

To determine the mean change in serum vitamin D levels in vitiligo patients undergoing NBUVB phototherapy

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Abstract

Background Vitiligo is a common, acquired, often heritable, multifactorial pigmentary disorder with a complex pathogenesis. Vitamin D is a fat soluble essential hormone synthesized in the skin on exposure to ultraviolet B present in the sunlight. It plays its role in calcium homeostasis as well as in immunoregulation. Low levels of vitamin D have been observed in vitiligo patients, who seem to improve with NBUVB treatment.

Objective To determine the mean change in serum vitamin D levels in patients of vitiligo after narrow band ultraviolet B therapy.

Study design Quasi experimental.

Settings Dermatology Department, Pakistan Air Force Hospital, E9, Islamabad.

Duration of study Study was carried out over a period of six months from 10-05-2017 to 09-11-2017.

Subjects and Methods A total of 30 patients were included in this study. Serum vitamin D level was analyzed at baseline in all the patients who planned to undergo Narrow Band Ultraviolet B phototherapy for vitiligo. The phototherapy was given for 8 weeks and vitamin D levels were measured again.

Results Mean age of the patients was 32.77 ± 10.68 years. There were 18 males (60%) and 12 females (40%). Pre-treatment serum vitamin D levels were 25.97 ± 16.10 nmol/l while post-treatment serum vitamin D levels were 39.07 ± 15.67 nmol/l ($p < 0.001$).

Conclusion In conclusion, low vitamin D levels in vitiligo patients were improved after narrow band ultraviolet B phototherapy, which may contribute to its therapeutic efficacy.

Key words

Vitiligo, Serum vitamin D levels, Narrowband Ultraviolet B phototherapy.

Introduction

Vitiligo is an acquired, chronic, depigmentation disorder characterized by loss of functional

melanocytes.¹ It occurs worldwide with prevalence of 1-2%, without any sex, racial or regional predilection.² Age of onset of vitiligo in Pakistan ranges from 5.5 months to 82 years while male to female ratio is 1.17:1.³ Its pathogenesis include genetic, autoimmune and neurological factors.⁴ It leads to considerable psychological morbidity.⁵ Its severity may increase with time, corresponding to loss of

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functioning epidermal and, sometimes, hair follicle melanocytes.⁶

Many different treatment modalities are used for the treatment of vitiligo including topical and systemic steroids, topical tacrolimus, 308-nm excimer laser etc.^{7,8} Light therapy, especially narrow band ultraviolet B light (NBUVB) has been found to be very effective in treating vitiligo.⁹ Ultraviolet B light (UVB) is the main wavelength in sunlight which is responsible for induction of vitamin D synthesis in skin.¹⁰ Vitamin D plays its role in regulating calcium and bone metabolism, controlling cell proliferation and differentiation, immunoregulation, inducing melanogenesis etc.¹¹ Low levels of vitamin D have been observed in vitiligo patients.¹² Vitamin D analogues (calcipotriol and tacalcitol) are also used in treatment of vitiligo. They target the local immune response and influence melanocyte maturation and differentiation, up-regulating melanogenesis.¹³

Sara et al. in 2016 found that mean Vitamin D levels increased after 12 weeks of NBUVB phototherapy in vitiligo patients (62.93 ± 14.1 nmol/l pretreatment; 80.11 ± 15.81 nmol/l post treatment; $p < 0.001$). The result of this clinical study is promising.¹⁴ There is no local data present on this topic to the best of my knowledge. So the purpose of this study is to repeat this clinical study in local population so that mean change of vitamin D level in vitiligo patients undergoing NBUVB phototherapy among local population could be determined.

Methods

This quasi experimental study was done in Dermatology Department, Pakistan Air Force Hospital, E9, Islamabad from 10-05-2017 to 09-11-2017. The inclusion criteria included patients of both sex from 12-50 years of age suffering

from vitiligo. Vitiligo was diagnosed by presence of at least one depigmented patch (≥ 1 cm in any dimension) for ≥ 6 weeks on any part of the body, confirmed by Woods lamp examination. Exclusion criteria included pregnant females, patients with photosensitivity disorders and patients who underwent phototherapy or vitamin D supplementation in last 12 weeks.

After approval from ethical review committee of Fazaia Medical College, 30 patients of vitiligo were included in the study (non-probability, consecutive sampling). Written informed consent was taken from every patient. Detailed history and examination was done and recorded in the performa along with demographic details of the patient.

Serum vitamin D levels were analyzed at baseline in all the patients by sending 5ml blood from each patient to laboratory. These samples were analyzed at Armed Forces Institute of Pathology (AFIP) laboratory, Rawalpindi on Siemens healthcare advia centaur machine.

The patients were then scheduled for phototherapy sessions by NBUVB machine/cabinet (Dermasense HOUVA, USA) with a spectrum from 310 to 315 nm and a maximum wavelength of 311 nm at a starting dose of 100 mJ/cm^2 with increment of 15 mJ/cm^2 for 8 weeks (three sessions in one week, i.e. Monday, Wednesday, Friday). During treatment all patients were regularly evaluated for erythema, response to treatment and any side effects. Follow-ups were ensured through their contact numbers. All the data was noted and recorded in the attached performa. Second sample of serum Vitamin D was taken within 48 hours after completion of 8 weeks of NBUVB treatment.

All the collected data was entered and analyzed into SPSS version 21. Numerical variables, i.e.

age and pre and post treatment serum vitamin D levels were presented by mean±SD. Paired-sample t-test was applied for pre and post serum vitamin D levels. P value ≤0.05 was considered significant.

Results

A total of 30 vitiligo patients were included in this study during the study period of six months from 10-05-2017 to 09-11-2017. All patients completed the study. There were minor side effects as mild erythema, which settled within few days. All patients responded to treatment.

Mean age of the patients enrolled in study was 32.77±10.68 years. 36% patients were less than 30 years while 63% were above 30 years. There were 18 males (60%) and 12 females (40%). Male to female ratio was 3:2.

Mean serum vitamin D levels at baseline were 25.97±16.10 nmol/l while mean serum vitamin D levels 8 weeks post-treatment were 39.07±15.67 nmol/l (p<0.001) (**Table 1**).

Discussion

Our study showed a statistically significant increase in mean serum vitamin D levels in vitiligo patients receiving NBUBV therapy. In past, few studies have been done to evaluate baseline serum vitamin D levels in vitiligo patients. Saleh et al. found statistically significant lower serum vitamin D levels in 40 patients relative to 40 controls.

Table 1 Mean change in serum vitamin D levels in patients who underwent NBUBV phototherapy

Serum vitamin D levels (nmol/mL)	Mean	Standard deviation
Serum vitamin D levels pre-treatment	25.97	16.10
Serum vitamin D levels post-treatment	39.07	15.67
t value	-4.84	
P value	P<0.001	

In our study, baseline vitamin D was lower than the normally accepted level of 30nmol/ml in general population which also supports Saleh's findings. They also speculated on the possibility of vitamin D supplementation for the treatment of vitiligo patients in the future.¹⁵

In addition, in a study published in British Journal of Dermatology in 2010, Vitamin D was measured at baseline and also after completion of NBUBV therapy. They found an increase in Vitamin D in patients who got better after treatment.¹⁶ These findings are in accordance to our study where we found raised post NBUBV Vitamin D levels. Another study by Sehwat et al. confirmed that vitamin D levels increased with increase in duration of phototherapy.¹⁷

In a recent study, it was found that vitamin D receptor (VDR) expression and vitamin D levels were significantly higher in controls compared to vitiligo patients. After NBUBV therapy, there was a significant rise in both VDR expression and serum vitamin D. VDR expression was found to be significantly higher in repigmented skin compared to nonresponding lesions. Better repigmentation response to NBUBV may be associated with higher baseline VDR expression and its upregulation after phototherapy.¹⁸

It is important to note here that sunlight (including NBUBV) induces synthesis of Vitamin D in healthy subjects which may lead to increased levels of vitamin D. So, it should be studied that whether raised level of vitamin D possess some therapeutic efficacy in vitiligo or not. Large case control studies should be done to ascertain role of vitamin D. It is known that topical vitamin D analogues such as calcipotriol are extensively being used for treatment of vitiligo. They have two different effects on vitiligo in terms of immune function and melanocytes. Vitamin D ligands are designed to target the local immune response in vitiligo,

acting specifically on T cell activation and by inhibiting the expression of several pro-inflammatory cytokines genes, such as those encoding tumor necrosis factor-alpha (TNF- α) and interferon gamma (IFN- γ). Vitamin D3 compounds are known to influence melanocyte maturation and differentiation and also to up-regulate melanogenesis through pathways activated by specific ligand receptors.¹⁹ So, vitamin D compounds can halt disease progression in vitiligo by immunosuppression and possibly induce repigmentation by activating melanocyte precursors and the promotion of melanogenic pathways.²⁰

In a recent study published in October 2018, Ibrahim et al. measured influence of cumulative doses of NBUVB on vitamin D in 80 patients with vitiligo and their correlation with NBUVB induced pigmentation. They found mean baseline level of vitamin D significantly lower in vitiligo patients than the control group. Levels of vitamin D after 12 and 24 weeks of twice weekly NBUVB therapy showed significant reduction in Vitiligo Area Severity Index (VASI) score after 24 weeks of therapy.²¹ These findings also support our findings but didn't check effect of cumulative UVB as it is a first of its kind in our local population. Further studies should be done in this regard. We also need to find out its role in prognosis and in monitoring response to treatment. We need case control studies as well as studies to find cumulative effect of UVB. In addition, UVB may be used as a treatment for vitamin D deficiency.

Conclusion

In conclusion, baseline vitamin D level was lower in vitiligo patients and NBUVB improved vitamin D levels in vitiligo patients, which may contribute to its therapeutic efficacy.

More local studies are needed in order to confirm these results and to establish NBUVB as treatment modality to correct vitamin D levels.

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