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Original Research Article

Effect of Vitamin D Supplementation on Calcium Homeostasis in Psoriasis

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ABSTRACT

Vitamin D is traditionally known to play the biological function of maintaining normal blood levels of calcium and phosphorus in our body and thereby is necessary for mineral homeostasis and proper formation of bone. Recently a role of Vit D in the pathogenesis of different skin diseases, including psoriasis, has been reported. The present study was planned to evaluate the therapeutic usefulness of oral vitamin D supplementation in psoriasisand its effect on various biochemical parameters related to calcium homeostasis and kidney functions in patients of psoriasis. The results show that vit D (cholecalciferol), has a beneficial role on psoriatic lesions with improvement in PASI scoring when compared to patients on topical treatment and that a daily low dose of vit D, does not significantly affect the calcium metabolism, renal function or hepatic function, and hence may prove to be an efficacious treatment for psoriasis.

Key words: Vitamin D (vit D), Psoriasis Area Severity Index (PASI), Albumin Corrected Calcium (ACC)

INTRODUCTION

Vitamin D, the sunshine vitamin, is traditionally known to play the biological function of maintaining normal blood levels of calcium and phosphorus in our body and thereby is necessary for mineral homeostasis and proper formation of bone. Hence, vit D deficiency is linked to bone diseases (rickets and osteomalacia) and various other disorders of calcium and phosphorus metabolism. [1-2]

Increasingly though, studies are indicating that vit D has a protective role in various other diseases like cancer, autoimmune diseases, diabetes, respiratory infections, cardiac failure etc. Newer target tissues of Vit D have been discovered. Nuclear vit D-receptor (VDR) has been found to be ubiquitously distributed amongst tissues like stomach, gonads, brain, skeletal muscle, cardiac muscle, pancreas, immune cells, dermal fibroblasts, keratinocytes and various cancer cells. The wide distribution of VDR in numerous organ system suggests diverse biologic activities of vitamin D which have been described as non-classical actions of vit D. [3-4]

There is growing evidence that Vit D acts as a key modulator of immune and inflammatory mechanisms. [5] A low Vit D status is associated with increased risk of developing Th 1 mediated autoimmune diseases. Recently a role of Vit D in the pathogenesis of different skin diseases, including psoriasis, has been reported. [6-8]

Psoriasis is a chronic immune-mediated inflammatory skin disease characterised by hyper-proliferation of epidermal keratinocytes associated with inflammatory cellular infiltrate in both dermis and epidermis. It is mediated by Th1, Th17, Th22 cell and involves the innate and acquired immunity. [9-10]

Epidermal and dermal cells possess receptors with a high affinity for vit D and it inhibits the proliferation of keratinocytes, inducing them to differentiate terminally and modulating the proliferation of T-lymphocytes. [11-12] In vitro studies have shown that a low vit D concentration promotes keratinocytes proliferation while a high concentration has an inhibitory effect. [13-14] Apart from these, vit D, through its role in regulation of intracellular calcium level, also regulates the synthesis of glycosylceramides needed for the barrier integrity and permeability in the stratum corneum. [8,15]

Although the exact role of Vit D in the pathogenesis of psoriasis is still unclear, based on the above findings, Vit D and its analogues have been used in the treatment of Psoriasis. But till date, the effectiveness of Vit D supplementation as an adjunctive treatment in psoriasis remains controversial. [9-10]

Since the major physiological action of Vit D is to enhance the efficiency of the intestine to absorb dietary calcium, there remains concern that oral vit D supplementations can be of limited value for treating psoriasis because of its potent calcemic effect. [16-17]

Hence, the present study was planned to evaluate the therapeutic usefulness of oral vitamin D supplementation in psoriasisand its effect on various biochemical parameters related to calcium homeostasis and kidney functions in patients of psoriasis.

MATERIALS AND METHODS

The study was conducted in a tertiary care hospital of India. Proper written consent of the patients was taken before taking their samples.

60 psoriatic patients attending the Dermatology clinic, who had at least 10-15% involvement of their body surface area with psoriatic skin lesions, were selected for the study. The diagnosis was made clinically on the basis of detailed history and clinical appearance of skin lesions characterized by erythematous plaques of various sizes, with silvery white scales. The extent and severity of psoriatic lesions were assessed by PASI scoringon their first visit and then again after 3 months of treatment. [18]

The patients were divided into two groups - Group I (Study Group) consisted of 30 patients of psoriasis were given oral vit D {cholecalciferol} supplementation (0.5µgm/day) for three months along with routine treatment consisting of emollients and topical steroids with 3% salicylic acid ointment. The other 30 patients were given routine treatment as described above and were included in Group II (Control Group).Patients on methotrexate and psoralens with UV-A light (PUVA) therapy, hepatic impairment, renal impairment, idiopathic hypercalciuria, pregnant women and lactating mothers were excluded.

Blood and urine samples were collected from each patient twice, at the time of registration as well as after 3 months of treatment. To assess calcium homeostasis and associated renal and hepatic functions, the following biochemical parameters were estimated in their samples - serum calcium, serum phosphorus, serum creatinine,blood urea, serum albumin, serum SGOT and SGPT, 24 hours' urinary calcium and phosphorus and urinary creatinine.

Statistical Analysis

Data obtained were analysed as per standard statistical methods. Mean, standard deviation and standard error of mean (SEM) for all parameters were calculated. Statistical difference between two groups was found out using student's t-test.

RESULTS

It was observed that in the study group, mean PASI scoring (Table 1) decreased from 19.69±0.95 to 12.02±0.88. The decrease in PASI scoring in study group was highly significant (P <0.001) as compared to control subjects (P <0.05).

Table 1: Comparison of PASI Scoring in both the groups before and after treatment

	0 Month(Mean±S.E)	3 Months(Mean±S.E)	p value
Control Group(N=30)	19.78±0.92	18.94±0.93	p<0.05
Study Group(N=30)	19.69±0.95	12.02±0.88	p<0.001

Table 2: Comparison of the biochemical parameters in both the groups before and after treatment

Parameter	Control Group (N=30)			Study Group (N=30)		
	0 Month (Mean±S.E)	3 Months (Mean±S.E)	p value	0 Month (Mean±S.E)	3 Months (Mean±S.E)	p value
Serum Ca mg/dl	8.7±0.08	8.9±0.07	NS	8.8±0.12	9.6±0.07	p<0.001
Serum Albumin g/dl	3.91±0.06	3.95±0.24	NS	4.25±0.07	4.23±0.06	NS
Albumin corrected Ca	4.87±0.09	4.95±0.09	NS	4.80±0.13	5.60±0.09	p<0.001
Serum P mg/dl	3.35±0.09	3.50±0.72	NS	3.39±0.14	3.22±0.07	p<0.05
Ca x P	29.40±0.83	29.48±0.73	NS	30.61±1.14	31.32±0.79	NS
Urinary Ca mg/day	163.76±7.21	162.0±5.96	NS	153.586±7.24	235.08±5.41	p <0.001
Urinary Creatinine	1301.56±36.09	1332.7±37.39	NS	1339.80±29.45	1339.80±29.45	NS
24 hrs Urine Ca/Cr ratio	0.1267±0.005	0.1245±0.005	NS	0.1146±0.006	0.1849±0.004	p<0.001
Creatinine clearance	103.41±2.20	103.616±1.69	NS	108.091±1.76	100.99±1.62	p<0.05

* NS - Not significant

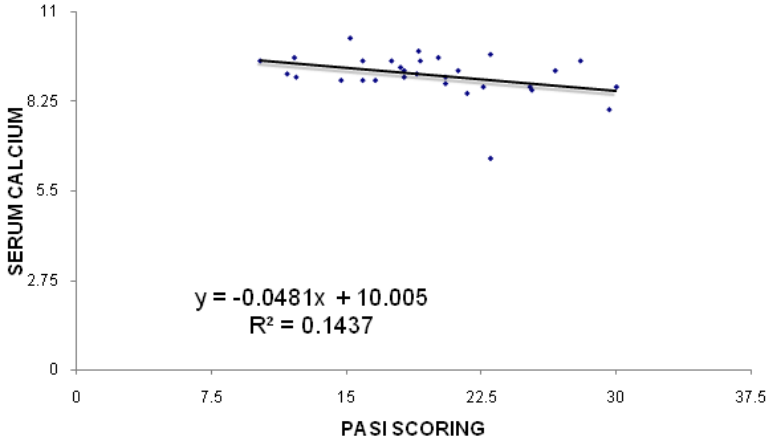

Figure1: Correlation between PASI scoring vs Serum Calcium at 0 month

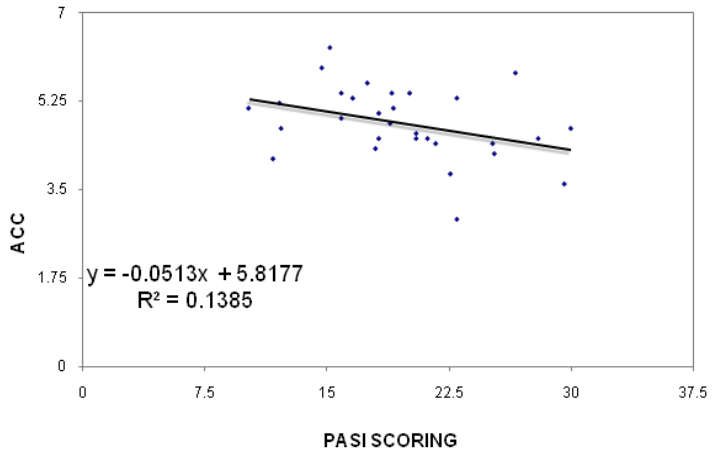

Figure2: Correlation between PASI scoring vs Albumin Corrected Calcium at 0 months

DISCUSSION

Psoriasis remains the scourge for at least 70 million people worldwide. Most therapies that have been designed to in some way alter the proliferative activity of epidermal cells. None of the currently available treatment for psoriasis is satisfactory as they are either time consuming, expensive, only temporarily effective or even potentially carcinogenic. [19]

In our study, psoriatic patients who were on management with oral vit D and topical treatment (emollient and topical steroid with 3% salicylic acid) have significantly low PASI scoring ($p<0.001$) as compared to control subjects who were only on topical therapy (Table 1). Although there was improvement in control subjects too ($p<0.05$) but it was not as significant. It is therefore suggested that oral vit D has beneficial response in psoriasis and it can be an effective adjunctive treatment for psoriasis. These findings are in accordance with the similar study carried out by, Finamor, D. *et.al.* and Mayara Lourencetti *et.al.* [20-21]

This improvement in the study group may be due to the role of vit D in decreasing the concentrations of various inflammatory proteins like C-reactive protein, matrix metalloproteinases (MMPs) which are proteolytic enzymes that inflict damage by degrading the extracellular matrix, pro-inflammatory cytokines like IL-1, IL-17and IFN-gamma. [22-23]

AbdElmegeedA *et.al.*in their study had suggested that the severity of psoriasis correlates inversely with vit D levels, but Preethi B Nayak*et.al.* had mentioned that the severity of psoriasis has no correlation with vit D levels. We had not estimated the vit D levels in our study. [24-25]

Table 2 shows that in the study group, after 3 months, there was a significant rise in serum Ca levels ($p<0.001$) and decrease in serum phosphorous levels ($p<0.05$), but it was not outside the normal range. This decrease in phosphorous levels can be due to the fact that calcium phosphorus product always tends to remain constant. The increase in Ca levels in this group was also supported by the albumin corrected calcium levels, which is a calculated parameter, which increased significantly ($p< 0.001$) in the study group. Albumin levels had remained unchanged during the three months of vit D treatment.

It was observed that in the study group, both calcium and albumin corrected calcium levels had a negative correlation with PASI score (Fig. I & II) and the level of calcium increased after 3 months of treatment of vit D along with an increase of PASI score. This can be explained by the fact that vit D increase the extracellular calcium levels, which in turn may increase intracellular free calcium in keratinocytes and there by modifying its mechanism of action.

Various studies had suggested that intracellular calcium plays a role in the differentiation and proliferation of keratinocytes and that hypocalcemia may lead to intensification and extension of psoriatic lesions. [26-28] However, Sunil Chaudhari *et.al*. were of the view that hypocalcemia is a risk factor of psoriasis but its levels have no correlation with the severity of the lesions. [29]

In the study group, there was significant increase ($p<0.001$) in 24 hrs urine Ca/Cr ratio. This can be explained by the fact that as serum calcium level increases, calcium excretion also increases because the raised calcium level cause a decrease in PTH (Parathyroid hormone) and this decreased PTH will inhibit the reabsorption of filtered calcium from renal tubule. The mean of this ratio after three months of treatment was 0.184±0.004 and it is believed that as long as the urine calcium / creatinine ratio is less than 0.20 and serum calcium <10.4 mg/dl, there is minimal risk of nephrolithiasis. [30] These findings corroborates with the findings of Perez *et.al.* where in, they also observed a significant increase in urinary calcium and calcium creatinine ratio. [31]

There was no significant change in blood urea levels and serum creatinine in both control and study group patients, showing that oral vit D supplementation in cases had no untoward effect on renal function. The creatinine clearance, when compared in study group during the three months of protocol, was significantly decreased ($p<0.05$). This decrease in creatinine clearance is probably due to altered metabolism of creatinine caused by vit D and is not due to renal tubular damage or function. [31] The levels of SGOT and SGPT too showed no alteration in study group ($P>0.05$). Thus it can be easily inferred that vit D has a beneficial effect on psoriatic skin lesions without causing any renal or hepatic abnormality.

In our study we had not estimated the serum levels of vit D, which could have given a still better insight into its relationship with psoriasis.

CONCLUSION

Therefore, the present study shows that vit D (cholecalciferol), has a beneficial role on psoriatic lesions with improvement in PASI scoring when compared to patients on topical treatment and that a daily low dose of vit D, does not significantly affect the calcium metabolism, renal function or hepatic function, and hence may prove to be an efficacious treatment for psoriasis.

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