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# LABORATORY EFFECTS OF ORAL TREATMENT WITH VITAMIN D IN PATIENTS WITH PLAQUE PSORIASIS

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## ABSTRACT

**Background:** Psoriasis is a chronic T-cell-mediated inflammatory skin disease. Recently, many studies have reported an important role for vitamin D in the pathogenesis and treatment of the disease. **Objective:** To study the laboratory effects of oral vitamin D therapy in patients with plaque psoriasis. **Materials and Techniques:** The study included 50 patients who have been given oral vitamin D at a dose of **60,000 IU** every two weeks for six months. The level of vitamin D in the serum, phosphorus, parathyroid hormone, and inflammatory reaction protein has been measured as well as other analyses. **Results:** Giving oral vitamin D to psoriasis patients leads to an increase in the level of the vitamin D in the serum after three and six months (average vitamin D /17.2±5.3/. After three and six months /24.15±4.5/ and /40.1±10.8/, respectively. Moreover, the results also showed an inverse relationship between high vitamin D and low PTH. Other Test results were similar. No significant side effects were recorded. **Conclusion:** Giving oral vitamin D in psoriasis increases the level of vitamin D in the serum without having any significant effect on other laboratory tests.

**KEYWORDS:** Psoriasis, serum vitamin D level.

## INTRODUCTION

Psoriasis is defined as a T-cell-mediated disease in which Th1, Th17, and Th22 helper T cells play an essential role. It interacts with many cell types via different cytokines such as (TNF-α), IL-6, and IL-17.

Vitamin D exists in two forms: Vitamin D3, which is the most important source is in animals and produced in the skin. Vitamin D2 differs from D3. It has a methyl group at C24 and a double bond at C22 = C23, and is produced by plants.

Vitamin D promotes the differentiation of young T cells into regulatory T cells, thus enhancing the production of anti-inflammatory cytokines (TGF-β, IL-4, and IL-10). It also inhibits the production of pro-inflammatory cytokines (TNFα, INFγ, IL-2, IL-17A, and IL-21).

Interestingly enough, vitamin D also stimulates the expression of IL-33 and its receptor. IL-33 has been shown to ameliorate Th17-induced psoriatic inflammation. Accordingly, the anti-inflammatory activity of vitamin D is a crucial factor in the pathogenesis of psoriasis and useful in its management.

There are various studies that have reported a potential role for vitamin D deficiency in the pathogenesis of psoriasis. Several other studies have also reported that vitamin D is a key regulator of inflammatory function. The active metabolite of vitamin D has an anti-inflammatory effect on monocytes/macrophages, thus reducing the production and expression of several pro-inflammatory cytokines including TNF-α, IL-1β, IL-6, and IL-8.

### Importance of Research

Psoriasis patients are considered one of the risk groups exposed to vitamin D deficiency. Many studies have reported an important role for vitamin D in treating the disease. On the other hand, an increase in the level of vitamin D after oral doses in psoriasis patients who have a deficiency in its levels may be accompanied by a change in the level of other accompanying tests. Therefore, the importance of the research springs from studying these changes if they are present and if they increase, decrease, or if they don't exist.

## STUDY OBJECTIVES

Studying the Laboratory Effects of Oral Vitamin D Therapy in Patients with Plaque Psoriasis.

**Research Materials and Techniques**
**Study type:** Before and After the Study.

**Study sample**
The studied sample includes outpatients at Tishreen University Hospital in Latakia in the period between 2021-2023 who met the requirements of the study (50 patients).

**Admission Criteria**
Patients with plaque psoriasis who are over 18 years old who have low serum levels of vitamin D.

**Exclusion criteria**
- Patients with renal and liver failure.
- Patients who have malabsorption.
- Patients with high calcium.
- Patients with a history of kidney stones.
- Patients with High parathyroid hormone.
- Mentally unfit patients.
- Pregnant and breastfeeding women.
- Patients who take immunosuppressants.
- Patients who take certain medications such as thiazides, antiepileptics, anticoagulants, or bisphosphonates.
- Patients who currently, or during the past two months, take vitamin D at a dose greater than 1,000 IU per day.
- Patients undergoing ultraviolet radiation treatment currently or within the previous month.
- Patients were examined, a diagnosis was made, and informed consent was taken for the treatment plan.

The psoriasis area index and risk index were calculated and divided as follows:

**Psoriasis Area and Severity Index (PASI)**
Psoriasis Area and Severity Index less than 7, mild psoriasis.
Psoriasis Area and Severity Index between 7-12, moderately severe psoriasis
Psoriasis Area and Severity Index above 12, severe psoriasis.

The following analyzes were performed:
- Vitamin D Titration.
- PTH –CBC-GLU-AST-ALT titration.
- Blood phosphorus titration.
- Urea and creatinine titration.
- Albumin titration.
- CRP (C-reactive protein) titration

Patients were asked about the following information:
- Duration of illness.
- Family history.
- Current or previous medications and treatments.

The evaluation was made at the first meeting, after 3 months, and after 6 months.

Patients were compensated with a dose of 120,000 IU per month (60,000 IU every two weeks) for six months period.

**Serum levels of vitamin D**
Less than 20 ng/ml very deficient.
Between the 21-29ng/ml insufficient.
Between the 30-100ng/ml is sufficient.
More than 100ng/ml toxicity

**The sample was distributed according to the duration of the disease**
**Table 1: Sample distribution according to duration of illness.**

| | | Frequency | Percentage | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| **Valid** | **One year or below** | 17 | 34.0 | 34.0 | 34.0 |
| | **2-4** | 13 | 26.0 | 26.0 | 60.0 |
| | **5-7** | 4 | 8.0 | 8.0 | 68.0 |
| | **8-10** | 5 | 10.0 | 10.0 | 78.0 |
| | **11 years and Above.** | 11 | 22.0 | 22.0 | 100.0 |
| | **Total** | 50 | 100.0 | 100.0 | |

Table (1) shows the distribution of the sample according to the duration of the disease. The largest percentage of the sample members were patients whose duration of illness was one year or less (17 patients), representing **34%**. The lowest percentage was patients whose duration of illness ranged between 5 and 7 years (4 patients), representing **8%**. The percentage of patients whose duration of illness did not exceed **4** years was **60%** of the total sample. The percentage of patients with duration of illness exceeding four years was 40% of the total sample.

**The sample is distributed according to genetic history**
**Table 2: Sample distribution according to genetic history.**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| **Valid** | **No genetic story** | 34 | 68.0 | 68.0 | 68.0 |
| | **No genetic story** | 16 | 32.0 | 32.0 | 100.0 |
| | **Total** | 50 | 100.0 | 100.0 | |

Table (2) shows the distribution of the sample according to the presence of a genetic history of the disease. The sample showed that 34 patients out of 50, or (68%), had no genetic history, whereas only 16 patients (32%) had a genetic history related to the disease.

**A Study of Changes in Vitamin D Values During the Period of Treatment**

Analysis of Variance Test (ANOVA)

Analysis of variance test was adopted for testing this hypothesis:

**Table 3: Analysis of variance test of changes in vitamin D values during treatment.**

| Vita | | | | | |
|---|---|---|---|---|---|
| | **Sum of Squares** | **df** | **Mean Square** | **F** | **Sig.** |
| **Between Groups** | 13719.923 | 2 | 6859.962 | 122.658 | .000 |
| **Within Groups** | 8221.327 | 147 | 55.927 | | |
| **Total** | 21941.250 | 149 | | | |

As seen in Table (3), the significance value (sig value) was equal to /0.000/, which is smaller than /0.05/. This means that there are important differences between the average value of vitamin D during treatment periods.

**Changes in vitamin D values during treatment**

**Table 4: Multiple Comparisons.**

| Dependent Variable: vita | | | | | | |
|---|---|---|---|---|---|---|
| LSD | | | | | | |
| **(I) Duration of treatment** | **(J) Duration of treatment** | **Mean Difference (I-J)** | **Std. Error** | **Sig** | **95% Confidence Interval** | |
| | | | | | **Lower Bound** | **Upper Bound** |
| Initial examination | Three months later | -6.88420* | 1.49569 | .000 | -9.8400 | -3.9284 |
| | After 6 months | -22.83420* | 1.49569 | .000 | -25.7900 | -19.8784 |
| Three months later | Initial examination | 6.88420* | 1.49569 | .000 | 3.9284 | 9.8400 |
| | After 6 months | -15.95000* | 1.49569 | .000 | -18.9058 | -12.9942 |
| After 6 months | Initial examination | 22.83420* | 1.49569 | .000 | 19.8784 | 25.7900 |
| | Three months later | 15.95000* | 1.49569 | .000 | 12.9942 | 18.9058 |
| ***. The mean difference is significant at the 0.05 level.** | | | | | | |

Table (4) demonstrates the significance value corresponding to the initial examination (beginning of treatment) was equal to /0.000/, which is smaller than /0.05/. This means that there are important differences between the average vitamin D values at the initial examination and after three months; between the initial examination and after 6 months, and the corresponding sig value (for the second stage after 3 months of treatment) was equal to /0.000/, which is smaller than 0.05, which means that there are significant differences between the average vitamin D values between the second stage (treatment after 3 months) and the last stage (After 6 months).

As long as there are differences between the different vitamin D values during the treatment stages, it is possible to compare these values in order to judge the level of progress or decline in vitamin D level.

**Table 5: Descriptives: Changes in Vitamin D Values during the Treatment Period.**

| Vita | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **N** | **Mean** | **Std. Deviation** | **Std. Error** | **95% Confidence Interval for Mean** | | **Min** | **Max** |
| | | | | | **Lower Bound** | **Upper Bound** | | |
| Initial examination | 50 | 17.26 | 5.32024 | .75240 | 15.7538 | 18.7778 | 10.1 | 26.4 |
| Three months later | 50 | 24.15 | 4.55874 | .64470 | 22.8544 | 25.4456 | 12.5 | 29.6 |
| Six months later | 50 | 40.10 | 10.89473 | 1.540 | 37.0038 | 43.1962 | 10.0 | 62.8 |
| Total | 150 | 27.17 | 12.13494 | .99081 | 25.2141 | 29.1298 | 10.0 | 62.8 |

As seen in Table (5), the average value of vitamin D in the first stage (initial examination) is **17.265**, and it rose to **24.15** in the second stage (after 3 months). It rose again to **40.10** in the third stage (after 6 months). This means that vitamin D increases with treatment.

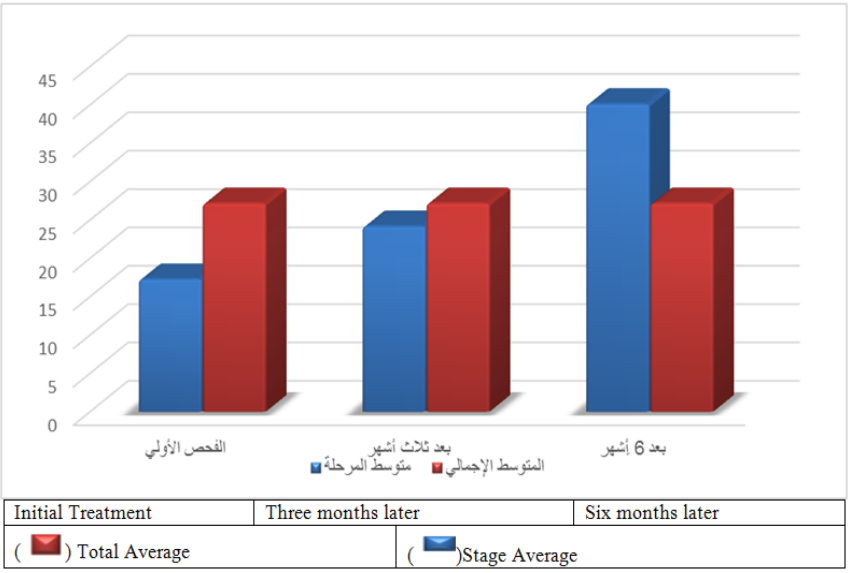


**Figure 1: Comparison between the average vitamin D values at each stage of treatment and the total average for whole sample during the treatment period.**

Figure (1) shows a comparison between the average vitamin D values at each stage of treatment and the total average vitamin D value for whole sample during the treatment period, which shows the beginning of a gradual increase in the vitamin D level accompanying treatment.

It can be noted that the average value of vitamin D in the first stage (initial examination) and the second stage (after 3 months) was less than the total average value during the treatment period (within 6 months), while the average value of vitamin D at the end of the third stage of treatment (after 6 months) was greater than the total average value of vitamin D for the whole sample during the treatment stages. This is an indication that the value of vitamin D gradually increases throughout the stages of treatment. The increase is at its highest level during the last stage of treatment.

**Changes in test values during the treatment period**

**Table 6: Changes in analysis values during the treatment period.**

| | | N | Mean | Std. Deviation | Std. Error | Min | Max |
|---|---|---|---|---|---|---|---|
| **P** | Initial examination | 50 | 4.2944 | .79715 | .11273 | 1.70 | 5.40 |
| | Three months later | 50 | 4.1260 | .60636 | .08575 | 2.80 | 5.10 |
| | Six months later | 50 | 3.8980 | .48170 | .06812 | 3.00 | 5.20 |
| **UREA** | Initial examination | 50 | 24.7280 | 8.41396 | 1.18991 | 6.00 | 44.00 |
| | Three months later | 50 | 26.4880 | 6.53667 | .92442 | 17.00 | 44.10 |
| | Six months later | 50 | 26.2360 | 7.25325 | 1.02577 | 15.00 | 44.10 |
| **CREA** | Initial examination | 50 | .8498 | .20079 | .02840 | .50 | 1.30 |
| | Three months later | 50 | .8396 | .19378 | .02740 | .50 | 1.30 |
| | Six months later | 50 | .8642 | .21022 | .02973 | .10 | 1.20 |
| **AST** | Initial examination | 50 | 22.5400 | 5.03137 | .71154 | 12.00 | 32.00 |
| | Three months later | 50 | 23.8000 | 5.70714 | .80711 | 10.00 | 33.00 |
| | Six months later | 50 | 22.4000 | 5.54389 | .78402 | 12.00 | 35.00 |
| **ALT** | Initial examination | 50 | 19.3000 | 7.52750 | 1.06455 | 6.00 | 35.00 |
| | Three months later | 50 | 20.2000 | 6.24336 | .88294 | 8.00 | 36.00 |
| | Six months later | 50 | 20.9800 | 6.60702 | .93437 | 7.00 | 33.00 |
| **CRP** | Initial examination | 50 | 1.5958 | 1.13542 | .16057 | .10 | 5.60 |
| | Three months later | 50 | 1.6480 | .99511 | .14073 | .10 | 4.40 |
| | Six months later | 50 | 1.6086 | .92309 | .13054 | .10 | 4.10 |
| **ALB** | Initial examination | 50 | 4.3380 | .42131 | .05958 | 3.60 | 5.20 |
| | Three months later | 50 | 4.1546 | .41639 | .05889 | 3.60 | 5.20 |
| | Six months later | 50 | 4.2828 | .55499 | .07849 | 3.60 | 6.90 |
| **RBC** | Initial examination | 50 | 4.5880 | .44968 | .06360 | 3.80 | 5.50 |
| | Three months later | 50 | 4.5680 | .41426 | .05858 | 3.80 | 5.50 |
| | Six months later | 50 | 4.5614 | .37868 | .05355 | 3.70 | 5.40 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **WBC** | Initial examination | 50 | 7.8186 | 1.88378 | .26641 | 3.20 | 11.70 |
| | Three months later | 50 | 7.9684 | 1.72103 | .24339 | 4.20 | 11.50 |
| | Six months later | 50 | 7.9900 | 1.86134 | .26323 | 4.10 | 11.50 |
| | Total | 150 | 7.9257 | 1.81281 | .14802 | 3.20 | 11.70 |
| **HB** | Initial examination | 50 | 11.7940 | 2.08125 | .29433 | 1.80 | 15.40 |
| | Three months later | 50 | 13.8480 | 12.37356 | 1.74989 | 8.90 | 99.00 |
| | Six months later | 50 | 12.1440 | 1.42100 | .20096 | 9.20 | 14.60 |
| **PLT** | Initial examination | 50 | 243.6000 | 70.97082 | 10.03679 | 139.00 | 376.00 |
| | Three months later | 50 | 243.1200 | 52.06418 | 7.36299 | 155.00 | 351.00 |
| | Six months later | 50 | 248.3400 | 59.07367 | 8.35428 | 151.00 | 358.00 |
| **PTH** | Initial examination | 50 | 46.0820 | 13.25566 | 1.87463 | 22.00 | 70.20 |
| | Three months later | 50 | 38.3940 | 10.96306 | 1.55041 | 17.20 | 66.40 |
| | Six months later | 50 | 32.3860 | 11.94252 | 1.68893 | 14.60 | 63.10 |
| **GLU** | Initial examination | 50 | 106.2440 | 27.09035 | 3.83115 | 70.60 | 181.00 |
| | Three months later | 50 | 103.3100 | 22.43869 | 3.17331 | 72.00 | 174.00 |
| | Six months later | 50 | 101.6660 | 15.41204 | 2.17959 | 76.60 | 128.10 |

Table (6) shows the statistical descriptions for each of the analyzes covered in the study, whereas the arithmetic average is seen at each stage of treatment in addition to the standard deviation, standard error, highest value, and lowest value during the treatment period.

The following figure (2) shows a comparison of the changes that occurred in each of the analysis values during the studied period, taken on the basis of the general average of the sample.

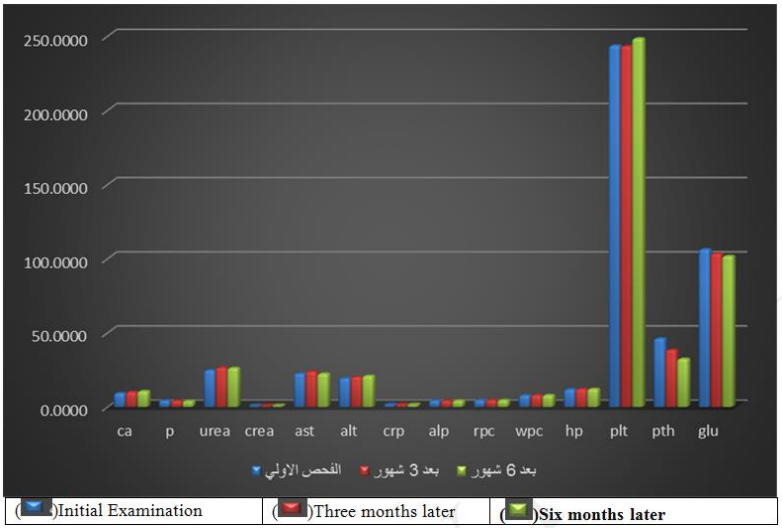


**Figure 2: Change in test values during the treatment period.**

**Study of the relationship between vitamin D and PTH values (Parathyroid Hormone values) during the treatment period**

To test this hypothesis, we relied on a simple linear correlation test, and the results were as follows:

**Table 7: Correlations: Relationship between vitamin D and PTH values during treatment.**

| | | Vita | PTH |
|---|---|---|---|
| Vita | Pearson Correlation | 1 | -.308** |
| | Sig. (2-tailed) | | .000 |
| | N | 150 | 150 |
| PTH | Pearson Correlation | -.308** | 1 |
| | Sig. (2-tailed) | .000 | |
| | N | 150 | 150 |
| **. Correlation is significant at the 0.01 level (2-tailed). | | | |

Table (7) shows that the sig value was equal to /0.00/, which is smaller than /0.05/. This means that there is a significant relationship between vitamin D values and PTH values during the treatment period.

Table (7), shows the value of the Pearson correlation coefficient was equal to /0.308/ with a negative sign, which means that there is a weak inverse relationship between the vitamin D values and the PTH values of the sample during the treatment period.

The result is that the increase in vitamin D values is directly related to the decrease in PTH values in the studied sample during the treatment period.

**Studying the relationship between vitamin D and other test values during the treatment period**

To test this relationship, we relied on a simple linear correlation according to the matrix that appears in Table (8), and the results were as follows:

**Table 8: The relationship between vitamin D and other test values during the treatment period.**

| | | |
|---|---|---|
| P | Pearson Correlation | -.065 |
| | Sig. (2-tailed) | .428 |
| | N | 150 |
| UREA | P arson Correlation | .057 |
| | Sig. (2-tailed) | .487 |
| | N | 150 |
| CREA | Pearson Correlation | .055 |
| | Sig. (2-tailed) | .506 |
| | N | 150 |
| AST | Pearson Correlation | -.160* |
| | Sig. (2-tailed) | .050 |
| | N | 150 |
| ALT | Pearson Correlation | .065 |
| | Sig. (2-tailed) | .432 |
| | N | 150 |
| CRP | Pearson Correlation | -.141 |
| | Sig. (2-tailed) | .085 |
| | N | 150 |

| | | vita |
|---|---|---|
| ALB | Pearson Correlation | .001 |
| | Sig. (2-tailed) | .990 |
| | N | 150 |
| RBC | Pearson Correlation | -.058 |
| | Sig. (2-tailed) | .481 |
| | N | 150 |
| WBC | Pearson Correlation | .109 |
| | Sig. (2-tailed) | .184 |
| | N | 150 |
| HB | Pearson Correlation | -.003 |
| | Sig. (2-tailed) | .973 |
| | N | 150 |
| PLT | Pearson Correlation | -.088 |
| | Sig. (2-tailed) | .286 |
| | N | 150 |
| PTH | Pearson Correlation | -.368** |
| | Sig. (2-tailed) | .000 |
| | N | 150 |
| GLU | Pearson Correlation | -.115 |
| | Sig. (2-tailed) | .162 |
| | N | 150 |

Table (8) shows that the sig value for the correlation coefficient between vitamin D and the values of all the tests is greater than /0.05/ (except for PTH). This means that there is no relationship between vitamin D and the tests studied.

## DISCUSSION

This study included 50 patients with plaque psoriasis and vitamin D deficiency, and the results were as follows:

- Duration of illness for most of the sample patients was one year or less at a rate of 34%.
- The number of patients with a hereditary history of psoriasis was 16 patients, 32%.
- Average vitamin D at admission /17.26 ± 5.32/, and after 3 months /24.15 ± 4.55 /. After 6 months /40.10±10.89/. Accordingly, we conclude that vitamin D increases during the treatment period.
- The increase in Vitamin D values is directly related to the decrease in PTH values in the studied sample throughout the treatment period.
- No difference in the tests was recorded during the treatment period except for PTH.

Upon comparing and contrasting the results of our study with other studies, it was found out:

- In the study by Hukins et al... conducted in the United States in 1990 and included 6 patients at a dose of 40 IU per day, which was gradually increased every two weeks to reach a maximum dose of 80 IU per day for a period of 6 months, the results were as follows: Side effects such as hypercalciuria were recorded in 20% of patients.
- In the study by Gaal et al... conducted in the United States in 2009 and included 10 patients at a dose of 10 international units twice daily for a period of 6 months, the results were as follows: No significant side effects were recorded.
- In the study by Finamor et al… conducted in Hungary in 2013 and included 9 patients at a dose of 35 thousand international units per day for a period of 6 months, the results were as follows: All patients achieved a moderate to excellent rate of improvement without significant side effects.
- In the study by Disphanurat et al …, conducted in Thailand in 2019 and included 45 patients at a dose of 20,000 international units every two weeks for a period of 6 months, the results were as follows: The PASI improved moderately after 3 and 6 months with a relationship between high vitamin D and low PTH, and no significant side effects were recorded.

## CONCLUSIONS

- There was no difference in the tests during the treatment period except for PTH.
- Increase in vitamin D levels during treatment has an inverse relationship with PTH.

### Recommendations

- Vitamin D is considered a good treatment option for psoriasis patients in terms of associated laboratory effects, as the dose and duration studied in this

research did not record significant side effects at the level of analyses.

- Studying the laboratory effects associated with giving oral vitamin D to psoriasis patients depending on the dose of the vitamin taken or the duration of treatment.

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