

Comparative Study of Vitamin D Level between Psoriatic Patients and Psoriatic Arthritis Patients

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ABSTRACT

Background Psoriatic arthritis (PsA) is a seronegative (rheumatoid factor-negative) usually Cyclic Citrullinated Peptide (CCP) antibody negative, immunologically triggered, chronic inflammatory joint disease within the framework of psoriasis. Psoriasis affects 2–4% of the general population. It is a common, chronic, relapsing/remitting, immune-mediated systemic disease characterized by skin lesions including red, scaly patches, papules and plaques, which usually itch. Vitamin D is actually a fat-soluble steroid prohormone that has endocrine, paracrine and autocrine functions.

Aim of the Work: To investigate the level of serum vitamin D in patients with psoriatic arthritis and compare it with patients with psoriasis to show if there is a role of vitamin D in development of arthritis in psoriatic patients or not.

Patients and Methods: This study is a cross sectional study in which fifty patients with psoriatic arthritis and psoriasis age range 16-50 years selected from those attending the outpatient clinic and inpatients of rheumatology, physical medicine & rehabilitation department, Al-Azhar university hospitals from 2017 to 2018 and divided into two groups: **Group (A):** (25) patients with psoriatic arthritis were diagnosed according to the criteria for psoriatic arthritis classification “CASPAR criteria”. **Group (B):** (25) patients with skin psoriasis. In this study we measured of 25 hydroxy vitamin D3 using commercial ELISA kits, ESR, CRP, CBC, Blood urea, serum creatinine, Liver enzymes (SGOT & SGPT), Serum uric acid, Fasting blood glucose, RF, urine analysis, ANA, HCV Ab and HIV Ab. Plain x-ray on both hands postero-anterior view, Plain x-ray on lumbosacral spine antero- posterior and lateral views and Plain x-ray on both sacroiliac joints “cone” view.

Results: There was female sex predilection in psoriatic arthritis group. Otherwise, both groups were comparable regarding age, BMI, residence, co-morbid diseases, disease characteristics, and laboratory investigations, except significant increase of WBCs and inflammatory markers (ESR and CRP) in psoriatic arthritis group. Diseases severity was mild in 72%, moderate in 22% and severe in 6.0%; and there was statistically significant increase of moderate and severe disease in PA when compared to psoriasis group. vitamin D was sufficient in 32.0%, insufficient in 34.0% and deficient in 34.0%; and there was no significant difference between psoriasis and PA groups. In addition, vitamin D levels were increased in psoriasis when compared to PA groups. However, the difference was statistically non-significant. No significant relation was found between vitamin D from one side and each of patient characteristics, laboratory investigations (except significant positive correlation with hemoglobin and RBCs), disease characteristics (except significant inverse (negative) correlation with disease duration and disease severity), X-ray findings, and psoriatic arthritis disease activity indices.

Conclusion: Vitamin D deficiency/insufficiency was common among psoriasis and psoriatic arthritis patients and the deficiency was significantly and inversely correlated with disease severity (PASI) and disease duration. Thus, is thought to play a role in development (or a consequence) of psoriasis. On the other hand, there was no correlation with PA disease activity and severity indices. Thus, the association seems to be linked to psoriasis proper. Vitamin D supplementation thought to have a potential therapeutic role in treatment of psoriasis.

Keywords: Psoriatic Arthritis, Psoriasis, Vitamin D.

INTRODUCTION

Psoriatic arthritis (PsA) is a seronegative (rheumatoid factor-negative) usually Cyclic Citrullinated Peptide (CCP) antibody negative, immunologically triggered, chronic inflammatory joint disease within the framework of psoriasis. PsA has many similarities to rheumatoid arthritis and other inflammatory joint diseases making the diagnosis more difficult. About one-fourth to one-

third of all psoriasis patients (depending on study design and population studied) develop musculoskeletal involvement typical for this disease. In about 20 % of patients inflammatory joint disease appears usually many years after the manifestation of skin disease. PsA can appear without or before the manifestation of cutaneous signs and symptoms. The male:female ratio is about 1:1.3⁽¹⁾.

Psoriasis affects 2–4% of the general population. It is a common, chronic, relapsing/remitting, immune-mediated systemic disease characterized by skin lesions including red, scaly patches, papules and plaques, which usually itch ⁽²⁾.

Vitamin D is actually a fat-soluble steroid prohormone that has endocrine, paracrine and autocrine functions. The endocrine effects of vitamin D are mainly involved in serum calcium homeostasis. The paracrine and autocrine effects of vitamin D depend on genetic transcription, unique to the type of cell expressing nuclear vitamin D receptors. These potential effects include inhibition of cell proliferation, promotion of cell differentiation, and apoptosis which may in turn have roles in cancer, immunity and many organ systems ⁽³⁾.

Autoimmune diseases are characterized by a loss of immune homeostasis resulting in corrupted self-antigen recognition followed by the destruction of body tissue by autoreactive immune cells. A combination of genetic predisposition, epidemiological and environmental risk factors contributes to the development of autoimmune diseases ⁽⁴⁾.

Compromised vitamin D status has been associated with an increased risk for Th1 cytokine-mediated autoimmune diseases, including insulin dependent diabetes mellitus (IDDM), multiple sclerosis (MS), inflammatory bowel disease and rheumatoid arthritis (RA) ⁽⁵⁾.

AIM OF THE WORK

The aim of this study is to investigate the level of serum vitamin D in patients with psoriatic arthritis and compare it with patients with psoriasis to show if there is a role of vitamin D in development of arthritis in psoriatic patients or not.

PATIENTS AND METHODS

This study is a cross sectional study in which fifty patients with psoriatic arthritis and psoriasis age range 16-50 years selected from those attending the outpatient clinic and inpatients of rheumatology, physical medicine & rehabilitation department, Al-Azhar university hospitals from 2017 to 2018 and divided into two groups: 1- (Group A): (25) patients with psoriatic arthritis were diagnosed according to the criteria for psoriatic arthritis classification "CASPAR criteria". 2- (Group B): (25) patients with skin psoriasis.

An informed consent was taken by each patient before the procedure. **The study was**

approved by the Ethics Board of Al-Azhar University.

Patient's selection

Inclusion criteria:

1-Patients with psoriatic arthritis diagnosed as CASPAR criteria which include: Evidence of psoriasis (current, past or family): two points if current history of psoriasis, one point others. Psoriatic nail dystrophy: one point. Negative rheumatoid factor: one point. Dactylitis (current or past history): one point. Radiographic evidence of juxtaarticular new bone formation: one point. Three or more points have 99% specificity and 92% sensitivity for diagnosis of psoriatic arthritis.

2-Patients with psoriasis symptomized from: Red, raised and inflamed patches of skin. Silver-white scales or plaques on the red patches. Dry skin that may crack and bleed. Soreness around patches. Itching and burning sensations around patches. Thick and pitted nails.

Exclusion criteria:

1-Other forms of inflammatory arthritis as Rheumatoid Arthritis and the other seronegative spondyloarthropathies (Ankylosing Spondylitis, Reactive Arthritis and Inflammatory bowel disease associated Arthritis) particularly when patients have sacroiliitis and enthesitis.

2-Patients with other chronic diseases which might have relation with vitamin D deficiency (as hepatic and renal disease or failure).

3-Patients with drugs which might have relation with vitamin D deficiency (as anti epileptic drugs as carbamazepine, rafimpicin, isoniazid , anti fungal drugs as ketoconazole and steroids).

4-HCV and HIV patients.

5-Pregnancy and lactating women.

Methods:

For every patient included in the study, the following items were fulfilled:

Detailed history including: Personal history: Name, age, sex, residence, occupation, family history, marital status, drug intake, associated faulty habits or life style, precipitating factors, seasonal variation, presence of any systemic disease.

Present history: Onset, course, duration.

General physical examination to determine any other systemic disease that may be related to condition.

Complete Locomotor and dermatological examination to detect the lesions and the distribution all over the body.

Laboratory investigations including measurement of 25 hydroxy vitamin D3 using commercial ELISA kits. ESR: using western green tubes method. CRP using latex agglutination test. Complete blood count : using automated cell counter. Blood urea , serum creatinine , Liver enzymes (SGOT & SGPT), Serum uric acid and Fasting blood glucose by spectrophometric method. Rheumatoid factor using latex agglutination test. Complete urine analysis by microscopic examination. ANA by ELISA.

HCV abs and HIV by ELISA.

Radiology: Plain x-ray on both hands postero-anterior view. Plain x-ray on lumbosacral spine antero- posterior and lateral views. Plain x-ray on both sacroiliac joints “cone” view.

Statistical analysis: All data were collected, tabulated and statistically analyzed using SPSS 22.0 for windows (SPSS Inc., Chicago, IL, USA) & MedCalc 13 for windows (MedCalc Software bvba, Ostend, Belgium).

Continuous Quantitative variables e.g. age were expressed as the mean ± SD & median (range), and categorical qualitative variables were expressed as absolute frequencies (number) & relative frequencies (percentage).

Continuous data were checked for normality by using Shapiro Walk test. Independent samples Student's t-test was used to compare two groups of normally distributed data while Mann-Whitney U test was used for non-normally distributed data. One Way ANOVA test was used to compare more than two groups of normally distributed data while Kraskall Wallis H test was used for non-normally distributed data. Categorical data were compared using Chi-square test or Fisher's exact test when appropriate.

Spearman's rank correlation coefficient was calculated to assess correlations between study parameters. We consider (+) sign as indication for direct correlation i.e. & (-) sign as indication for inverse correlation, also we consider values near to 1 as strong correlation & values near 0 as weak correlation.

All tests were two sided. p-value < 0.05 was considered statistically significant, p-value < 0.001 was considered highly statistically significant, and p-value ≥ 0.05 was considered non statistically significant.

RESULTS

Table (1): Patient characteristics of studied populations.

Variable	Psoriasis	Psoriatic A	Total	P value	
Age (years)	31.60±8.25	31.96±8.66	31.78±8.37 18-52	0.88(ns)	
Sex	Male	17(68.0%)	9(36.0%)	26(52.0%)	0.024*
	Female	8(32.0%)	16(64.0%)	24(48.0%)	
BMI(kg/m2)	26.74±1.52	27.00±1.11	26.87±1.32; 23.62 – 30.07	0.49(ns)	
Residence	Rural	15(60.0%)	13(52.0%)	28(56.0%)	0.38(ns)
	Urban	10(40.0%)	12(48.0%)	22(44.0%)	
Smoking	5(20.0%)	7(28.0%)	12(24.0%)	0.37(ns)	
Hypertension	5(20.0%)	9(36.0%)	14(28.0%)	0.17(ns)	

In the present work, patient age ranged from 18 to 52 years, and there was no significant difference between psoriasis and PA groups. Patient gender distribution revealed that, 52.0% were males and 48% were females, and there was significant increase of females in psoriatic arthritis group when compared to psoriasis group (64.0% vs 32.0% respectively). However, there was no significant difference between both groups as regard to BMI, residence, smoking and hypertension.

Table (2): Clinical data of studied populations.

		Psoriasis		PA		Total		P value
		N	%	N	%	N	%	
Disease duration	< 5 years	15	60.0%	12	48.0%	27	54.0%	0.56 (ns)
	5-10 years	6	24.0%	6	24.0%	12	24.0%	
	> 10 years	4	16.0%	7	28.0%	11	22.0%	
Onset	Sudden	12	48.0%	15	60.0%	27	54.0%	0.28 (ns)
	Gradual	13	52.0%	10	40.0%	23	46.0%	
Type	Plaque	19	76.0%	19	76.0%	38	76.0%	0.92 (ns)
	Guttate	4	16.0%	3	12.0%	7	14.0%	
	Inverse	1	4.0%	1	4.0%	2	4.0%	
	Pustular	1	4.0%	2	8.0%	3	6.0%	
Course	Progressive	16	64.0%	19	76.0%	35	70.0%	0.31 (NS)
	stationary	7	28.0%	6	24.0%	13	26.0%	
	Regressive	2	8.0%	0	.0%	2	4.0%	
Family history	Positive	6	24.0%	7	28.0%	13	26.0%	0.50 (ns)
	Negative	19	76.0%	18	72.0%	37	74.0%	
Nail affection	Positive	5	20.0%	10	40.0%	15	30.0%	0.11 (ns)
	Negative	20	80.0%	15	60.0%	35	70.0%	
Arthritis	Oligoarticular			14	56.0%			
	Polyarticular			11	44.0%			

In the present work, disease duration was less than 5 years in 54%, from 5- 10 years in 24% and more than 10 years in 22.0%; the disease onset was sudden in 54% and gradual in 46.0%; the plaque type was reported in 76%, guttate in 14%, inverse in 4.0% and pustular in 6.0%; the course was progressive in 70.0%, stationary in 26% and regressive in 4.0%; the family history was positive

in 26%; nails were affected in 30.0% and psoriatic arthritis was oligoarticular in 56% and polyarticular in 44%.

Table (3): DIP joint in hand X-ray in psoriatic arthritis.

	N	%
Narrowing	10	40.0
Sclerosis	6	24.0
Erosion	6	24.0
Periostitis	3	12.0
Total	25	100.0

Hand- x ray examination revealed narrowing in 40%, sclerosis in 24%, erosion in 24% and periostitis in 12% of DIP joint of those with psoriatic arthritis.

Table (4): Sacroiliac X ray in psoriatic arthritis.

	N	%
Normal	19	76.0
Blurring	2	8.0
Pseudowidening	2	8.0
Sclerosis	1	4.0
Ankyloses	1	4.0
Total	25	100.0

Sacroiliac joint examination by X-ray revealed was normal in 76% of patients, showed blurring in 8%, pseudowidening in 8.0%, sclerosis in 4.0% and ankyloses in 4.0%.

Table (5): Laboratory data of studied populations.

	PSORIASIS		PA		P VALUE
	Mean	SD	Mean	SD	
RBCs x10 ⁶ /cc	4.11	0.22	4.09	0.17	0.70(ns)
Hg (g/dl)	11.91	0.60	11.82	0.49	0.56(ns)
WBCs x10 ³ /cc	6.39	1.01	7.06	0.86	0.015*
Platelets x10 ³ /cc	258.08	22.37	260.00	24.25	0.77(ns)
Urea (mg/dl)	15.88	1.92	16.20	2.91	0.64(ns)
Creatinine (mg/dl)	0.67	0.17	0.73	0.14	0.19(ns)
SGOT (U/ml)	19.28	1.67	20.08	1.65	0.09(ns)
SGPT (U/ml)	24.12	2.55	23.60	2.41	0.46(ns)
Fasting blood sugar (mg/dl)	114.16	13.39	118.08	16.79	0.36(ns)
ESR	Normal	16(64.0%)	7(28.0%)		0.011*
	Elevated	9(36.0%)	18(72.0%)		
CRP	Normal	14(56.0%)	5(20.0%)		0.009*
	Elevated	11(44.0%)	20(80.0%)		
Uric acid	Normal	19(76.0%)	16(64.0%)		0.26 (ns)
	Elevated	6(24.0%)	9(36.0%)		

In the present work, there was no significant difference between psoriasis and psoriatic arthritis as regard to laboratory data, except significant decrease of WBCs in psoriasis when compared to psoriatic arthritis (6.39±1.01 vs 7.06±0.86 respectively).

In the present study, there was statistically significant increase of elevated ESR, elevated CRP in psoriasis arthritis group when compared to psoriasis group (72.0%, 80.0%, vs 36.0%, 44.0%

and respectively); while there was no significant difference between both groups as regard to serum uric acid.

Table (6): Psoraitic disease severity in studied populations.

		Group				Total		P value
		Psoriasis		PA		n	%	
		n	%	n	%			
Severity	Mild	21	84.0%	15	60.0%	36	72.0%	0.050*
	Moderate	4	16.0%	7	28.0%	11	22.0%	
	Severe	0	0.0%	3	12.0%	3	6.0%	
PASI (mean ±SD)		7.61±2.79		10.73±5.28		9.17 ±4.47		0.012*

As regard to disease severity, it was mild in 72%, moderate in 22% and severe in 6.0%; and there was statistically significant increase of moderate and severe disease in PA when compared to psoriasis group (28.0%, 12.0% vs 16.0% and 0.0% respectively). In addition, the mean PASI score was significantly increased in PA when compared to psoriasis group (10.73±5.28 vs 7.61±2.79 respectively).

Table (7): Vitamin D in studied populations.

		Group				Total		P value
		Psoriasis		PA		N	%	
		N	%	N	%			
Vitamin D	Sufficient	10	40.0%	6	24.0%	16	32.0%	0.28 (ns)
	Insufficient	9	36.0%	8	32.0%	17	34.0%	
	Deficient	6	24.0%	11	44.0%	17	34.0%	
Vitamin D		26.11±5.97		22.83±8.40		24.47±7.40		0.12(ns)

As regard to vitamin D, it was sufficient in 32.0%, insufficient in 34.0% and deficient in 34.0%; and there was no significant difference between psoriasis and PA groups. In addition, vitamin D levels were increased in psoriasis when compared to PA groups. However, the difference was statistically non-significant.

Table (8): Psoriatic arthritis severity indices.

	Mean	SD	Minimum	Maximum
BASDAI	2.48	0.51	2.00	3.00
BASFI	2.60	0.50	2.00	3.00
BASMI	1.64	0.56	1.00	3.00

As regard to BASDAI, it was ranged from 2 to 3, the mean value was 2.48±0.51; while BASFI ranged from 2 to 3, the mean value was 2.60±0.50 and BASMI ranged from 1 to 3, the mean value was 1.64±0.56.

Table (9): Vitamin D in relation to age, BMI, and laboratory data.

	Vitamin D	
	r	p
Age	-0.06	0.67
BMI	-0.07	0.62
RBCs	0.29	0.038*
Hemoglobin	0.28	0.48*
WBCs	-0.07	0.62
Platelets	-0.09	0.52
Urea	-0.17	0.22

Creatinine	-0.14	0.30
SGOT	0.05	0.71
SGPT	0.25	0.07
Fasting blood glucose	0.03	0.83

In the present study, there was proportional (positive), statistically significant, moderate correlation between vitamin d and each of RBCs and hemoglobin. Otherwise, there was no significant difference between vitamin D and age, BMI, WBCs, platelets, urea, creatinine, SGOT, SGPT and fasting blood glucose.

Table (10): VitaminD in relation to clinical data

		Mean	SD	Mini.	Maxi.	P value
Disease duration	< 5 years	27.17	6.75	13.10	36.20	0.011*
	5-10 years	22.62	6.81	8.40	31.90	
	> 10 years	19.86	7.18	9.40	35.20	
Onset	Sudden	24.35	6.93	8.40	35.20	0.90 (ns)
	Gradual	24.61	8.07	9.40	36.20	
Type	Plaque	23.54	7.39	8.40	36.20	0.37(ns)
	Guttate	28.90	5.84	17.90	34.10	
	Inverse	25.45	10.53	18.00	32.90	
	Pustular	25.30	9.24	16.90	35.20	
Course	Progressive	24.12	7.75	8.40	36.20	0.36 (ns)
	stationary	24.28	6.64	14.10	33.90	
	Regressive	31.80	0.14	31.70	31.90	
Family History	Positive	24.45	8.72	9.40	35.10	0.99 (ns)
	Negative	24.48	7.01	8.40	36.20	
Nail affection	Positive	24.54	7.33	14.10	36.20	0.96 (ns)
	Negative	24.44	7.54	8.40	35.20	

In the present study, there was statistically significant decrease of vitamin D with increased disease duration (inverse correlation). However, there was no significant relation between vitamin D and disease onset type, course, family history or nail affection.

Table (11): Vitamin D in relation to type of arthritis, and X-ray in PA

		Mean	SD	Mini.	Maxi.	p
Type of Arthritis	Oligoarticular	25.46	7.28	15.80	36.20	0.08
	Polyarticular	19.47	8.85	8.40	34.10	
Hand X - ray	Narrowing	22.37	8.04	9.40	35.20	0.86
	Sclerosis	21.88	11.01	8.40	35.10	
	Erosion	25.45	8.76	15.20	36.20	
	Periostitis	21.00	5.63	17.50	27.50	
Sacroiliac X - ray	Normal	23.71	8.76	9.40	36.20	0.63
	Blurring	16.08	10.86	8.40	23.76	
	Pseudowidening	24.20	1.41	23.20	25.20	
	Sclerosis	25.50		25.50	25.50	
	Ankylosis	14.10		14.10	14.10	

In the present work, there was no significant relation between vitamin D from one side and each of type of arthritis, Hand x-ray findings and sacroiliac x ray findings.

Table (12): Vitamin D in relation to psoriatic disease severity.

	Mean	SD	Minimum	Maximum	P value
Mild	26.06	6.67	8.40	35.20	0.026*
Moderate	21.49	8.54	9.40	36.20	
Severe	16.33	2.01	14.10	18.00	

Total	24.47	7.40	8.40	36.20
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In the present study, there was statistically significant decrease of vitamin D levels with increased disease severity.

Table (13): Vitamin D in relation to ESR, CRP and uric acid.

		Mean	SD	Minimum	Maximum	P value
ESR	Normal	25.08	7.43	8.40	35.20	0.59
	Elevated	23.94	7.47	9.40	36.20	
CRP	Normal	25.57	6.98	13.10	35.20	0.41
	Elevated	23.80	7.68	8.40	36.20	
Uric acid	Normal	24.82	7.52	8.40	35.20	0.61
	Elevated	23.65	7.30	9.40	36.20	

In the present study, there was no significant relation between vitamin D and each of ESR, CRP and uric acid.

Table (14): Correlation between vitamin D and psoriatic arthritis severity indices.

	Vitamin D	
	r	P
BASDAI	-0.19	0.36
BASFI	-0.17	0.41
BASMI	-0.13	0.51

In the present work, there was no significant relation between vitamin D and each of BASDAI, BASFI and BASMI.

DISCUSSION

In the present work, patient age ranged from 18 to 52 years, and there was no significant difference between psoriasis and PA groups (it was 31.60±8.25 and 31.96±8.66 in psoriasis and PA groups respectively). Patient gender distribution revealed that, 52.0% were males and 48% were females, and there was significant increase of females in psoriatic arthritis group when compared to psoriasis group (64.0% vs 32.0% respectively).

Results of the present work are comparable to those reported by *Ibrahim et al.*⁽⁶⁾ who included thirty psoriatic arthritis patients (21female,9 male) with age range from 17–67 years (mean age 35.03± 15.56).

In addition, results of the present work regarding PA patients are in agreement with *Braun et al.*⁽⁷⁾ who found that most of patients were females.

In the study by *Baskan et al.*⁽⁸⁾, the mean age of the 52 PsA patients (23 males, 29 females) was 41.9 ± 8.4 years. This age is higher than the present work and this reflects the early development of disease. However, the sex

distribution is comparable between both studies, as there was increase of female sex predilection in psoriatic arthritis group.

In the present work, the disease duration in PA group was < 5 years in 48%, 5-10 years in 24% and > 10 years in 28%, while in psoriasis group 60% had disease duration < 5 years, 24% had duration 5-10 years and 16% had duration > 10 years with no significant difference between both groups. These results are comparable to that reported by *Ibrahim et al.*⁽⁶⁾ who reported that, in psoriatic arthritis, 46.7% of selected patient below 5 years duration of disease while 30% of selected patient from 5-10 years and 23.3% of selected patient above 10 years.

In addition, *Allayali et al.*⁽⁹⁾ from Saudi Arabia reported that, the average years for patients having psoriasis was 7.75 years

In the present work, the plaque type was reported in 76%, guttate in 14%, inverse in 4.0% and pustular in 6.0%. The disease onset was sudden in 54% and gradual in 46.0%; the family history was positive in 26%; nails were affected in 30.0% and psoriatic arthritis was oligoarticular in 56% and polyarticular in 44%.

These results are comparable to those reported by *Allayali et al.*⁽⁹⁾ who reported that, fifty eight cases of psoriasis patients had plaque Psoriasis (85.3%). They added, there was no significant difference between cases and control regarding comorbid condition, type of comorbid condition. However, only 4% in their work had positive family history, which is so lower than the present study.

Sacroiliac joint examination by X-ray revealed was normal in 76% of patients, showed blurring in 8%, pseudowidening in 8.0%, sclerosis in 4.0% and ankyloses in 4.0%. Thus, the total rate of abnormalities was 24% and this slightly higher than that reported by *Baskan et al.*⁽⁸⁾ in psoriatic arthritis patients and reported that, the vertebral deformity ratio was 19.2% in the PsA group, however, they included all deformities in both thoracic, lumbar and sacroiliac regions and this can explain their increased rate of deformities when compared to the present work.

Conversely, *Ibrahim et al.*⁽⁶⁾ reported that, in X-Ray sacroiliac joint, they found 23.3% of patients have blurring of sacroiliac joint, 16.7% of patients have Pseudowidening, 13.3% of patients with sclerosis of sacroiliac joint and 10% of patients have Ankylosis of joint. These data reflected high percentages of abnormalities in their study.

As regard to vitamin D, it was sufficient in 32.0%, insufficient in 34.0% and deficient in 34.0%; and there was no significant difference between psoriasis and PA groups. In addition, vitamin D levels were increased in psoriasis when compared to PA groups. However, the difference was statistically non-significant. These results are comparable to previous work showed lower vitamin D levels to be found in patients with psoriasis and psoriatic arthritis *Touma et al.*⁽¹⁰⁾; *Gisondi et al.*⁽¹¹⁾.

Zuchi et al.⁽¹²⁾ found that only 2 cases and 4 controls presented sufficient levels of vitamin D. Including all of the participants in the study, the median vitamin D level was 22.80±4.60 and it was lower in those that were exposed to sunlight for less than 30 minutes per day.

In addition, a study with 121 patients who had inflammatory joint disease (22 psoriatic arthritis) revealed that, the levels of 25(OH)-D3 in the patient group was lower than the levels observed in the control group *Braun et al.*⁽⁷⁾.

Furthermore, *Braun and his collages*⁽⁷⁾ found a high incidence of vitamin D deficiency in their patients. Also, *Ibrahim et al.*⁽⁶⁾ found a significant Vitamin D deficiency in psoriasis patients (skin psoriasis) (52.6) and insufficiency in (9.1%) and normal in (18.2%) while in the study done by *Molina and his collages* in 2012 they found significant Vitamin D deficiency in psoriatic arthritis.

In the present study, there was no significant difference between psoriasis and psoriatic arthritis as regard to serum vitamin D levels. However, there was significant positive correlation between vitamin D levels and each of hemoglobin and RBCs, and there was inverse correlation between vitamin D and each of disease duration and disease severity (PASI score).

These results are comparable to those reported by *Morimoto et al.*⁽¹³⁾ who found an inverse relationship between the severity of psoriasis and 1,25[OH]2D levels in 34 patients. In addition, *Ricceri et al.*⁽¹⁴⁾ found that 68% of psoriasis patients were 25[OH]D deficient. They reported a negative correlation with psoriasis area severity index (PASI).

Also, *Chandrashekar et al.*⁽¹⁵⁾ assessed the levels of 25[OH]D, in patients with psoriasis versus controls. The PASI correlated negatively with 25[OH]D levels, as found in the present study.

Kincse et al.⁽¹⁶⁾ analysed 25[OH]D levels in 72 patients with psoriasis and psoriatic arthritis. An

inverse correlation between 25[OH]D level and skin severity as well as severity of psoriatic arthritis was identified. However, in the present study, no significant correlation was found between serum levels of vitamin D and psoriatic arthritis severity indices.

In addition, *Osmancevic et al.*⁽¹⁷⁾ found that the PASI score correlated negatively with serum level of 25 (OH) vitamin D.

On the other hand, *Atwa et al.*⁽¹⁸⁾ reported that, 25[OH]D levels did not correlate with psoriasis severity as assessed by PASI. This results are in contradiction to the present study and may be explained by different inclusion criteria.

Vitamin D plays a critical role in psoriasis, and this is evidenced in many studies which reported either a deficiency or insufficiency of serum vitamin D in psoriatic patients *Mattozzi et al.*⁽¹⁹⁾; *Maleki et al.*⁽²⁰⁾.

Several case-control studies have shown significant lower levels of serum 25(OH)D in psoriatic patients compared to controls and reported an inverse correlation between serum 25(OH)D and the severity of the disease^(15,21,22). These results are comparable to that of the present study.

On the other hand, in a population-based screening, *Wilson*⁽²³⁾ showed that vitamin D deficiency is not common in psoriatic patients and that there is no significant difference in serum 25(OH)D levels in subjects with or without psoriasis. This can be explained by the fact that, the 25(OH)D level varies with several factors, including race, dietary intake, and UV light exposure. In addition, vitamin D insufficiency is a common finding in normal populations.

In the present work, there was no significant relation between vitamin D levels and each of sex, residence, smoking, hypertension and diabetes. In addition, there was no significant relation between vitamin D and disease onset type, course, family history or nail affection. Furthermore, there was no significant correlation between vitamin D and age, BMI, WBCs, platelets, urea, creatinine, SGOT, SGPT and fasting blood glucose. These results are in agreement with *Ibrahim et al.*⁽⁶⁾ who reported that, there was no significant statistical difference between vitamin D levels in relation to sex, and *Braun et al.*⁽⁷⁾ who reported that, there was no significant statistically correlations between 25(OH)D and gender, type of disease, season (winter and summer) and type of treatment. Older patients (age>60 years) had lower levels of 25(OH)D, but the correlation was of not significant.

In the present work, patients with elevated ESR had a low levels of serum vitamin D when compared to cases with normal ESR (23.94±7.47 vs 25.08±7.43 respectively). However, the difference was statistically non significant and thus there was no significant correlation between vitamin D and ESR. These results are in contradiction in those reported by *Ibrahim et al.*⁽⁶⁾ who reported that, 70% of their patients with elevated ESR have deficiency in vitamin D level, 15% of patients have insufficiency and 15% of patients have normal vitamin D level. However, results of the present work go in agreement with *Braun et al.*⁽⁷⁾ They found that no significant statistically correlations between vitamin D level, in relation to ESR.

In the present work, patients with elevated CRP had lower levels of vitamin D when compared to patients with normal CRP (23.80±7.68 vs 25.57±6.98 respectively). However, the difference was statistically non-significant. These results are in accordance with *Molina et al.*⁽²⁴⁾ and *Ibrahim et al.*⁽⁶⁾ who reported that, there was no significant statistical difference between vitamin D levels in relation to CRP and there was no correlation between vitamin D levels in relation to CRP.

CONCLUSION

Vitamin D deficiency/insufficiency was common among psoriasis and psoriatic arthritis patients and the deficiency was significantly and inversely correlated with disease severity (PASI) and disease duration. Thus, it is thought to play a role in development (or a consequence) of psoriasis. On the other hand, there was no correlation with PA disease activity and severity indices. Thus, the association seems to be linked to psoriasis proper. Vitamin D supplementation thought to have a potential therapeutic role in treatment of psoriasis.

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