Case control evaluation of serum vitamin D levels in psoriasis

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Abstract

Introduction: Psoriasis is a chronic non-infectious skin disorder which is mainly characterized by the hyperproliferation and disturbance in keratinocyte differentiation. Data shows that vitamin-D have role in regulation of keratinocyte proliferation, differentiation and apoptosis along with immunomodulatory actions. However, studies pertaining to the evaluation of vitamin-D serum level in psoriasis is relatively less. We studied the serum level of vitamin-D in psoriasis and compared with the controls at a tertiary care hospital.

Materials and Methods: This is a case-control study carried on 50 psoriasis and 44 age and sex matched controls from the dermatology outpatient clinic. Age, sex, occupation, family history and body mass index were recorded. Severity of psoriatic skin lesions were assessed using Psoriasis Area Severity Index (PASI) scoring. Serum vitamin-D level was assessed by Enzyme Linked Fluorescent Assay (ELFA) technique. Less than 20ng/ml (50nmol/l) was considered as vitamin-D deficiency and the data were statistically analyzed.

Results: The mean vitamin-D level of cases and controls was 15.6±7.7 and 19.8±10.2 respectively. Their difference was statistically significant (P<0.05). We found 80.0% of psoriatic patients and 70.5% of controls were Vitamin-D deficient. Mild, moderate and severe PASI groups had mean Vitamin-D serum level of 29.9±6.9, 18.3±6.4 and 10.1±2.8 respectively. Their difference and correlation among them were statistically significant (P<0.001).

Conclusions: Serum vitamin-D level was significantly lower in psoriasis cases than controls and was inversely proportional to PASI score. Vitamin D could play a role in the disease pathogenesis but the exact nature remains unclear.

Keywords: Psoriasis, Keratinocyte, Vitamin D, Psoriasis area severity index, Enzyme linked fluorescent assay.

Introduction

Psoriasis is a chronic skin ailment characterized by inflammatory and hyperproliferative skin lesions with genetic, environmental and immune factors playing a major role in its etiopathogenesis.[1] Initially, the disease was considered to arise due to an increased proliferation and altered differentiation of keratinocyte with secondary cutaneous inflammatory infiltration. [2] Later, it became evident that psoriasis is a systemic immune mediated inflammatory disease primarily involving Th1 cells.[2] The active form of vitamin-D is synthesized after the photochemical reaction and hydroxylation of Pro-vitamin-D3 (7-dehydrocholesterol).[3] Current knowledge has stressed upon the role of vitamin-D in regulating the proliferation, differentiation and apoptosis of keratinocyte through its vitamin-D receptors.[3,4] Vitamin-D also have immunomodulating actions on cells of both innate and acquired immunity and it is also found to have beneficial actions in inflammatory diseases mediated by type-1 helper T-lymphocytes.[5,6] This has made topical vitamin-D as one of the treatment options in psoriasis, however a dearth of knowledge on the vitamin-D serum level among the psoriasis patients still exists.[6] Here we present the data of a case control evaluation of vitamin D serum levels in psoriasis patients attending a tertiary care hospital in Chennai.

Materials and Methods

This is a hospital-based case control study, conducted at the outpatient services of department of Dermatology over a period of six months. Clinically diagnosed active psoriasis patients of any severity, aged more than 18 years, who had not been treated with phototherapy or vitamin D the previous 6 months were enrolled as cases. Age, sex matched volunteers from the same geographical area attending the dermatology outpatient services as an attendee for the patient without any skin ailments were selected as controls. Appropriate informed consent in the local vernacular language was obtained from both cases and controls.

Patients with diabetes mellitus, hypertension, renal failure, chronic liver disease, autoimmune diseases, inflammatory bowel diseases, malignancies, pregnancy, lactating women and mentally ill patients were excluded. Relevant demographics details, occupational history, family history was collected and the body mass index (BMI, kg/m^2) was calculated in both the groups.

Severity of psoriatic skin lesions were assessed based on their morphological appearance and percentage of surface area involved using Psoriasis Area Severity Index (PASI) scoring system.[7] Based on the guidelines suggested by British Association of Dermatologists the PASI score calculated were graded as mild (< 3), moderate (3 to 10) and severe (>10).[8] Enzyme Linked Fluorescent Assay (ELFA) which combines enzyme immunoassay competition methodology with final fluorescent detection was used to measure the serum vitamin-D level and 5ml of blood sample was used for the same.[9] Vitamin D was measured as 25 hydroxy vitamin D and a value of less than 20ng/ml (50nm0l/l) was taken as vitamin D deficiency.[10]

Statistical analysis and interpretation: The demographical and clinical variables of continuous types were analyzed and interpreted by independent student T test. $\chi 2$ (Chi-square)

test was used to interpret the categorical variables of both the groups. Statistical procedures were performed by the IBM SPSS statistics-20 and a P-value of less than or equal to 0.05 (P≤0.05) was fixed as the statistically significant measure.

Results

The parameters of age, sex, occupation and BMI were compared between the control and cases in table 1 and table 2. In Table 1 the variables of age and BMI were compared between the control and cases. The mean ages of the both groups were 41.1±13.2 and 38.5±11.4 years respectively and their difference in means was not statistically significant (P>0.05). The two groups were therefore comparable. The mean BMI of both groups were 27.3±3.8 and 26.3±2.6 respectively. The difference between the means was also not statistically significant. (P>0.05). Statistically significant difference was not observed in sex and occupation of the both groups (P>0.05) and hence they were comparable (Table 2).

Most common type of psoriasis observed was chronic plaque psoriasis shown in Table 2. We have observed Psoriasis case with a wide range of PASI scores from 2 to 48. Few of the cases along with their PASI scores are shown in the Figure 1. The mean duration of psoriasis in cases was observed to be 3.3±3.2years.A statically significant difference (P<0.05) was observed when the mean vitamin-D level of the cases (15.6±7.7) and controls (19.8±10.2) were compared. (Table 3) Eighty percent of the cases and 70.5% of the control subjects had vitamin-D deficiency. (Table 4)

Six percentage (3 cases) of psoriasis cases had sufficient level of serum vitamin D, whereas the majority 80% (40 cases) had deficient vitamin-D levels. About 14% (7 cases) had insufficient vitamin-D values. (Table 5) Mild, moderate and severe PASI groups had the following mean serum vitamin D levels, 29.9±6.9, 18.3±6.4 and 10.1±2.8 respectively and a statistically significant difference was observed between them (P<0.001). They had a statistically significant (P<0.001) correlation among them. The percentage of determination of psoriasis by vitamin D was 51.6%.

Discussion

A total of 94 people participated in our study which included 50 psoriatic patients [22 (44%) males and 28 (56%) females] and 44 controls [19 (43%) males and 25(57%) females]. The prevalence of psoriasis in India ranges from 0.44 to 2.8%.[11] Although a male preponderance for psoriasis is reported a greater number of female patients were recorded in our study with a male:female ratio of 1:1.27.[12] Sornakumar et al and Bedi et al and have reported 14% and 12.5% of their patients having a positive family history respectively and we had no significant family history in our analysis.[12,13] Mathilde Touvier et al conducted cross sectional survey among middle aged Caucasian adults and found out that serum vitamin D level is greatly influenced by age, sex, body weight, daily sun exposure (hours/week) and physical activity but in our study, we did not correlate the effect of sun exposure and physical activity on the serum vitamin-D levels.[14]

Orgaz-Molina et al found that psoriasis patients with BMI≥27 kg/m2 had a greater chance of vitamin D insufficiency, but in our study the difference of mean BMI between the cases and control groups did not have a statistical significance and we did not analyze the effect of BMI on the serum vitamin-D levels.[15] The most common type of psoriasis we observed was chronic plaque psoriasis 48% (24 cases) which is similar to the findings available in the literature.[12]

Chronic inflammation has been found to lie at the heart of pathogenesis of psoriasis and evidence have pointed towards its association with some of the common physical and psychological co-morbid conditions.[16,17] Studies have found significant association of these comorbid conditions with low vitamin D levels.[16,17.] A lacuna still prevails in confirming the definitive role of vitamin D in the pathogenesis of psoriasis.[18] Immuno-modulatory roles of vitamin D have been linked by the presence of VDRs on activated lymphocytes and its inhibitory effects in different autoimmune diseases.[19,20] Vitamin D insufficiency has been considered a global health issue and a level ≥30ng/ml is recommended as the normal value.[15]

Our major finding is significant reduction in the serum vitamin- D levels among the psoriasis group in comparison with the control population after the adjustment of confounding factors like age, gender, occupation and BMI. Similar finding was also put forward in studies done by Gisondi et al, Orgaz-Molina et al and Ricceri et al groups.[15,19,20] Gisondi et al. compared the serum vitamin D levels of psoriatic and rheumatoid arthritis (RA) patients with healthy controls and showed a significant reduction in the vitamin D levels of the psoriasis and RA patients [19]. However, in a study, Wilson et al by analyzed the NHANES data and found no such vitamin D level reduction in the psoriasis patient group thus providing inconsistency in the observation of low vitamin D levels in psoriasis patients.[15,20,21]

We also observed that the mean vitamin D level in the severe PASI group was 10.1±2.8ng/ml and this was the lowest among all 3 PASI groups discussed and the difference between their means was statistically significant (P<0.001). This shows that the vitamin D deficiency is proportional to the severity of psoriasis as assessed by PASI scoring. Similar observations have been made in a study conducted by Stoyan et al.[22] Vitamin D actions on macrophages and lymphocytes results in the inhibition of IL-17, IL-23 and TNF-α production while the expression of IL-4 and IL-10 is raised and therefore it has an important role in the regulation of immune tolerance.[24] In psoriasis a decreased vitamin D levels may lead to immune dysregulation which may alter the differentiation and proliferation of keratinocytes.[24] This finding could substantiate the thought of vitamin D supplementation in the treatment of psoriasis.[23,24]

Studies conducted by Perez et al and Finamor et al. have concluded that there is considerable clinical improvement of psoriasis and a decrease in the PASI score with oral vitamin D supplementation.[25,26] The effect of vitamin D supplementation in our cases is to be further established. Vitamin D receptor (VDR) polymorphism has been found to be associated with psoriasis susceptibility.[27] Decreased expression of vitamin D receptor and tight junction complex in psoriatic skin was demonstrated through immunochemical stain analysis by B. Visconti et al suggesting a role for vitamin D in the pathogenesis.[28] Based on the guidelines of Endocrine Society we found that vitamin D deficiency had a similar occurrence in both the cases and control groups (psoriasis 80% and control 70.4%, p>0.05) which could be explained by the increased prevalence of vitamin D deficiency among population of India.[10] Data in the literature have shown that 70-100% Indians in different age groups are vitamin D deficient which could be attributed to the prevailing social and cultural conventions in our country which hinders with adequate sun exposure.[29-31] Further darker skin types of Indians also produce a significantly lesser amount of vitamin-D when compared with the individuals with fairer skin.[30,31]

Table 1: Comparison of psoriasis and control subjects according to their age and BMI.

Variables	Psoriasis n=50		Control n=44		Difference b/w means	"t"	df	Sig
	Mean	SD	Mean	SD				
Age	41.1	13.2	38.5	11.4	2.5	0.971	92	P=0.334
BMI	27.3	3.8	26.3	2.6	0.98	1.443	92	P=0.152

Table 2: Comparison of categorical variables like sex, occupation, types of psoriasis.

Variables	Components	Psoriasis n=50		Control n=44		$\chi 2$	Sig.
		No	%	No	%		
Sex	Male	22	44.0	19	43.2	$\chi 2$ =0.006 df=1	P=0.936
	Female	28	56.0	25	56.8		
Occupation	Ministerial	5	10.0	8	18.2	$\chi 2$ =3.358 df=4	P=0.500
	Drivers	6	12.0	6	13.6		
	House wife	20	40.0	11	25.0		
	Professional	10	20.0	8	18.2		
	Others	9	18.0	11	25.0		
Types of psoriasis	Palmoplantar	12	24.0	0	0.0	Nil	Nil
	Plaque	24	48.0	0	0.0		
	Scalp psoriasis	8	16.0	0	0.0		
	Erythrodermic soriasis	3	6.0	0	0.0		
	Guttate psoriasis	3	6.0	0	0.0		

Table 3: Comparison of serum vitamin D between the control and psoriasis subjects.

Variable	Psoriasis		Control		Difference b/w means	"t"	Df	Sig
	Mean	SD	Mean	SD				
Vit. D	15.6	7.7	19.8	10.2	4.2	2.231	92	P=0.028

Table 4 Vitamin D deficiency prevalence in both groups.

Groups	No of cases Vit-D deficiency (<20ng/ml)	Prevalence (%)
Psoriasis	40	80.0
Control	31	70.5

Table 5: Distribution of cases according to their serum vitamin D level .

Serum vit D level (ng/ml)	PASI –Mild	PASI-Moderate	PASI-Severe	Total	%
>30(normal)	1	2	0	3	6.0
20 to 30(insufficiency)	3	4	0	7	14.0
<20(deficiency)	0	18	22	40	80.0
Total	4	24	22	50	100.0

Table 6: Comparison of PASI with serum vitamin D of psoriasis subjects.

PASI groups	N	Mean serum Vitamin-D	SD	"F"	Sig	Correlation (r)	r2	% of determination
Mild(<3)	4	29.9	6.9	31.046	P<0.001	-0.749	0.516	51.6
Moderate (3 to 10)	24	18.3	6.4					
Severe (>10)	22	10.1	2.8					

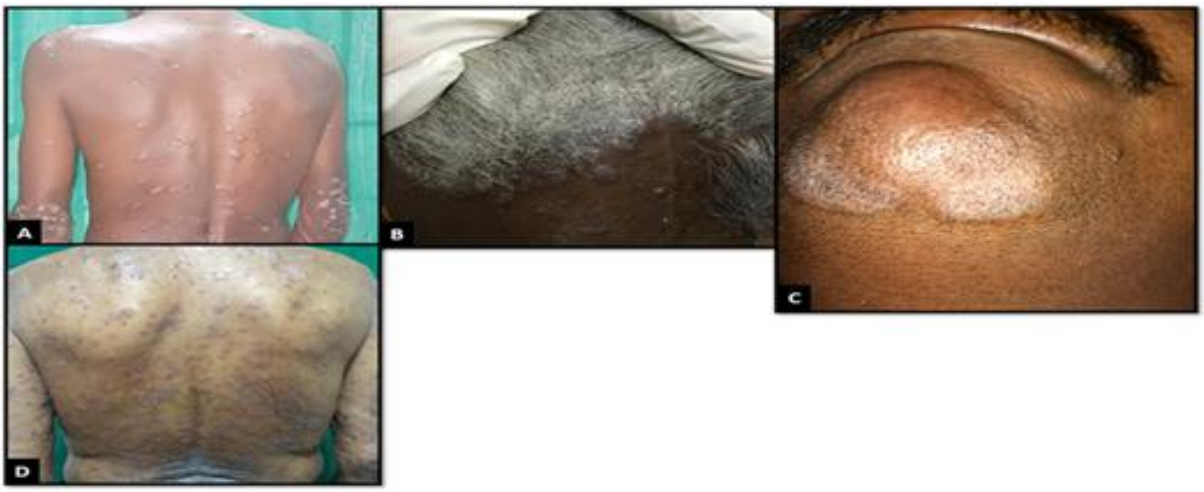

Fig. 1: a. Multiple scaly erythematous discrete paques over the back – psoriasis valgaris. PASI-38, b. Thick hyperkeratotic plaques over scalp-scalp psoriasis, PASI-18, c. Erythemstous scaly plaque over the Chin-Psoriasis vulgaris, PASI-18, d. Erythemstous scaly plaque over the Back – Unstable plaque psoriasis. PASI-44

Conclusion

Psoriasis patients relatively have lower serum vitamin D level than the control subjects and having an inverse relationship with PASI score. Further elucidation of the vitamin D role in the etiopathogenesis of psoriasis would make vitamin D a viable treatment option and also helps in the reduction of associated co-morbidities risk.

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Limitations of the study:

1. Lesser number of psoriasis cases
2. Did not calculate the daily sun exposure and physical activity in the cases and control

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