

Original Research Article

Evaluation of vitamin D status, selenium and C-reactive protein level in psoriasis

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ABSTRACT

Background: Psoriasis is an inflammatory skin disease associated with a variety of clinical conditions. Study aim to evaluate the association of vitamin D, selenium and C-reactive protein (CRP) levels in psoriasis.

Methods: This hospital-based case-control study involved 50 psoriasis cases and 47 healthy individuals. Serum vitamin D, selenium and CRP levels were measured, and the general demographic values were also recorded.

Results: Statistical analysis revealed that vitamin D levels are significantly lower in psoriasis ($p < 0.005$). Among the demographic parameters, obesity was found more common among psoriasis cases than controls. Serum selenium and CRP levels were not significantly different between the two groups.

Conclusions: Vitamin D deficiency is strongly associated with psoriasis. Vitamin D supplementation can be useful in psoriasis management and also in the reduction of obesity. Serum selenium and CRP levels aren't significant markers to demonstrate psoriasis.

Keywords: C-reactive protein, Vitamin-D, Psoriasis, Selenium

INTRODUCTION

The hallmarks of psoriasis are the presence of silvery scales that itch and flake off, leaving the underlying skin inflamed and exposed. In Germany alone, two million people suffer from the condition. It results from a combination of genetic predisposition and environmental factors, which together provoke sensitization of the immune system.¹ In the land of plentiful sunshine, Indians in most parts of the country suffer from Vitamin D deficiency. Vitamin D is having the main role in decreasing the risk of many chronic illnesses. It has a specific role in cellular proliferation, differentiation, apoptosis, and angiogenesis.² Vitamin D receptors are found in most tissues and cells in the body. It is found to

be an immune regulatory hormone with beneficial effects on inflammatory diseases, mediated by helper T-lymphocytes type 1 (Th1) cells such as diabetes, psoriasis.^{3,4} Vitamin D deficiency has been linked to several diseases - skin cancers, breast tumours, cardiovascular diseases, Psoriasis, etc. other than the known conditions like rickets and osteoporosis. It usually begins between the ages of 15 and 25, but it can occur at any age.³ The cause is unclear, but psoriasis seems to have immune characteristics because T cells and cytokines are involved in addition to local skin characteristics.⁵

A recent discovery about vitamin D receptors which are found in most tissues and cells in the body has opened a

whole new arena of research.² Psoriasis has been recently established to be a systemic disease centered on inflammation and involvement of cytokines of the Th1 pathway.⁶ Vitamin D can play a role in decreasing the risk of autoimmune diseases. It has been found to be an immune regulatory hormone with beneficial effects on inflammatory diseases (mediated by helper T-lymphocytes type1 (Th1) cells such as diabetes, psoriasis, and multiple sclerosis.²⁻⁴ It has the ability to reduce cell proliferation in cancers; this action may reduce the increased production of skin cells. Many studies show that the incidence of vitamin D deficiency is more in psoriasis.⁷

Selenium in high and low doses has an inhibitory effect on DNA synthesis and a stimulatory effect on and cellular proliferation. Selenium is also known for its ultraviolet A and ultraviolet B protective, antioxidant, and anti-inflammatory effects.⁸ The relationship between selenium status and psoriasis has been evaluated in many pilot studies and open trials. In particular, selenium levels were significantly lower in patients with a history of psoriasis for more than 3 years compared with that of healthy volunteers. There are also studies which show no significant reduction in contrast with previous reports of reduced selenium levels in psoriasis.⁹

C-reactive protein (CRP) is a member of the class of acute phase reactants, which is synthesized exclusively in the liver. Its levels have been shown to be raised by many folds following acute inflammation.¹⁰ Accordingly, CRP has been suggested to be a marker of inflammation in several conditions including psoriasis, rheumatoid arthritis, tuberculosis, cancer, and myocardial infarction.¹¹ Rate of CRP synthesis and its secretion increases within hours of acute inflammation and the value reaches peak level within 24-48 hr.¹² Studies also suggested that there can be a rise in CRP and uric acid in patients having an inflammatory disorder involving a large area of the body.⁸

With this background, author want to explore the status of serum vitamin D, selenium and CRP levels in patients with psoriasis in the hospital population and their association with the severity of disease and its prognosis.

METHODS

A total of 50 subjects with psoriasis reported to dermatology OPD at Sri Manakula Vinayagar Medical College and Hospital, Puducherry, India was included, from March 2014- December 2015. A sum of 47, age and sex-matched healthily, individuals were considered as controls. Both the patients and the control subjects belonged to the south Indian population in and around Puducherry.

A detailed medical, general and family history was taken along with a detailed consent form from the study subjects. Psoriasis patients taking vitamin D supplements

and with other skin diseases were excluded from this study.

General demographic data including age sex, BMI, waist to hip ratio, presence of diabetes, hypertension and smoking habit were recorded. Psoriasis area and severity index (PASI) was measured along with other parameters, including, blood sugar, urea, creatinine, cholesterol, triglycerides, low density lipoprotein (LDL), high density lipoprotein (HDL) and very low density lipoprotein (VLDL).

Estimation of vitamin D and CRP levels were done by ELISA using (kit) according to the manufacturer's instructions. Selenium levels were estimated by induction- coupled plasma (ICP) method.

The results of this study were analyzed using SPSS Software, Version 16 (SPSS Inc., Chicago, USA). Continuous and categorical variables were presented as Mean±SD and percentages respectively. A statistically significant difference will be considered at the level of $p < 0.05$.

Ethics approval

The study was started only after obtaining its' approval from the Research Committee and Institutional Ethics Committee of Sri Manakula Vinayagar Medical College and Hospital on 18 February 2014. Pondicherry.

RESULTS

The difference in the prevalence of vitamin D deficiency, Selenium deficiency and raised CRP levels were compared using the chi-square test for difference of proportion. 'p' value of 0.05 was considered significant.

The results of demographic data have shown significant association ($p < 0.05$) of age, BMI, waist-hip ratio and smoking habit with psoriasis (Table 1).

Table 1: Summary of general demographics.

Variables	Cases	Controls	P value
No. of patients	50	47	--
Mean age (SD) years	45 (13)	39 (9)	0.013*
Mean BMI (SD)	24.9 (4.0)	21.0 (4.4)	<0.001*
Males	60%	45%	0.761**
Diabetic patients	12 (24%)	--	--
Hypertensive patients	13 (26%)	--	--
Other complications	5 (10%)	--	--
Active smokers	10 (20%)	11 (31%)	<0.001**

*independent sample t-test was done with $p < 0.05$ considered statistically significant; **X² test done with $p < 0.05$ considered statistically significant.

Table 2: Comparison of general statistics (means).

Variables	Cases	Controls	P value*
	N (%)	N (%)	
Mean random blood sugar (SD) mg/dL	109 (25)	119 (31)	0.093
Mean blood urea (SD) mg/dl	29 (8)	30 (9)	0.382
Mean creatinine (SD) mg/dl	0.9 (0.2)	0.9 (0.2)	0.547
Mean total cholesterol (SD) mg/	168 (48)	188 (41)	0.031
Mean triglycerides (SD) mg/dl	128 (35)	144 (61)	0.133
Mean HDL (SD) mg/dL	40 (4)	43 (7)	0.007
Mean LDL (SD) mg/dL	103 (43)	116 (39)	0.108
Mean VLDL (SD) mg/dl	26 (7)	29 (12)	0.130
Mean PASI score	18.9 (13.1)	--	--

*independent sample t-test was done with $p < 0.05$ considered statistically significant

The other parameters were comparably similar between the cases and control group except for total cholesterol and HDL (Table 2).

Vitamin D deficiency was found to be significantly associated with psoriasis ($p < 0.001$) and the CRP and selenium levels between the psoriatics and controls were comparably similar (Table 3). Vitamin D deficiency was significantly correlated with other factors including, age, BMI, Waist-hip ratio and low levels of selenium (Table 4).

Table 4: Correlation of Vitamin D with measured parameters.

Parameters	Vitamin D	
	R-value*	P value
Age	-0.268	0.008
BMI	-0.288	0.004
Waist-hip ratio	-0.400	<0.001
Hs-CRP	-0.127	0.218
MDA	-0.115	0.263
Selenium	0.212	0.037

Pearson's correlation was done to analyse the data

*Pearson's Correlation coefficient ** $p < 0.05$ was considered statistically significant.

Table 3: Descriptive statistics of vitamin D, Hs-CRP, MDA and selenium levels among cases and controls.

	Original mean				Estimated Marginal mean*			
	Vitamin D	Hs-CRP (mg/dl)	MDA (μ moles/l)	Selenium (μ g/l)	Vitamin D	Hs-CRP (mg/dl)	MDA (μ moles/l)	Selenium (μ g/l)
Cases	24.4 \pm 2.1	0.44 \pm 0.06	6.4 \pm 0.6	74.6 \pm 3.5	25.6 \pm 2.5	0.47 \pm 0.06	7.9 \pm 0.7	74.3 \pm 4.1
Controls	61.0 \pm 2.6	0.41 \pm 0.06	7.8 \pm 0.6	83.9 \pm 4.4	59.6 \pm 2.7	0.39 \pm 0.07	6.4 \pm 0.7	81.9 \pm 4.4
Mean difference (control-case)	36.6	-0.03	-1.4	9.3	33.0	-0.09	-1.5	7.6
P value**	<0.001	0.633	0.102	0.100	<0.001	0.411	0.127	0.248

All values are expressed as Mean \pm SEM; *Estimated marginal mean \pm SEM of measured variables corrected for age, BMI and the waist-hip ratio was calculated Age =42, BMI =23.1, WHR=0.91; ** $p < 0.05$ considered statistically significant.

DISCUSSION

Psoriasis is a common dermatological disorder in India but there is a paucity of data related to Indian psoriasis patients on its genetics, epidemiology, disease severity, relapse, remission patterns and its associations. This study evaluated the vitamin D deficiency status in psoriasis patients. It also analyzed the role of selenium in psoriasis which has contradictory results and CRP levels guidance to assess the severity of psoriasis.

Nowadays it is mandatory to use vitamin D for the treatment of psoriasis. But in genetic setup, author don't have many studies to find out whether psoriasis patients have vitamin D deficiency or not. Vitamin D plays an important role in the regulation of growth and differentiation of keratinocytes and dermal fibroblasts.

Vitamin D is metabolized to 1, 25(OH)₂, -vitamin D₃, which binds to its receptor in human skin.¹³ Vitamin D has been recently studied for its immune regulatory properties. Psoriasis is an inflammatory disease mediated by Th1/ Th17 cells and vitamin D is related in such a way that it reduces the Th1/Th17 (pro-inflammatory) response and increases the Th2/T-reg cells (anti-inflammatory).^{14,15} Thus the lack of VD affects the growth and development of skin as well as reduces the anti-inflammatory effects which are the key aspects of psoriasis. The results of this study strongly support a positive association of vitamin D deficiency with psoriasis.

Vitamin D deficiency is associated with a number of disease states including cardiovascular and other co-morbid conditions. Obesity is a common health problem found among people all around the world. Although the

mechanism is uncertain, literature shows that vitamin D deficiency is more common among obese than people with normal BMI.^{16,17} Patients with psoriasis are found to be obese than the normal population and it is directly proportional to the duration of psoriasis.¹⁸ According to the study, a significantly higher BMI and waist-hip ratio which are the hallmarks of obesity were recorded in psoriasis individuals. Vitamin D deficiency was also correlated to increased BMI and waist-hip ratio as analyzed. Hence, it was concluded that psoriasis, vitamin D deficiency and obesity are interrelated, and further research is essential to explore the bio-mechanisms.

Selenium is an effective antioxidant, anti-proliferative and anti-inflammatory agent obtained through dietary supplements. It is a main component of selenoproteins which regulates important cellular functions. It has been found that selenoproteins regulates the proliferation of immune cells and makes them more defensive against oxidative stress. Selenium is present in glutathione peroxidase, a selenoprotein which acts on hydroperoxides to prevent the effects of free radicals.¹⁹ Selenium status in psoriasis is low and found significant with respect to the longer duration of the disease.^{8,20} No significant association was found of low selenium status with psoriasis. Although study has been limited to that the duration of psoriasis wasn't taken into consideration. Donadini et al, had studied the selenium status in patients with psoriasis duration of minimum 1 to maximum 27 years and reported no significant association.¹¹

CRP is a non-specific inflammatory marker found elevated in psoriasis, especially with severe disease status.^{21,22} CRP levels were reported to be directly proportional to PASI scores and significantly reduced as an outcome of treatment.^{23,24} According to the study, the mean CRP value of cases was slightly higher but wasn't significantly different than controls.

CONCLUSION

Study strongly supports a positive correlation of vitamin D deficiency with psoriasis. It was found that obesity is more common and significantly associated with psoriasis when compared to the general population. Awareness and weight reduction programs may help to minimize psoriasis associated co-morbidities. Vitamin D deficiency is positively correlated to obesity and the administration of vitamin D would help for the better management of psoriasis and its associated co-morbidities. No significant association of CRP and selenium levels was found, and they cannot be employed to demonstrate psoriasis status.

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