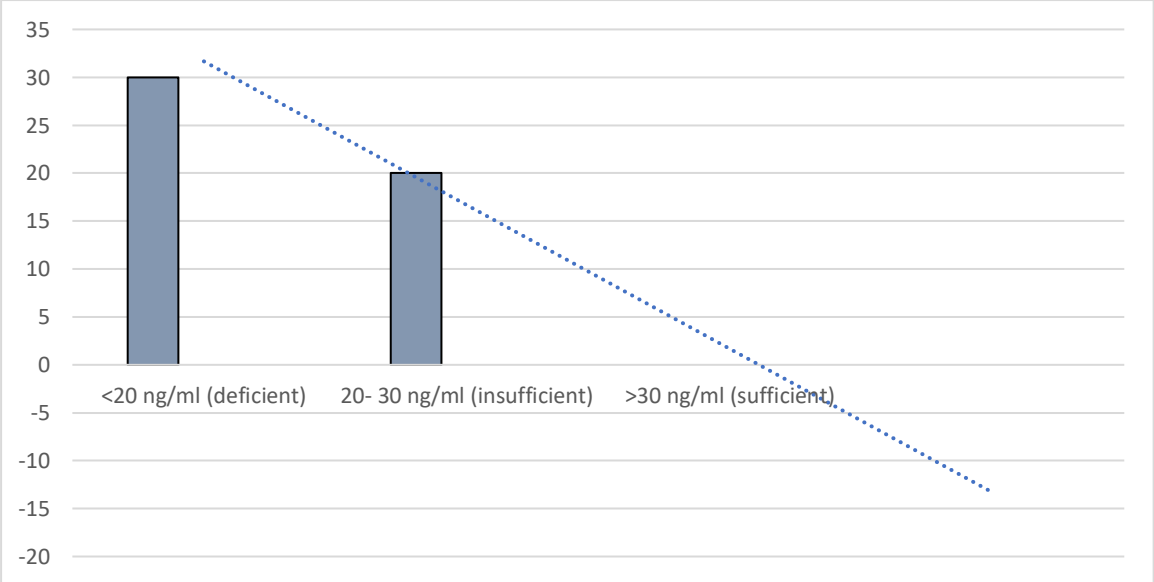


**Figure 3: Serum Vit. D level distribution in SLE patients is displayed in a column chart with a trendline.**

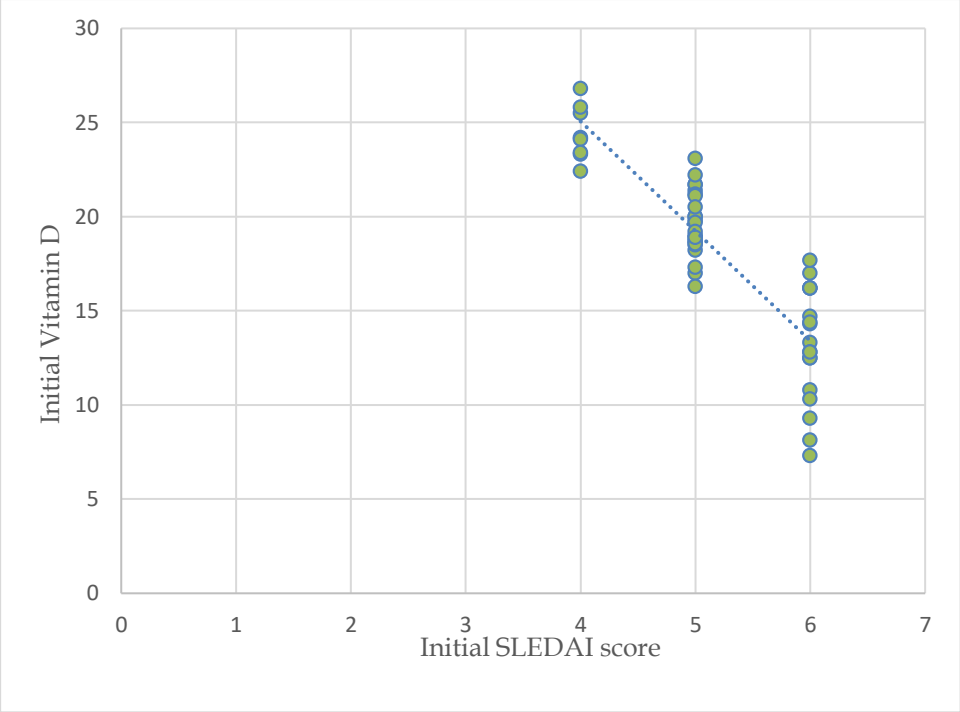


**Figure 4: Diagram with a scatter plot illustrating the relationship between initial Vit. D levels & initial SLEDAI score or disease activity**

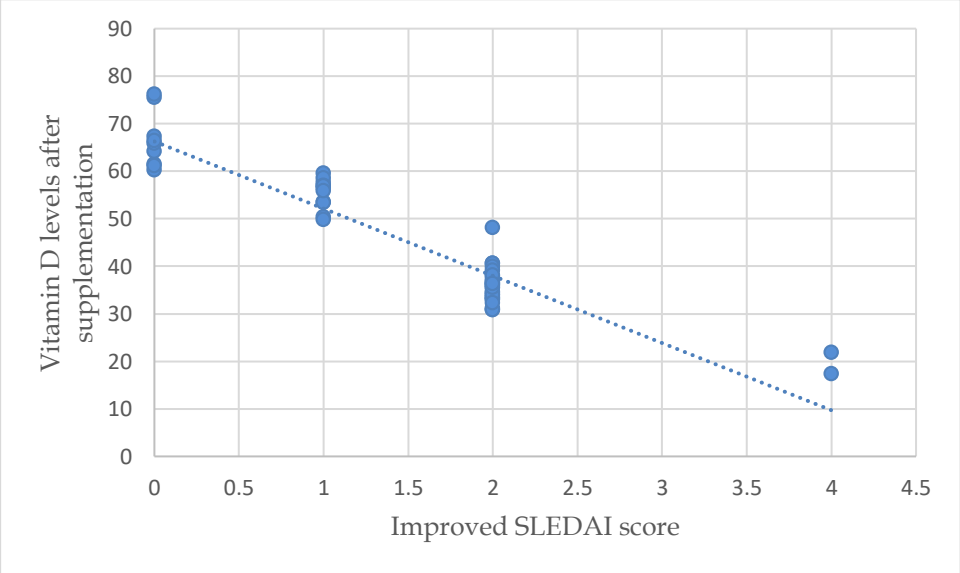


**Figure 5: Diagram with a scatter plot illustrating the relationship between increased SLEDAI score or disease activity & levels of Vit. D after supplementation.**

## Discussion

Medical research has long been interested in how Vit. D affects immune responses, particularly autoimmune diseases [1,2]. Patients with SLE have a complex connection with Vit. D since the condition is linked to several risk factors that can result in a Vit. D shortage and a flare-up of clinical symptoms. (McNaughton 2006) [3,5].

The goal of this current investigation was to ascertain how common aberrant serum's Vit. D levels in individuals having SLE and the inter-relation between these levels & the SLEDAI, or disease activity score. In the group of people who are actively reproducing, there were more female SLE patients [8]. This is in line with the conclusions of Vasile M. et al. (2008), who looked at the higher frequency of autoimmune illnesses in women, which could be related to hormones. According to our research, SLE patients were more likely to be deficient in Vit. D and had comparatively low levels of serum Vit. D ($p<0.001$). Over two thirds of the subjects had insufficient levels, and over half showed signs of insufficiency. Ritterhouse et al.'s findings sup-

ported this, finding a significant correlation (p value <0.001) between deficiency of Vit. D & SLEDAI score in patients suffering from SLE (N=32, 69%). Similar levels of prevalence, which differ based on a no. of facets like, geographical, environmental & genetic factors, have been shown in other research [10]. These percentages vary from 16 to 96.5,6. Similar findings were obtained by Mandal M & colleagues [5] in their trials, which showed a negative correlation (p= <0.0001) between SLEDAI score & disease activity and levels of Vit. D.

Our study's mean values of Vit. D amounts were 18.07 +/- 4.65 ng/ml, which is nearly identical to research findings from Egypt (17.6+/-6.9 ng/ml).10.1+/-9.5 ng/ml, Serbia [11,12]. Supplementation led to a statistically notable (p=<0.001) raise in levels of Vit. D amongst patients having SLE in the current investigation. This is consistent with studies by Cutillas et al. [2] on sixty patients of SLE in Cuttack, Odisha (where the odds ratio of Vit. D insufficiency in serum was determined to be 3.47), and Ritterhouse et al. [3] on thirty-two SLE patients. Handor N & associates [6] obtained comparable outcomes. Low serum Vit. D levels & disease's activity, & the SLEDAI score, were successfully shown to be strongly inversely correlated. Furthermore, patients' disease activity was improved by Vit. D therapy, as seen by a decreased SLEDAI score. The trials conducted by Mandal M and colleagues5 yielded similar results, demonstrating an inverse relationship between levels of Vit. D & activity of disease (p= <0.0001).

## Conclusion

Patients suffering from SLE disease, typically have reduced vitamin. D levels. Moreover, vitamin. D levels in patients of SLE statistically increased following the treatment. We found a substantial negative Pearson's connection between vitamins. D levels & the SLEDAI score i.e. disease activity. Consequently, all patients suffering from SLE should have their vitamin. D levels checked, & supplements should be prescribed as per their need.

## Limitation

Other inflammatory factors or markers that could affect how pathogenic SLE is are not examined in this study, which could have an impact on the findings. The range of genders and ethnicities in our study population further restricts our ability to fully analyze the study's findings. More long-term research is necessary to fully generalize the findings of this study due to the limited sample size.

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