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Original Research Article

Association of vitamin D3 with psoriasis and psoriatic arthritis-an observational study

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ABSTRACT

Background: The objective of this study is to investigate the association between 25 (OH) vit D3 level and psoriasis, in our city with long sunny weather, in an attempt to clarify the controversies.
Methods: The 100 patients with psoriasis including 29 with psoriatic arthritis were taken randomly as cases from medicine outpatient department of KPCMCH. Psoriasis area and severity index (PASI) was calculated for all patients with psoriasis and disease activity score (DAS28-CRP) in all arthritis patients. The control group had 150 age and sex-matched participants without any symptoms related to psoriasis or psoriatic arthritis. The 25 (OH) vit D3 serum level was estimated for both groups. This is an observational, cross-sectional study.
Results: Out of total 100 patients, 55% were male and 45% female, with mean age and disease duration 49.7±6.7 years and 11.4±3.5 years, respectively. The control group had 150 subjects (86 males, 64 females). The 25 (OH) vit D3 levels of both patients and controls were 19.2±8.5 ng/ml and 29.9±6.7 ng/ml, respectively and the difference was statistically significant ($p<0.05$). The 25(OH) vit D3 levels were 21.9±4.1 ng/ml in patients with disease duration <10 years, and 15.9±4.2 ng/ml in patients with disease duration ≥ 10 years and difference was statistically significant ($p<0.05$). It was 18.9±7.8 ng/ml and 20.1±8.4 ng/ml respectively in psoriasis patients with and without arthritis but the difference was statistically not significant ($p>0.05$). The 25(OH) vit D3 level was lower in psoriasis with high PASI compared to psoriasis with low-moderate PASI and lower in psoriatic arthritis with high disease activity compared to arthritis with low-moderate disease activity.
Conclusions: Both psoriasis and psoriatic arthritis patients had lower 25 (OH) vit D3 levels. The disease durations were directly related to 25 (OH) vit D3 insufficiency. Lower levels were associated with higher active diseases.

Keywords: 25 (OH) vit D3, Psoriasis, Psoriatic arthritis, Psoriatic area, Disease severity index, DAS28 score

INTRODUCTION

Psoriasis is a chronic immune-mediated inflammatory skin condition that affects 2-3% of the general population. Although inflammatory processes can sometimes occur in other organs, the skin is where psoriasis most frequently expresses itself.[1] In fact, psoriasis is now recognised as a systemic pathology that includes a variety of problems, such as psoriatic arthritis, obesity, and metabolic disorders, all of which enhance a patient's risk of cardiovascular disease.[2,3] The 50-79% of patients with skin psoriasis and up to 80% of those with psoriatic arthritis (Psoriatic arthritis) may experience nail problem.[1]

The 30% of people with psoriasis develop psoriatic arthritis, an inflammatory form of arthritis that causes pain and stiffness in the affected joints. Women and men

are equally affected by psoriasis and psoriatic arthritis.[4] Psoriatic arthritis presents in a variety of ways and can affect the peripheral joints as well as the axial bone (spondylitis and/or sacroiliitis). Skin, nails, and entheses are also affected.[4] Psoriasis may have several associated comorbidities such diabetes mellitus, hypertension, and obesity. Low bone mineral density and psoriasis have been linked in some recent study.[5]

The sun's ultraviolet B is the principal source of vitamin D. It is a key regulator of the homeostasis of mineral ions. Its deficiency has been linked to osteomalacia, osteoporosis, and rickets. The biological functions of vitamin D are carried out by its active form, calcitriol, also known as 1,25-dihydroxyvitamin D (1,25(OH) vitamin D). One-third to half of otherwise healthy middle-aged and elderly persons have low levels of 25-hydroxyvitamin D3 [25(OH) vit D3], the main circulating form of vitamin D.

Low levels of 25(OH) vit D3 are mostly caused by impaired synthesis due to insufficient sun exposure or dark skin, as well as insufficient dietary intake.[6] It is well recognised fact that vitamin D has a wide range of physiological effects. Evidence suggests that vitamin D plays a crucial role in modulating the function of dendritic cells and regulating keratinocytes and T-cell proliferation.[7] Serum 25(OH) vit D3 level below 20 ng/mL is an indication of vitamin D deficiency; whereas vitamin D insufficiency is defined as a serum 25(OH) vit D3 level ranging from 20 to 30 ng/mL.[8]

In this study, we investigated that the incidence of 25(OH) vit D3 deficiency is more in psoriasis and psoriatic arthritis patients than in the control population and 25(OH) vit D3 deficiency increases disease severity and leads to a poorer prognosis.

METHODS

A cross-sectional, observational study was carried out in the medicine outpatient department of K.P.C. medical college, Kolkata. A sample of 250 (141 males and 109 females) patients was divided into two subgroups, 100 patients with psoriasis, diagnosed by a physician and confirmed by dermatologist in the outpatient department, including 32 patients with Psoriatic Arthritis, who fulfilled the classification criteria of psoriatic arthritis and 150 (86 males and 64 females), age and sex-matched controls recruited from the general population without any symptoms related to psoriasis or psoriatic arthritis, were enrolled for this study, after proper consent.[2,9] Data collection was done through an interview with the patients using a special questionnaire developed by the researchers.

The questionnaire regarding details on the patient's age, sex, length of illness, and drug usage history. The complete blood count, erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) of all patients were checked. Serum 25(OH) vit D3 levels were assessed in both the groups. The dermatologist evaluated the severity index (PASI) for each patient.[2,10] The PASI is a weighted assessment of the average redness, thickness, and scaliness of the lesions (each rated on a 0-4 scale) (head, upper extremities, trunk, and lower extremities). A rheumatologist evaluated the DAS28 using 28 joint counts and CRP for each patient with psoriatic arthritis. Elderly patients, postmenopausal women, patients with endocrine, metabolic, renal, malabsorption diseases, and patients on systemic steroids were excluded from study.[11]

Ethical consideration

Study was started after approval from institutional ethics committee. Written informed consent was obtained from all participants before their participation in the study.

Statistical analysis

For data analysis, SPSS software version 25.0 was used. Tables containing the data were created using percentages and the mean. Student's t test was used for continuous data and the Chi-square test for categorical data and the study groups were compared. $P<0.05$ was considered statistically significant. Hedges' g and Glass's delta were measured to ensure different groups of our study were statistically comparable.

RESULTS

Table 1 shows baseline characteristics of the patients. From the total sample of 100 patients (including 29 with Psoriatic Arthritis), 55 (55%) patients were male and 45 (45%) were female, with mean age and disease duration were 49.7±6.7 and 11.4±3.5 years, respectively. There were 150 (86 males and 64 females) in control group.

We also calculated Hedges' g and Glass's delta as we had different sample sizes in cases and control groups. Hedges' g represents measure of effect size weighted according to relative sample size and Glass's delta represent appropriate effect size having groups with different standard deviation. In our study, values are 1.432255 and 1.258824 respectively, ensuring statistically that both of our groups have similar effect size and thus statistically comparable.

Table 1: Base-line characteristic of patients.

Characteristics	Cases, (n=100)	Control, (n=150)
Mean age (Years)	49.7±6.7	54.8±7.1
Males: Females	55:45	86:64
Duration of psoriasis	11.4±3.5	--

Figure 1 shows the distribution of psoriasis group of patients who had psoriatic arthritis, 29% of study group had psoriatic arthritis and rest 71% had only skin lesions.

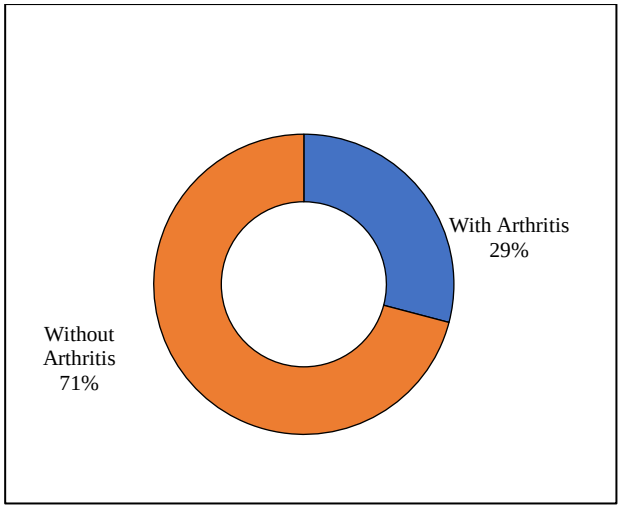

Figure 1: Distribution of psoriatic patients.

In Figure 2, 25(OH) vit D_3 levels of both patients and controls were 19.2±8.5 ng/ml and 29.9±6.7 ng/ml respectively. Unpaired student T test was performed; t was -11.0942 and p<0.00001. It means the difference was extremely significant.

Duration of disease process was grouped into <10 years and ≥10 years. We had 56 patients having disease duration <10 years and 44 patients with disease duration >10 years. Based on duration, 25(OH) vit. D3 levels were compared and shown in Figure 2. It was 21.9±4.1 ng/ml in patients with disease duration <10 years, and 15.9±4.2 ng/ml in patients with disease duration ≥10 years. Calculated t=7.1868 (Unpaired t test) and found that difference was statistically significant (p<0.00001).

The 25(OH) vit D3 levels were also compared between psoriasis patients with (29 cases) and without (71 cases) psoriatic arthritis which was 18.9±7.8 ng/ml and 20.1±8.4 ng/ml respectively but the difference is statistically not significant -(t=0.6614, p=0.5099).

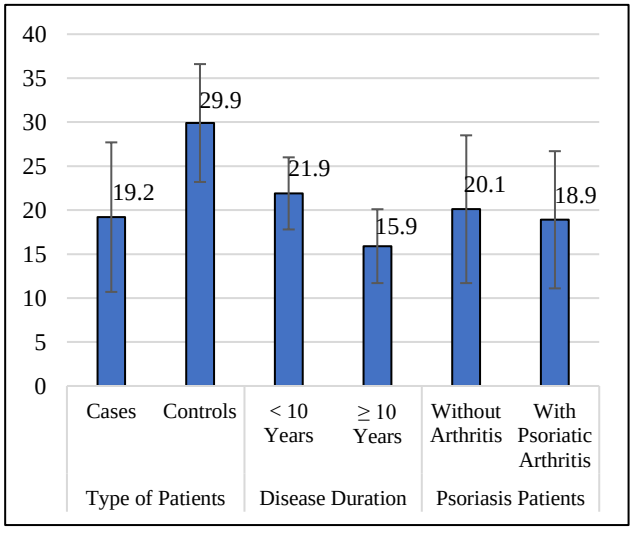

Figure 2: 25 (OH) vit D3 level in different groups.

Association between level of 25(OH) vit D3 and the disease activity in both patient subgroups, psoriasis, and Psoriatic Arthritis was analysed (Table 2). The 25(OH) vit D3 level is lower in psoriasis with high PASI (19 cases) compared to psoriasis with low-moderate PASI (81 cases) (t=-7.5778, p<0.0001). It is also lower in psoriatic arthritis with high disease activity (12 cases) (using DAS28) compared to psoriatic arthritis with low-moderate disease activity (17 cases). Calculated t value from unpaired student t test is -2.7904 and p=0.0095.

Table 2: The 25(OH) vit D3 level in psoriasis with respect to PASI and PsA with respect to disease activity.

Characteristics	25(OH) vit D3 level	P value
Psoriasis with high PASI	13.4±7.1	<0.0001
Psoriasis with low-moderate PASI	26.8±6.9	
PsA with high DAS 28	12.3±6.7	<0.0095
PsA with low-moderate DAS 28	20.5±8.2	

DISCUSSIONS

The important role of 25(OH) vit D3 in psoriasis can be demonstrated by the therapeutic response to vitamin D analogues used topically in the treatment of this disease. Important cytokines for Th1 and Th17 differentiation, which are key players in the pathogenesis of psoriasis, are inhibited by 25(OH) vit D3.[12,13] Low 25(OH) vit D_3 levels are thus linked to the pathophysiology of this illness.

In this study, we found low levels of 25(OH) vit D3 in psoriasis patients compared to healthy controls, a finding similar to a study by Gisondi et al who compared psoriasis patients with rheumatoid arthritis patients and healthy controls and found that both the RA and psoriatic patients had significantly lower serum levels of 25(OH) vit D_3 than the controls.[14] Orgaz-Molina et al demonstrated significantly lower 25(OH) vit D_3 levels in psoriatic patients when compared to healthy controls, which is in agreement with our observation.[15]

Our findings of lower 25(OH) vit D3 levels in Psoriatic Arthritis patients compared to controls, are comparable to those of Ibrahim et al and Touma et al whose study populations also showed lower 25(OH) vit D_3 levels than healthy controls.[16,17]

The results of the current study, which are analogous to those of studies by Filoni et al and Beata and Ligia, reveal that low 25(OH) vit D_3 levels have been linked to longer disease duration.[18,19] Psoriasis sufferers always cover the affected regions of their body. This behaviour leads to lower UV exposure and, as a result, decreased 25(OH) vit D3 levels, especially if the disease duration is longer. Therefore, patients with a long duration possibly

could be more prone to reduced serum level of 25(OH) vit D3.[18,19] In contrast, lower 25(OH) vit D3 levels may be implicated in the etiology of psoriasis as well.

Low 25(OH) vit D3 levels are known to be linked to an increased risk of developing Th1-mediated autoimmune illnesses, and psoriasis too is thought to be a Th1-Th17-dependent autoimmune inflammatory disease involving both innate and acquired immunity.[20] In this study, we observed that in both subgroups of our study population, low 25(OH)Vit D3 levels were linked to higher disease involvement. Our conclusion about psoriasis is analogous to the findings of Chandrashekar et al and Mattozzi et al which revealed that the PASI score and serum 25(OH)Vit D3 had a significant inverse corelation.[21,22] However, it should be noted that there is ongoing debate over the association of the severity of psoriasis and 25(OH) vit D3 levels, and further large multicentric study is required to resolve this issue.[18]

Also, we found that patients with psoriatic arthritis had lower levels of 25(OH) vit D3 and higher levels of disease activity (DAS28), which is consistent with a study by Ibrahim et al who too found that psoriatic arthritis patients had an inverse relationship between 25(OH) vit D3 level and disease activity.[16] In general, the results of our study was in accordance to some previous observational studies, that found a negative correlation between 25(OH) vit D3 levels and both psoriasis and psoriatic arthritis.

CONCLUSION

Patients of psoriasis and psoriatic arthritis show low serum 25(OH) vit D3 levels and severity of disease activity is also inversely proportional to 25(OH) vit D3 levels. Both psoriasis and psoriatic arthritis were shown to have longer illness durations that were related to 25(OH) vit D3 insufficiency. Lower amounts of 25(OH) vit D3 are found in patients with active diseases.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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