

ASSESSMENT OF SERUM VITAMIN D LEVELS IN VITILIGO PATIENTS BEFORE  
AND AFTER NB-UVB (NARROWBAND UV-B) THERAPY<sup>1</sup>\*Jalal Sameer Jalal Chalabee, <sup>2</sup>Jamal Khaddam and <sup>3</sup>Faisal Redwan<sup>1</sup>Department of Dermatology, Tishreen University, Faculty of Medicine, Lattakia, Syria.<sup>2</sup>Department of Dermatology, Tishreen University, Faculty of Medicine, Lattakia, Syria.<sup>3</sup>Department of Laboratory Medicine, Tishreen University, Faculty of Medicine, Lattakia, Syria.

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## ABSTRACT

**Background:** Ultraviolet B(UVB) phototherapy is considered an effective treatment for vitiligo, in which beneficial effects could be partly due to the effects on levels of vitamin D3. **Aim:** The purpose of this study was to evaluate the effect of narrowband UVB(NB-UVB) on the level of vitamin D3 in vitiligo patients, as well as the association of this change with severity of disease and demographic characteristics of the patients. **Materials and Methods:** This was an observational analytic study (prospective) involved 40 patients with a diagnosis of vitiligo referred to clinic of dermatology, Tishreen University Hospital, Lattakia, during one-year period (2023-2024) who underwent treatment. **Results:** Out of 40 patients, 15(37.5%) were male and 25(62.5%) were female, with mean age of the patients was  $35.25 \pm 12.2$  years. The type of vitiligo was localized in 85%, with presence of family history in 62.5%, and the duration of disease was in the range from 1 to 3 years in 62.5%. Serum levels of vitamin D3 increased significantly after treatment ( $37.67 \pm 8.3$  versus  $23.43 \pm 7.5$  before treatment,  $p:0.0001$ ), with decreasing of vitiligo area severity index (VASI);  $2.85 \pm 1.8$  versus  $5.92 \pm 2.5$  before treatment,  $p:0.0001$ . Improvement was very good in 67.5%, with significant correlation between the grade of improvement and the following variables: age and duration of disease, in which excellent-very good grades were higher in young ages( $p:0.04$ ) and with duration of disease less than one year. **Conclusion:** The current study showed that phototherapy might be an effective treatment for re-pigmentation in patients with vitiligo, via its effects on vitamin D and calibration its level could be a tool to determine patients who are more responsive to treatment.

**KEYWORDS:** Narrowband UVB(NB-UVB), phototherapy, Syria, vitiligo, vitamin D3.

## INTRODUCTION

Vitiligo is defined as a chronic, acquired disorder characterized by loss of functional epidermal melanocytes which leads to circumscribed depigmented macules and patches surrounded by normal skin.<sup>[1,2,3,4,5]</sup> It may develop anywhere on the body, but it localizes frequently on the face(especially around eyes and mouth), nipples, dorsal aspect of the hands and anogenital regions.<sup>[6,7,8]</sup> Vitiligo affects both sexes equally and it may appear at any time from birth to senescence (peak incidence:10 to 30 years) with presence of family history in 25% of the patients.<sup>[9,10]</sup> The pathogenesis of melanocytes destruction in vitiligo is unclear, but it thought to be multifactorial including; genetic, autoimmune, neural, biochemical, viral, and decreasing levels of vitamin D.<sup>[11,12,13,14]</sup>

Narrowband UVB(NB-UVB) has become the- first line treatment for children older than 6 years and adults with generalized vitiligo, especially in the cases with involvement more than 15% of body surface

area(BSA).<sup>[15,16]</sup> Phototherapy is recommended at a dose of  $200\text{mJ}/\text{cm}^2$ , which is increased by 10-20% at each subsequent treatment until occurrence asymptomatic, mild erythema and maximum dose  $1500\text{mJ}/\text{cm}^2$  for face and  $3000\text{mJ}/\text{cm}^2$  for the body.<sup>[17,18]</sup> Irradiation human skin by UVB rays in the range 290-315 nm leads to production of pre-vitamin D3 from 7-dehydrocholesterol, which undergoes enzymatic hydroxylation in the liver (calcidiol) and in the kidney by 1-alpha hydroxylase(calcitriol) which represent the active form of vitamin-D.<sup>[19,20]</sup>

Vitamin D acts on epidermal and melanocytes via many mechanisms: increasing activity of tyrosinase enzyme and melanogenesis, stimulation differentiation of immature melanocyte in the bulge of hair follicle to produce melanin, and by regulation of T-cells activation which reduces autoimmune damage to melanocytes.<sup>[21,22]</sup> We conducted the current study due to the high frequency of vitiligo and supposed role of vitamin D in the pathophysiology of vitiligo as well as the effects of

NB-UVB on its levels. Therefore, the aims of current study were: 1- to evaluate changes in the levels of vitamin D after NB-UVB therapy. 2- to study the alterations in VASI after treatment. 3- to detect the association between the degree of improvement and the following variables; age, sex, duration of disease, family history of vitiligo and Fitzpatrick classification.

## PATIENTS AND METHODS

### Study population

This was an analytic study of a group of patients with vitiligo attending department of dermatology at Lattakia University Hospital in Syria during one-year period (2023-2024). The inclusion criteria were: patients of all ages and from various types of vitiligo who underwent NB-UVB therapy. The exclusion criteria were presence one of the following: a history of photosensitivity, renal or liver failure, pregnant women, breast-feeding mothers who received oral contraceptives, vitamin D antagonist therapy during the last month, or receiving drugs that effect on the levels of vitamin D such as; barbiturates, corticosteroids and drugs that contain vitamin D. History and physical examination were performed for all patients as well as detecting the affected BSA before and after therapy using VASI which is defined as one of the first quantitative scale used to measure the response of vitiligo patients by one hand unit. Venous blood samples (5 ml) were taken for vitamin D3 calibration and patients were classified as follows; normal (30-150 ng/mL), insufficiency (20-30 ng/mL) and deficiency (<20 ng/mL).

### Ethical consideration

After discussing the study with the patients, all of them gave a complete and clear informed consent to participate in the study. This study was performed in accordance with the Declaration of Helsinki and approval for the study was obtained from the institutional ethics committee.

### Statistical Analysis

Statistical analysis was performed by using IBM SPSS version 25. categorical variables were reported as numbers and percentages and continuous variable were presented as mean  $\pm$  standard deviation (SD). Chi-square test was used to examine the comparisons between the two groups. Paired T-test was used to compare two samples that are correlated. All the tests were considered significant at a 5% type I error rate ( $p < 0.05$ ),  $\beta$ : 20%, and power of the study: 80%.

## RESULTS

The study included a group of 40 patients with a diagnosis of vitiligo who fulfilled the criteria of the study. Age ranged from 10 to 55 years, with mean age of  $35.25 \pm 12.2$  years. The most frequent age group was 20 to 40 years (55%), followed by >40 years (32.5%), and <20 years (12.5%). Female represented 62.5% of the study sample and males were 37.5 % with sex ratio (Female: male) 1.66:1. According to Fitzpatrick skin

type scale, patients were classified to: II:20%, III:65%, IV:15%.

**Table 1: Demographic characteristics of the study population.**

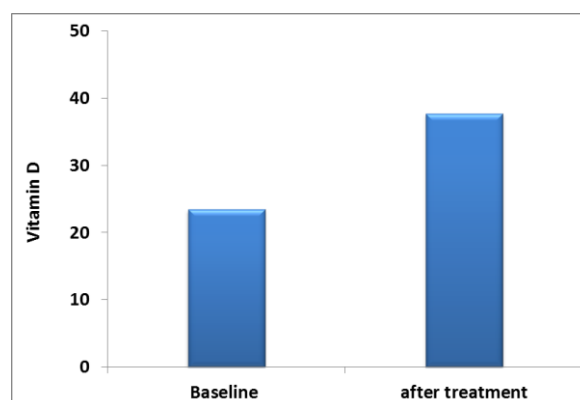
Variable	Result
<b>Age(years)</b>	$35.25 \pm 12.2$
<b>Age group(n,%)</b>	
<20	5(12.5%)
20-40	22(55%)
>40	13(32.5%)
<b>Sex,(n,%)</b>	
Male	15(37.5%)
Female	25(62.5%)
<b>Fitzpatrick skin phototype</b>	
II	8(20%)
III	26(65%)
IV	6(15%)

As shown in table (2) localized form of vitiligo represented the most frequent type of disease in 34 cases (85%) with presence of family history in 25 cases (62.5%). Patients were divided into three groups according to the duration of vitiligo; <1 year in 13 cases (32.5%), 1 to 3 years in 25 cases (62.5%), and >3 years in 2 cases (5%).

**Table 2: Characteristics of vitiligo.**

Variable	Result
<b>Type of vitiligo</b>	
Localized	34(85%)
Generalized	6(15%)
<b>Family history of vitiligo</b>	
Present	25(62.5%)
Absent	15(37.5%)
<b>Duration of disease(years)</b>	
<1	13(32.5%)
1-3	25(62.5%)
>3	2(5%)

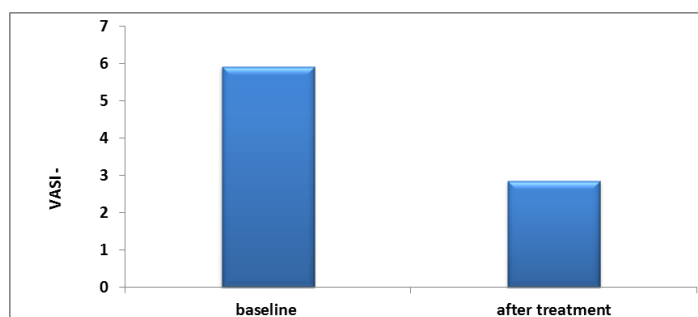
Levels of vitamin D increased significantly after treatment with NB-UVB;  $37.67 \pm 8.3$  versus  $23.43 \pm 7.5$  before treatment,  $p: 0.0001$ , with an increase in vitamin D approximately 60.7%.



**Figure1: Alterations in levels of vitamin D after NB-UVB treatment.**

As shown in figure2 , VASI decreased significantly after treatment;  $5.92 \pm 2.5$  versus  $2.85 \pm 1.8$  before treatment,

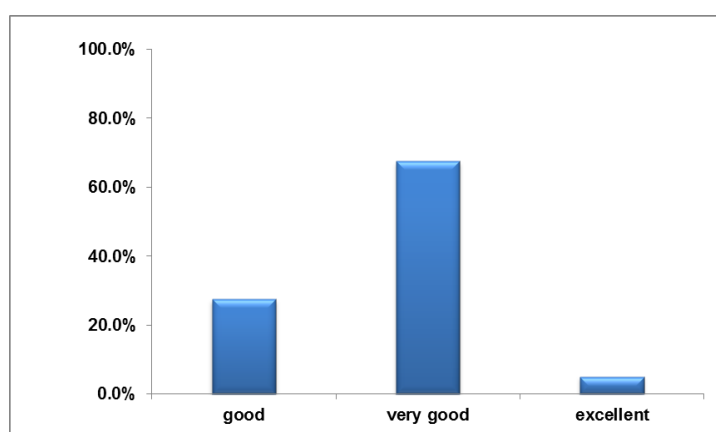
$p:0.0001$ , with decrease rate of VASI 51.85%.



**Figure 2: Alterations in VASI score after NB-UVB treatment.**

Patients were classified according to the grade of improvement as follows; good in 11 cases (27.5%), very

good in 27 cases (67.5%), and excellent improvement in 2 cases (5%).



**Figure 2: Classification of patients according to the grade of improvement.**

**Table 3: Effects of NB-UVB treatment on clinical and laboratory parameters of the study population.**

Variable	Result
<b>Vitamin D3</b>	
Baseline	23.43±7.5
After treatment	37.67±8.3
p-value	0.0001
<b>VASI score</b>	
Baseline	5.92±2.5
After treatment	2.85±1.8
p-value	0.0001
<b>Grade of improvement</b>	
Good	11(27.5%)
Very good	27(67.5%)
Excellent	2(5%)

As shown below in Table (4), no significant associations were found between final outcome and the following variables; sex, presence of family history, type of vitiligo, and Fitzpatrick skin phototype ( $p>0.05$ ). There were significant correlation between improvement and age of patients( $p:0.04$ ) in which improvement was good in 80% and excellent in 20% of the patients younger than 20 years. In addition to, there were significant association between duration of disease and improvement after NB-UVB therapy in which improvement was very good to excellent in 84.6% of the cases with duration of disease less than one year.

**Table 4: Comparison clinical improvement of the study population according to the characteristics of patients.**

Variable	Type of procedure			P value
	Good	Very good	Excellent	
<b>Gender</b>				
Male	3(20%)	11(73.3%)	1(6.7%)	0.6
Female	8(32%)	16(64%)	1(4%)	
<b>Age groups(years)</b>				
<20	0(0%)	4(80%)	1(20%)	0.04
20-40	3(13.6%)	18(81.8%)	1(4.6%)	
>40	8(61.5%)	5(38.5%)	0(0%)	

<b>Family history</b>				
Present	8(32%)	16(64%)	1(4%)	0.06
Absent	3(20%)	11(73.3%)	1(6.7%)	
<b>Type of vitiligo</b>				
Localized	9(26.5%)	23(67.6%)	2(5.9%)	0.08
Generalized	2(33.3%)	4(66.7%)	0(0%)	
<b>Fitzpatrick skin phototype</b>				
II	2(25%)	5(62.5%)	1(12.5%)	0.07
III	9(34.6%)	16(61.5%)	1(3.8%)	
IV	0(0%)	6(100%)	0(0%)	
<b>Duration of disease(years)</b>				
<1	2(15.4%)	9(69.2%)	2(15.4%)	0.001
1-3	8(32%)	17(68%)	0(0%)	
>3	1(50%)	1(50%)	0(0%)	

## DISCUSSION

Although various treatment modalities have been used to manage vitiligo, it still remains a difficult disease and NB-UVB is considered an emerging, effective and safe therapy via many effects.

The current study of 40 patients with vitiligo who underwent NB-UVB therapy showed the main findings: first, patients were from different age groups with mean age  $35.3 \pm 12.2$  years and females constituted approximately two-third of patients due to an increase in reporting of cosmetic concerns by female patients. Second, Fitzpatrick skin type III detected in approximately two third of patients and the type of vitiligo was localized in majority of cases. Third, family history of vitiligo was present in 62.5% of the patients and duration of disease ranged from 1 to 3 years in 62.5%. Fourth, NB-UVB therapy led to significant increase in vitamin D levels and decrease in VASI ( $P < 0.05$ ) and the improvement was very good in approximately two-third of patients. In addition to, there were negative correlations between improvement and the following variables: age of the patients and duration of disease, in which improvement was observed more frequently in younger patients and duration of disease less than one year. Finally, there were no significant correlations between gender, type of vitiligo, Fitzpatrick skin type and the grade of improvement,  $p > 0.05$ . Previous results around the association between NB-UVB therapy and an increase in vitamin D levels with its effects on repigmentation might be explained by the following; NB-UVB therapy (311-313 nm) leads to an increase in skin synthesis of vitamin D with elevated levels of 25(OH), as well as alterations in binding proteins such as albumin via decreasing the concentration or changes in affinity to 25(OH) leading to high levels of free 25(OH) and biological vitamin D.

Vitamin D suppresses activation of T lymphocytes and releasing of inflammatory cytokines with protection melanocyte of autoimmune attack via suppression some of innate and adaptive immune cells directly and indirectly. In addition to, vitamin D promotes differentiation and proliferation of melanocytes, in which production of new melanocytes exceeds senescent cells

death and an improved effect of repigmentation. The results of current study are consistent with the previous studies.

Manu et al(2014) demonstrated in a study conducted 30 patients with vitiligo who treated by NB-UVB presence of significant increase in vitamin D3 levels and decrease in VASI after therapy( $P:0.001$ ).<sup>[23]</sup>

Yalda et al(2018) showed in a study included 38 patients with generalized vitiligo who treated by NB-UVB significant increase in vitamin D3 and decrease in VASI, $p:0.001$ .<sup>[24]</sup>

Khodair et al(2019) demonstrated in a study included 30 patients with vitiligo and 30 healthy individuals that levels of vitamin D3 increased significantly after NB-UVB therapy with significant decrease in VASI in generalized and localized forms of disease.<sup>[25]</sup>

## CONCLUSION

The current study revealed that phototherapy is an effective treatment which induces repigmentation in vitiligo patients especially in younger and with shorter duration of disease due to an increase in vitamin D3 levels, and calibration its levels might be a useful tool to determine patients who benefit from therapy.

## COMPETING OF INTERESTS

All the authors do not have any possible conflicts of interest.

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Not applicable.

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