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Original Research Article

Role of dual energy X-ray absorptiometry scan for assessing bone mineral density in patients with chronic plaque psoriasis: a cross-sectional study

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ABSTRACT

Background: Psoriasis is a T cell mediated chronic inflammatory disorder of skin, joints and immune system. Data regarding possible association between psoriasis and reduced bone mineral density are limited and hence association is not fully conclusive. Systemic inflammatory cytokines in the psoriasis have been identified in the pathogenesis of reduced bone mineral density. Among various available methods, Dual X-ray absorptiometry (DXA), found to be gold standard for assessing bone mineral density.
Methods: An observation study of 30 patients with chronic plaque psoriasis aged between 18 years to 50 years fulfilling the criteria were enrolled and studied. Dual energy X-ray absorptiometry scan (DEXA) of left forearm radius (non-dominant hand) was done. T score was calculated and bone mineral density assessed based on WHO criteria. Using software SPSS version 24, Pearson's correlation and linear regression analysis applied.
Results: Out of 30 patients, there were 18 males and 12 females. Mean age of patients 37.93 years. Majority of the psoriatic patient showed osteopenia on DEXA scan and significant positive correlation was found between duration of psoriasis disease (r=0.34, p=0.03), body surface area percentage (r=0.36, p=0.04) and body mass index (r=0.32, p=0.02).
Conclusions: Early identification of reduced bone mineral density in patients with psoriasis particularly in those with longer duration of the disease, involving large body surface area (more than 10) and with higher body mass index by DEXA scan helps to reduce osteoporotic fracture and other associated comorbidities.

Keywords: Psoriasis, Bone mineral density, Osteoporosis, Dual energy X-ray absorptiometry

INTRODUCTION

Psoriasis is a chronic, recurrent skin disorder characterized histologically by cutaneous inflammation, increased epidermal proliferation, hyperkeratosis, angiogenesis, abnormal keratinization, shortened maturation time and parakeratosis. Considering available reasons of psoriasis, the main reason is not known but several factors such as family records and accompanying with some human leukocytes antigens has been mentioned.[1]

Intracellular calcium plays an important part in the regulation of proliferation and differentiation of

keratinocytes.[1] Vitamin D deficiency is very frequent in patients with chronic plaque psoriasis. The reason for higher prevalence of vitamin D deficiency in patients with psoriasis is not clear. Substantial evidence suggest that vitamin D plays a pivotal role in modulating dendritic cell function and regulating keratinocytes and T cell proliferation.[2]

Reduced bone mineral density is the major risk factor for osteoporotic fracture has been linked to palmoplantar and pustular psoriasis, but no significant studies have examined bone mineral density in chronic plaque psoriasis. Increased alcohol consumption, cigarette smoking and long term therapy with systemic corticosteroids in patients with chronic plaque psoriasis have the potential to adversely affect bone mineral density. Conflicting evidence exist for psoriatic arthropathy, methotrexate and retinoid therapy being associated with osteoporosis. Bone mineral density is an important marker of fracture risk.[3]

Several mechanisms may be implicated as a possible cause for association between psoriasis and osteoporosis, such as systemic inflammation, anti-psoriatic drug intake and joint dysfunction for psoriatic arthritis. Several mechanisms may be implicated in the association between psoriasis and osteoporosis, such as the elevated systemic levels of inflammatory cytokines (interferon-ɣ, interleukin-6, tumour necrosis factor-α), use of anti-psoriatic drugs (corticosteroids, methotrexate, cyclosporine) and prolonged immobilization due to joint dysfunction and severe pain for patients suffering from psoriatic arthritis.[4]

The most frequent extra-cutaneous association with psoriasis is arthritis. Because pro-inflammatory cytokines are increased in psoriasis, patients with this disease may be more prone to osteoporosis than the healthy individuals.[5]

The objectives of the present study were to study the bone mineral density in association with chronic plaque psoriasis.

METHODS

A cross sectional hospital based study was conducted in the Department of Dermatology, Bangalore medical college and research Institute, Bangalore from November 2016 to May 2018. Total 30 male and female adult patients aged between 18 and 50 years presenting with clinical signs and symptoms of chronic plaque psoriasis involving >10% body surface area and duration of disease >1 year were included in our study and those with history of corticosteroid therapy, hormone replacement therapy, thyroxine or vitamin D3 or calcium supplementation over past 3 months, history of known primary hyperparathyroidism, thyroid disease, renal failure, malabsorption, malignancy, chronic alcoholic patients and pregnant and lactating mothers are excluded.

Detailed history including name, age, sex, address, contact number, occupation, marital status, menstrual history in females, diet history, history of alcohol intake, family history of psoriasis vulgaris, physical activity, Ultraviolet radiation exposure, lifestyle, medical history, and history of medications were noted. Height, weight, body mass index and body surface area involved were assessed.

Dual energy X-ray absorptiometry (DEXA) scan of left forearm radius (non-dominant hand) was done. T score was calculated and bone mineral density assessed based on WHO criteria. We have applied Pearson's correlation and linear regression analysis using software SPSS version 24.

RESULTS

In our total 30 study population, 18 patients were males (60%) and 12 patients were females (40%). Male to female sex ratio was 1.5. Youngest age of patient was 20 years and maximum age was 49 years. About one third of the psoriatic patients were overweight (33.3%). Minimum and maximum weight of the patient is 52 kg and 85 kg respectively. Minimum height of the patient was 147 cm and maximum height found to be 175 cm. Among 30 patients, minimum duration of the disease was 1 year and maximum duration was 15 years. Body surface area of psoriasis disease involved in our study ranged from 11-24%. Body mass index of study population ranged from 22.5 to 33.3 kg/m^2. Majority of the patients showed osteopenia and found a positive correlation between osteopenia and duration of the disease (r=0.34, p=0.03) body surface area (r=0.36, p=0.04) and body mass index (r=0.32, p=0.02).

Table 1: Mean value of the variables.

	Mean	SD	Minimum	Maximum
Age (in years)	37.93	7.952	20	49
Body weight (in kg)	68.30	7.897	52	85
Height (in cm)	159.43	8.037	147	175
Duration (in years)	4.340	3.3507	1.0	15.0
BSA (%)	15.23	3.471	11	24
BMI (kg/m^2)	26.4	3.22	22.5	33.3

Table 2: Correlation between variables and DEXA scan score.

	DEXA (T score of left forearm radius)	
	R value	P value
Age (in years)	0.32	0.81
Body weight	0.26	0.15
Height	0.17	0.36
Duration (in years)	0.34	0.03*
BSA (%)	0.36	0.04*
BMI	0.32	0.02*

Spearman's correlation, sig. 2-tailed, p<0.05.

Table 3: Linear regression model for DEXA scan with age, BSA% and duration.

Model	R	R square	Adjusted R square	Std. error of the estimate	Change statistics		
					R square change	F change	Sig. F change
BSA (%)	.376[a]	.141	.085	1.0924	.141	3.704	0.035*
BMI	.321	.133	0.74	1.0823	.133	2.785	0.007*
Age (y)	.353[b]	.125	.060	1.1075	.008	.241	.627
Duration (y)	.390[c]	.152	.054	1.1107	.028	.847	.366

Predictors: (constant), BSA (%); Predictors: (constant), BSA (%), age (in years); Predictors: (constant), BSA (%), age (in years), duration (in years).

DISCUSSION

Psoriasis is an immunologically mediated, chronic inflammatory disease of the skin and joints. The disease is mainly characterized by increased cytokine production in the skin due to a combination of environmental and genetic factors. Increased cytokine expression in these patients promotes a pro-osteoclastogenic milieu which may promote bone loss.[6]

Psoriasis found to be associated with many other disorders like arthritis, immunobullous disorders, vitiligo, metabolic syndrome and synovitis, acne, pustulosis, hyperostosis, and osteitis (SAPHO) syndrome etc.[7]

In our study, out of total 30 patients, 18 patients were male constituting 60% of study population, 12 patients were female accounting for 40% of total study population. Male to female ratio in our study group is 1.5:1. This was similar to study by Affandi et al, have shown higher incidence among males.[8]

In our total study population of 30, age of the patient ranged from minimum 20 years to maximum of 49 years, with mean age of total study population is 37.93 years. Affandi et al, in his study found mean age was 35.14 years.[8] Compared to study conducted by Affandi et al the mean age of study population in our study is found to be higher.

In our study, majority of the psoriatic patient showed osteopenia on DEXA scan and significant positive correlation was found between duration of psoriasis disease (r=0.34, p=0.03), body surface area percentage (r=0.36, p=0.04) and body mass index (r=0.32, p=0.02). D'Epiro et al, in his study found that duration of psoriasis was significantly longer in patients with osteopenia or osteoporosis compared to psoriasis patients with normal T-score (p=0.04).[4] P value in this study was comparable to our study. Kathuria et al, conducted a study on association of psoriasis and psoriatic arthritis with osteoporosis and pathological fractures.[9] Study showed psoriasis and psoriatic arthritis were associated with osteopenia, osteoporosis, ankylosing spondylitis and pathologic fractures. Kastelan et al, suggested a possible association of psoriasis and reduced bone mineral density secondary to increased TNF-α and IL-6 concentrations.[10] Uluckan et al**,** found that bone loss in psoriasis patients is due to IL-17-mediated inhibition of Wnt signaling in osteoblasts.[11]

Kocijan et al, in their study on quantitative and qualitative changes of bone in psoriasis and psoriatic arthritis patients found out that in psoriatic patients with longer duration of the disease are more prone to develop bone loss.[12] Similarly in our study we found correlation between the duration of the disease and decreased bone mineral density.

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