

Vitamin D Levels in Psoriatic Patients

A Case Control Study

Nada F Al Tajer* MBChB, Jamal R Al-Rawi FICMS, Sama Asim Sahib CABD

ABSTRACT

Background: Psoriasis is a chronic immune-mediated disorder that results from the interplay of multiple factors, among such factors is vitamin D, which is postulated to play an immune modulatory anti-proliferative, anti-inflammatory and anti-angiogenic effects in psoriasis.

Objectives: To study the association between vitamin D3 level and psoriasis, through a case-control study.

Methods: The study is an epidemiological observational case-control study. It was conducted at the out-patient clinic at the Center of Dermatology and Venereology, in Medical City in Baghdad of Iraq between January 2019 and March 2020. A total of 280 participants were enrolled in this study, and were classified into two groups; 180 healthy controls, and 100 psoriatic patients. Vitamin D3 level was assessed for both groups.

Results: The control group showed comparable vitamin D levels when comparing males and females (P value= 0.263). The lowest vitamin D levels were scored in winter, and highest in autumn (P value < 0.001). Vitamin D3 was higher in individuals with normal body mass index, and lower in underweight individuals (P value=0.002). The psoriatic group demonstrated a significant difference in vitamin D values between males and females (P value= 0.007). No significant differences were observed neither when comparing variable age groups (P value= 0.142), seasonal variation (P value= 0.387), nor body weight (P value = 0.676). There was a significant difference between vitamin D3 values when comparing the control group and the psoriatic group (P value < 0.001).

Conclusion: Vitamin D3 was significantly lower in the psoriatic group when compared to the control group.

Keywords: Healthy control, Severity, Psoriasis, Vitamin D deficiency.

Iraqi Medical Journal Vol. 68, No. 2, July-Dec 2022; p. 83-89.

Psoriasis is an immune-mediated skin disorder with a chronic course, mediated by an interplay between genetic liability and environmental triggers such as trauma, infection, drugs, stress, endocrinological factors, and others. Psoriasis has a worldwide prevalence of 2-3% with no gender predilection^(1,2), with an estimated prevalence of 2.3% in Iraqi population⁽³⁾. Psoriasis is considered to be a disorder of keratinocytes proliferation in the epidermis secondary to activated lymphocytes in the dermis.⁽⁴⁻⁶⁾

Vitamin D is a fat-soluble vitamin that is either derived from plants and fish (ergocalciferol) or synthesized in the human body (cholecalciferol), the active metabolite of vitamin D, 1, 25(OH)₂D. Both 1, 25(OH)₂D and its receptor (VDR) play essential roles in the skin.⁽⁷⁾

The precise contribution of vitamin D deficiency to the pathogenesis of psoriasis is not fully understood. Several pathways have been postulated including, loss of the anti-proliferative function of vitamin D, as it has been found that human cultured keratinocytes exposed to calcitriol showed marked inhibition of growth and accelerated maturation.^(8,9)

Moreover, as inflammation and angiogenesis are the main players in the pathogenesis of psoriasis, the loss of the

*Corresponding author:
Dr. Nada F Al Tajer
Email: nadafresh100@gmail.com

anti-inflammatory and anti-angiogenic activity of vitamin D could represent another explanation to the contribution of the vitamin D deficiency in psoriasis.⁽⁹⁻¹¹⁾

Vitamin D deficiency results in unchecked proliferation of Th1 and 17 cells on one hand and unchecked inhibition of Tregs on the other hand, which are two important steps in the pathogenesis of psoriasis. Topical treatment with calcipotriol has been shown to significantly decrease cutaneous levels of human beta defensins (HBD) 2 and HBD3 as well as IL-17A, IL-17F and IL-8, which play significant roles in psoriasis, further linking vitamin D deficiency to the pathogenesis of psoriasis.^(12,13)

The aim of this study is to study the association between vitamin D3 level and psoriasis, through a case-control study.

Methods

A total number of 100 out-patients with clinical diagnosis of psoriasis were enrolled in this study. The diagnosis of psoriasis was established on clinical bases.

Patients' inclusion criteria: All age groups and both genders were included. All clinical presentations of psoriasis. Vitamin D level was evaluated, irrespective to the season. Psoriatic patients with established disease, who had not received topical treatment over the past three months, or consumed systemic treatment over the past six months.

A total of 180 healthy subjects who visited the Center of Dermatology and Venereology in the Medical City as companions or relatives to the patients, were elected after matching them to the patients' group regarding age, gender, and daily sun exposure time.

Patients' exclusion criteria: Patients receiving treatment for any systemic conditions. Patients complaining of any concomitant systemic or skin diseases or infections. Patients receiving supplements or vitamins, currently or over the past six months. Psoriatic female patients who were

pregnant or lactating. Psoriatic patients regularly applying sunscreen.

Enrolled patients were subjected to a detailed history taking regarding the duration, family history, presence of other autoimmune diseases, and previous treatment protocol. Physical examination was carefully performed for each patient which included measuring the size, site, erythema, and scales of psoriatic lesions. Then, the severity of psoriasis was assessed using body surface area (BSA) involved and psoriasis activity score index (PASI), by which psoriasis was classified into mild (PASI <10), and moderate to severe psoriasis (PASI ≥10).⁽¹⁴⁾

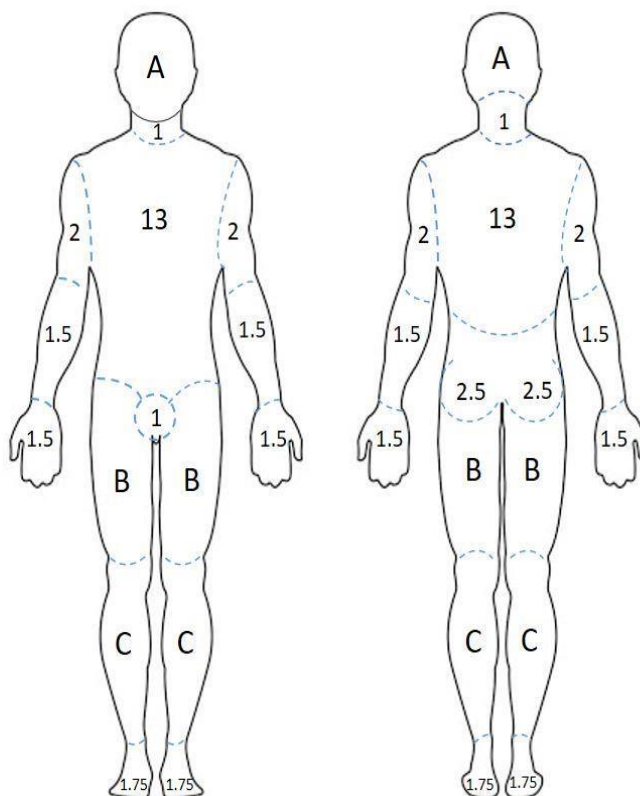
Skin phenotype of the participants, whether they belonged to the psoriatic or to the control group, was determined by Fitzpatrick classification of skin types.⁽¹⁵⁾

The body percentage exposed to sunlight was evaluated by using Lund and Browder chart (Figure 1), which is originally used for initial assessment of body areas involved in major burn.⁽¹⁶⁾

Blood samples were taken to assess serum 25-hydroxyvitamin D3 (25(OH) D3), vitamin D deficiency is defined as serum hydroxyvitamin D levels less than 20 ng/ml, insufficiency as 20-30 ng/ml, while a level between 30-100ng/mL was considered sufficient. Ethical approval was given by the Scientific Council of Dermatology and Venereology of the Arab Board for Medical Specializations. Consent was obtained from administration of Dermatology Center at the Medical City and, after explaining the aim and procedure of the study, and verbal consent was taken from all patients.

The collected data was organized, tabulated, and statistically analyzed using Statistical Package for Social Science (SPSS) version 26.

Values were expressed as mean ± standard deviation (SD). Significant levels were set as P values ≤ 0.05 in all cases.



Area	Age 0	1	5	10	15	Adult
A= ½ of head	9.5	8.5	6.5	5.5	4.5	3.5
B= ½ of one thigh	2.5	3.5	4	4.5	4.5	4.75
C= ½ of one lower leg	2.5	2.5	2.75	3	3.25	3.5

Figure 1: Lund and Browder chart used in this study to assess body percentage exposed to direct sun light. (Designed by the author, adapted from reference no. 16)

Results

There was a significant difference in exposure to sunlight between psoriatic and control group (P-value= 0.005), while there

was no significant difference in age , BMI or the percentage of body surface area exposed to direct sunlight (P-value= 0.067, 0.222 and 0.360, respectively), (Tables 1 and 2).

Table 1: Socio-demographic characteristics of the psoriatic and the control groups (males).

Parameters	Psoriatic males	Control males	P-value*
Number of participants	47	88	
Age (years) mean \pm SD	31.11 \pm 16.03	30.77 \pm 15.69	0.886
BMI (kg/m ²), mean \pm SD	25.92 \pm 4.47	26.30 \pm 4.35	0.569
Skin phenotype 2	0	4	
3	27	45	
4	19	36	
5	1	2	
Daily sun exposure time (hours)	2.77 \pm 1.41	2.22 \pm 1.08	0.011
Surface area exposed to sun%	18.90 \pm 2.87	19.35 \pm 4.12	0.294
Alcohol consumers %	4 (8.51%)	4 (4.55%)	
Smokers %	28 (59.57%)	52 (59.09%)	

* Student's t-test was applied.

Table 2: Socio-demographic characteristics of the psoriatic and the control groups (females).

Parameters	Psoriatic females	Control females	P-value*
Number of participants	53	92	
Age (years) mean \pm SD	24.17 \pm 13.00	29.62 \pm 15.51	0.004
BMI (kg/m ²), mean \pm SD	23.86 \pm 4.04	24.47 \pm 4.25	0.284
Skin phenotype 2	7	18	
3	26	51	
4	20	22	
5	0	2	
Daily sun exposure time (hours)	1.58 \pm 0.86	1.35 \pm 0.52	0.053
Surface area exposed to sun%	14.84 \pm 3.37	14.97 \pm 4.66	0.800
Alcohol consumers %	0 (0%)	0 (0%)	
Smokers %	3 (5.66%)	5 (5.43%)	

* Student's t-test was applied.

Duration of psoriasis varied between 2 weeks and 30 years with a mean of 68.14 \pm 75.65 months. There was no significant difference when comparing the duration of the disease between the two genders (P-value= 0.283). This study demonstrated a higher incidence of moderate/severe psoriasis among male patients (19 males vs. 12 females), male to female ratio was 1.58:1. The male patients with psoriasis had significantly higher levels of vitamin D when compared to the female patients (P-value=0.007), while there was no significant difference when comparing males and females within the control population (P-value= 0.263).

The patients were further classified according to their PASI score into 66 patients (66%) with mild psoriasis (PASI <10), and 31 patients (31%) with moderate to severe psoriasis (PASI >10). Patients with erythrodermic psoriasis (two males), and one male patient with guttate psoriasis were not included in neither of the aforementioned categories, since PASI score cannot be elucidated in these variants. This study demonstrates a higher incidence of moderate/severe psoriasis among male patients (19 males vs. 12 females), male to female ratio was 1.58:1

Vitamin D levels were significantly lower in the 31% of patients with PASI score \geq 10

(7.77 ± 3.38) compared to the 66% with PASI score < 10 (10.98 ± 5.12), with a P-value = 0.001.

Upon assessing vitamin D levels, the control group demonstrated a mean of $20.12 \text{ ng/ml} \pm 10.87 \text{ ng/ml}$ standard deviation, compared to $9.88 \pm 4.77 \text{ ng/ml}$ found in the psoriatic group (P-value < 0.001). In this study, 94 patients (94%) and 120 control (66.66%) were found deficient, six patients (6%) and 32 control (17.77%) were found insufficient, while only 28

control (15.55%) had sufficient Vitamin D values. As provided in [table3], seasonal variation seemed to have a great impact on vitamin D level in the control group (P-value < 0.001), but no significant difference within the psoriatic group (P-value = 0.387).

Table 4 demonstrates the relation of body mass index (BMI) to vitamin D levels, which was significantly different within the control group (P-value < 0.001), and not significantly different within the psoriatic group (P-value = 0.676).

Table 3: Effects of seasonal variations on vitamin D levels.

Seasons	Psoriatic group Vitamin D3 level mean \pm SD	Control group Vitamin D3 level mean \pm SD	P value*
Winter	9.42 ± 3.86	15.13 ± 7.93	0.000
Spring	10.32 ± 4.83	16.63 ± 6.73	0.000
Summer	9.09 ± 5.36	23.34 ± 9.78	0.000
Autumn	11.43 ± 4.57	23.77 ± 13.36	0.000
P value**	0.387	0.000	

* Student's t-test was applied.

** Two-way ANOVA test was applied.

Table 4: Effects of body mass index on vitamin D levels.

BMI	Psoriatic group Vitamin D level Mean \pm SD (ng/ml)	No.	Control group Vitamin D level Mean \pm SD (ng/ml)	No.	P-value*
Underweight	10.82 ± 6.42	16	13.38 ± 6.53	54	0.160
Normal range	10.05 ± 4.53	30	23.29 ± 13.54	77	0.000
Overweight	9.56 ± 4.56	54	19.58 ± 9.38	49	0.000
P-value**	0.676		0.005		

* Student's t-test was applied.

** Two-way ANOVA test was applied.

Discussion

This study was conducted with the intention to decipher the relation between psoriasis and vitamin D levels, and to display all the factor that might had influenced this complicated relationship. Many studies had been conducted previously in many countries including Iraq and the Gulf region. Most of the studies demonstrated positive correlation between vitamin D deficiency and psoriasis, and a few demonstrated no significant relation between these two variables.^(17,18)

Al-Dhubaibi conducted an exploratory study, which included 20 published articles with 2046 psoriatic patients, with or without arthritis and 6508 healthy controls. Fourteen studies showed a positive correlation between vitamin D deficiency and psoriasis, and the remaining six studies did not depict a positive correlation between the two variables under study.⁽¹⁸⁾ Maleki et al studied 50 psoriatic patients and 43 controls in Mashhad, Iran, and found no significant differences in vitamin D3 levels between the two groups.⁽¹⁹⁾ Allayali et al studied 63 psoriatic patients and 63 non

psoriatic individuals in Umm Alqura University Makkah, Saudi Arabia, and again, found no significant difference in vitamin D3 values between the two groups.⁽²⁰⁾ Another study conducted by Al Mutairi et al in Kuwait which included 100 psoriatic individuals and 100 controls, which revealed a significantly lower values of vitamin D3 in the psoriatic group.⁽²¹⁾ One previous study conducted by Khalil et al in Babylon of Iraq, that included 45 psoriatic patients and 45 controls, concluded a significant difference in vitamin D3 values between the studied groups.⁽²²⁾ The evaluation of the 41 patients (41%) whom had suffered from psoriasis over long durations (more than 5 years), had revealed no improved figures in vitamin D (9.92 ± 5.03 ng/ml) status despite previous therapeutic attempts, however. These figures were considered a further decline (although non-significant) in the values when compared to the more recently presented patients (11.07 ± 5.46 ng/ml) (P-value=0.155).

The observations mentioned above may hint towards a bidirectional relation between psoriasis and diminished vitamin D levels. On one hand, there is the pathogenic role of vitamin D in psoriasis, manifesting in the increased risk of developing Th1-mediated autoimmune diseases (including psoriasis)⁽²³⁾, on the other hand, psoriasis itself contributes to a lower vitamin D values in its sufferers when compared to the general population. This could be explained by the plain nature of psoriasis, being a hyper-proliferative condition, in which upon the rapid turnover and desquamation of the epidermis renders the stratum basale and stratum spinosum prone to accelerated wash off, hence, preventing them from performing their functions properly (including vitamin D synthesis).⁽²⁴⁾ The fact that psoriatic patients in general tend to keep their lesions covered to conceal their undesirable appearance, an attitude, practiced over the years, could lead to decreased UV exposure with consequent reduced vitamin D levels.⁽²⁵⁾ This attitude may not be very appreciable in Iraq, considering the customary religious attire,

especially when evaluating the female population.

Furthermore, the ominous silver scales that psoriasis deploys opaque shields over the skin preventing the interaction between ultraviolet light and the epidermis, resulting in impairment of vitamin D synthesis in the affected body parts. This assumption is supported by the low vitamin D values observed in patients with psoriasis involving more than 10% of body surface area (mean 7.94 ± 2.94 ng/ml).

In conclusion; Psoriatic individuals suffer from lower vitamin D levels when compared to their healthy counterparts. Factors that are associated with lower vitamin D levels in psoriatic patients include: long duration of the disease, larger body surface area involved, female gender, and winter season.

Conflict of interest: None.

Funding: Self-funded study.

References

1. Nestle F, Kerhof VDP. Psoriasis. In: Bologna JL, Schafeer JV, Cerroni LL (Editors). *Dermatology*. 4th ed. Elsevier; 2018. p. 138-60.
2. Maluki A, Fulaih Z. Correlation between the severity of chronic plaque psoriasis and metabolic derangements. *Kufa Med Journal* 2012;15(3):1-14.
3. Al Samarai A. Prevalence of skin diseases in Iraq: A community based study. *Int J Dermatol* 2009;48(7):1-6.
4. Chong BF, Wong HK. Immunobiologics in the treatment of psoriasis. *ClinImmunol* 2007;123:129-38.
5. Rendon A SK. Psoriasis pathogenesis and treatment. *Int J Mol Sci* 20(6):1475.
6. Mobini N CS, Stephanie HU, Kamino H. Non-infectious erythematous, papular, and squamous diseases. In: Elder DE, Elenitsas R, Rosenbach M, Murphy GF, Rubin AI (Editors). *Levers Histopathology of the Skin*. 11th ed. China. Wolters Kluwer; 2015. p. 582-675.
7. Bikle DD. Vitamin D and the skin: Physiology and pathophysiology. *Rev Endocr Metab Disord* 2012;13:3-19.
8. Holick MF. Vitamin D: A millennium perspective. *J Cell Biochem* 2003;88(2):296-307.
9. Filoni A, Vestita M, Congedo M, Giudice G, Tafuri S, Bonamonte D. Association between psoriasis and vitamin D: Duration of disease correlates with decreased vitamin D serum levels. *Medicine (Baltimore)* 2018; 97(25):1-4.

10. Botti E, Spallone G, Caruso R, Monteleone G, Chimenti S, Costanzo A. Psoriasis, from pathogenesis to therapeutic strategies: IL-21 as a novel potential therapeutic target. *Curr Pharm Biotechnol* 2012;13(10):1861-7.
11. Picotto G, Liaudat AC, Bohl L, Tolosa de Talamoni N. Molecular aspects of vitamin D anticancer activity. *Cancer Invest* 2012;30(8):604-14.
12. Peric M, Koglin S, Dombrowski Y, Gross K, Bradac E, Büchau A, Steinmeyer A, Zügel U, Ruzicka T, Schaubert J. Vitamin D analogs differentially control antimicrobial peptide/"alarmin" expression in psoriasis. *PLOS One* 2009; 4(7):e6340.
13. Stanescu AM., Simionescu AA., Diaconu CC. Oral vitamin D therapy in patients with psoriasis. *Nutrients* 2021; 13(1):1-11.
14. Oakley A. PASI score. *DermaNet NZ* [Internet]. 2020; Available from: <https://dermnetnz.org/topics/pasi-score>.
15. Sachdeva S. Fitzpatrick skin typing: Applications in dermatology. *Indian J Dermatol Venereol Leprol* 2009;75:93-6.
16. Hettiaratchy S., Papini R. Initial management of a major burn: II--assessment and resuscitation. *BMJ* 2004; 329(7457):101-3.
17. Pitukweerakul S., Thavaraputta S., Prachuapthunyachart S., Karnchanasorn R. Hypovitaminosis D is associated with psoriasis: A systematic review and meta-analysis. *Kans J Med* 2019;12(4):103-8.
18. Al-Dhubaibi MS. Association between vitamin D deficiency and psoriasis: An exploratory study. *Int J Health Sci* 2018;12(1):33-39.
19. Maleki M. Nahidi Y. Azizahari S. Meibodi NT. Hadianfar A. Serum 25-OH vitamin D level in psoriatic patients and comparison with control subjects. *J Cutan Med Surg* 2015;20(3):207-10.
20. Allayali A. Niaz G. Al Hawasawi K. Fatani M. Siddiqui I. Baghdadi R. Al Sulimani H. Al Hawsawi W. Association between vitamin D deficiency and psoriasis: A case-control study. *J Clin Exp Dermatol Res* 2018;9(2):1-5.
21. Al Mutairi N. El Eassa B. Nair V. Measurement of vitamin D and cathelicidin (LL-37) levels in patients of psoriasis with co-morbidities. *Indian J Dermatol Venereol Leprol* 2013;79(4):492-6.
22. Khalil MA. Alta'ee AH. Al-Sultany HA. Al-Hattab MK. Vitamin D3 level and its receptor of patients with psoriasis: A case control study. *Euromediterranean Biomed J* 2018;13(34):150-4.
23. Cantorna MT. Vitamin D and autoimmunity: Is vitamin D status an environmental factor affecting autoimmune disease prevalence? *Proc Soc Exp Biol Med* 2000;223:230-3.
24. Barrea L. Savanelli MC. Somma C. Napolitano M. Megna M. Colao A. Savastano S. Vitamin D and its role in psoriasis: An overview of the dermatologist and nutritionist. *Rev Endocr Metab Disord* 2017;18(2):195-205.
25. Lee YH, Song GG. Association between circulating 25-hydroxyvitamin D levels and psoriasis, and correlation with disease severity: A meta-analysis. *Clin Exp Dermatol* 2018; 43(5):529-35.

IMJ 2022; 68(2): 83-89.