Acta Derm Venereol 2008; 88: 240–246

CLINICAL REPORT

Risk Factors for Osteoporosis and Bone Status in Postmenopausal Women with Psoriasis Treated with UVB Therapy

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The aims of this study were to examine whether postmenopausal women with psoriasis who were exposed to regular ultraviolet light B (UVB) therapy had greater bone mineral density than women of similar age from the same region, and to estimate the influence of risk factors on bone status. A total of 35 randomly selected women, age (mean ± SD) 69.3 ± 6.29 years (age range 60–82 years), with active psoriasis, mean onset at 37.0 years (± 23.5 SD) were studied. The patients had been previously exposed to broadband or narrowband UVB. Age-matched, women (*n* = 2448) from Göteborg, examined at the Geriatric out-patient clinic during the years 2001 and 2002, were used as controls. Bone mineral density was examined by Dual-Energy X-ray Absorptiometry (Hologic Delphi A) at the hip and the lumbar spine. Medical history and lifestyle factors were assessed with a questionnaire. Postmenopausal women with psoriasis were found to have higher bone mineral density than age-matched controls. Higher body weight, physical activity and UVB exposure could explain this finding. *Key words: bone mineral density; psoriasis; UVB therapy.*

(Accepted September 24, 2007.)

Acta Derm Venereol 2008; 88: 240–246.

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Psoriasis is a common skin disease that usually has a chronic course. Many patients with psoriasis have been treated with ultraviolet light B (UVB) once or several times a year, often during autumn, winter and spring (i.e. the seasons when the disease usually gets worse). Lack of sun, especially UVB, in Sweden during the winter period, can be a contributing factor to the severity of psoriasis. Most patients with psoriasis describe favourable effects of summer, sunlight, and pregnancy, and adverse effects of winter and stress (1).

The influence of environmental factors regarding the quality and quantity of terrestrial ultraviolet radiation (UVR) is important when trying to optimize conditions for climatic therapy of skin diseases (2).

UVB irradiation inhibits cellular proliferation, and induces apoptosis, systemic immune suppression and synthesis of vitamin D. The same wavelength range of UVB (290–315 nm) induces synthesis of vitamin D and improves psoriasis. The serum concentrations of the vitamin D metabolite calcidiol (25-hydroxyvitamin D (25(OH)D)), shows clear seasonal variation, with a maximum in late summer and a minimum at the end of winter (3). The extent of this seasonal variation depends on the latitude, and thus the intensity of sunlight striking the exposed skin (4, 5). UVB-stimulated production of vitamin D in the skin can have beneficial effect on bone status.

Information about the prevalence of osteoporosis among patients with psoriasis and the epidemiology of risk factors for osteoporosis in this group is sparse. Previous studies did not detect any differences in bone mineral density (BMD) between patients with psoriasis and healthy controls (6). It is not known if psoriasis itself has any impact on bone metabolism.

The aim of this study was to examine BMD and factors contributing to osteoporosis in a group of postmenopausal women with psoriasis who had been exposed to UVB therapy, in comparison with an age-matched population sample.

MATERIALS AND METHODS

Subjects and study design

Thirty-five postmenopausal women (≥ 60 years of age, age range 60–82 years) with UVB-treated psoriasis from the Göteborg region were included in the study. They were randomly selected from our out-patient clinic. The mean age of onset of psoriasis was 37.0 years (± 23.5 standard deviation (SD)). Medical history and lifestyle factors were assessed using a questionnaire. All age-matched women (*n* = 2448) from Geriatric out-patient clinic, Göteborg during years 2001 and 2002 were used as controls.

Each participant was given written information about the aim of the study, which was approved by the ethics committee of Göteborg University and the National Data Inspection Board.

The study was epidemiological and descriptive/explorative.

Anthropometry

Body mass index (BMI) was calculated as body weight divided by height squared (kg/m^2).

BMD was examined by Dual-Energy X-ray Absorptiometry (DEXA) (Hologic Delphi A) at the hip and the lumbar spine after the UVB treatment.

 ISSN 0001-5555
doi: 10.2340/00015555-0403

BMD results were recorded as the T-score (SD from the mean peak value in young sex-matched adults) and the *Z*-score (difference in SD from the mean of a healthy, age- and sex-matched sample) for each subject.

The questionnaire comprised 73 questions divided into medical, family and gynaecological history, nutrient intake, physical activity, history of psoriasis, previous psoriasis treatment and sun exposure. Present and previous (at the age of 25 years) body height and weight were asked for.

Medical history

Past and present health status, inclusive heart and vascular disease, thyroidal disease, diabetes, metabolic and inflammatory disease, arthropathy, operations and cancer disease, tooth status, present and previous medication, vitamins and other supplementation, cytotoxic drug (such as methotrexate, retinoids and cyclosporine), systemic or local cortisone therapy were assessed with a questionnaire. Previous fractures after the age of 25 years, location of fractures, and in which circumstances they had occurred, were considered. Information about mother's age, bone fractures and breast cancer was recorded.

Gynaecological history was taken, including: menstrual history, fertility, childbirth, breastfeeding, contraception, menopausal discomfort, postmenopausal hormonal replacement therapy (HRT) and gynaecological disease. Regarding psoriasis, we asked about onset of disease, presence of psoriatic arthropathy and whether arthropathy influenced the patient's mobility. Participants were asked about their history of previous treatment with phototherapy, systemic steroids, immunosuppressive, retinoids and topical therapy.

Lifestyle factors

Nutrient intake: milk consumption (number of glasses/day), coffee consumption (number of cups/day), cheese consumption (number of slices/day) were recorded. Smoking habits were graded as non-smokers and smokers.

Physical activity during previous and present employment was graded from 1 to 4. Grade 1 was defined as mainly sedentary, 2 as alternating walking and sedentary, grade 3 as mainly walking excluding lifting heavy objects, and grade 4 as mainly walking including lifting heavy objects, i.e. heavy physical labour.

Physical activity during leisure time was also graded from 1 to 4. Grade 1 was defined as mainly sedentary without any exercise. Grade 2 was defined as moderate activity comprising sometimes walking, swimming during holidays or picking berries and mushrooms in the autumn. Grade 3 included regular exercise within different activities due to season, such as swimming, skiing, walking and gardening. Grade 4 included regular exercise on the specific days of the week, such as gymnastics, tennis, swimming or riding.

Sun exposure and UV treatments

Exposure to sunlight during the summer was graded from 1 to 4. Grade 1 was sun exposure 0.5 h/day. Grade 2 was sun exposure 0.5–1 h/day. Grade 3 was sun exposure 1–2 h/day, and grade 4 was defined as sun exposure > 2 h/sunny summer day.

We asked about spending time outdoors per day (independent of sun exposure) and graded this from 1 to 4. Grade 1 was defined as being outdoors < 0.5 h/day, grade 2 0.5–1 h/day, grade 3 as outdoors 1–2 h/day, and grade 4 as outdoors > 2 h/day.

We asked about travel to sunny countries in the last 2 and 10 years, respectively. We recorded the number of trips to sunny countries in the last 2 years. Trips to sunny countries in the last 10 years were graded from 0 to 4. Grade 0 was defined as no travel to sunny countries in the last 10 years, grade 1 1–4 trips, grade 2 5–10 trips, grade 3 10–20 trips and grade 4 > 20 trips in the last 10 years.

The number of broadband or narrowband (TL01) UVB treatments in the last 2 and 10 years, respectively, was recorded.

Biochemical analyses

Serum 25-OH-vitamin D was determined using the ^{125}I RIA (radioimmunoassay) method. This data is available for 24 out of 35 patients.

Statistics

The patients' BMD, anthropometrical results and results from the questionnaires were compared with those of controls by means of the *t*-test. The data were analysed using Microsoft Excel (Office 2000). Covariate analyses were performed by linear regression models.

RESULTS

Anthropometry and bone status

Anthropometric data are given in Table I. Women with psoriasis had higher present weight and BMI than controls.

Mean value of Z-score (SD from the mean peak value in age-matched women) at the hip was 0.70 (± 1.09) and for the lumbar spine 0.60 (± 1.59) in women with psoriasis. The patients had higher BMD, expressed as Z-scores, than age-matched women from the Göteborg region (the Z-score is adjusted in the BMD measurements from population data and inlaid as a control value in Hologic Delphi A).

The mean value of the T-score (SD from the mean peak value in young women) at the hip was –0.77 (± 1.19) and for the lumbar spine –1.40 (± 1.60) in women with psoriasis. The mean value of the T-score in the control group at the hip was –1.75 ± 1.1 ($p < 0.00001$) and for the lumbar spine –1.85 (± 1.4) ($p = 0.059$). Psoriasis patients had higher BMD at the hip than the controls (Table I).

Medical history

None of the patients had had systemic therapy for psoriasis or previous cytostatic treatment, breast cancer or

Table I. *Anthropometric data and bone mineral density (BMD) (mean ± SD) in postmenopausal patients with psoriasis and controls*

Measurements	Patients ($n = 35$)	Controls ($n = 2448$)	*p*-value
Present BMI, kg/m^2	27.1 ± 4.1	25.3 ± 4.2	0.013
Present height, cm	162.1 ± 6.8	162 ± 6.3	ns
Present weight, kg	70.9 ± 11.4	66.3 ± 11.7	0.019
BMI at age 25 years, kg/m^2	21.2 ± 1.6	20.8 ± 2.3	ns
Height at age 25 years, cm	165.4 ± 5.8	165.3 ± 5.6	ns
Weight at age 25 years, kg	58.1 ± 5.1	57 ± 7.3	ns
BMD T-score at the hip	–0.77 ± 1.2	–1.75 ± 1.1	< 0.0001
BMD T-score at the lumbar spine	–1.4 ± 1.6	–1.85 ± 1.4	0.059

ns: not significant; SD: standard deviation; BMI: body mass index.

epilepsy, or had undergone ventricle resection. Twelve patients had undergone cholecystectomy. The data from controls are missing. Prevalence of myocardial infarction and angina was more common in the patient group.

Family and gynaecological history

A positive family history of kyphosis was less common in patients than in the controls ($p = 0.0086$). This could be a possible explanation for the worse BMD at the lumbar spine in controls. The duration of HRT was shorter in patients than in controls ($p = 0.045$).

Nutrient intake and physical activity

Patients had higher consumption of cheese and coffee than controls. The patients were more physically active than controls ($p = 0.014$). The mean number of periods of physical activity in patients was 3.7 ± 2.2 per week vs. 1.8 ± 1 in controls ($p = 0.0001$).

The influence of age, body weight, physical activity, menopause, oestrogen substitution and childbirth on BMD in patients with psoriasis and controls showed that the difference between the 2 groups decreased by 22% compared with the difference adjusted only for age (Table II).

The covariate analyses of those factors on T-score at the hip is presented in Table II and on T-score at the hip and the lumbar spine in Table III and Fig. 1.

Subgroup analyses

Results for psoriatic patients divided according to bone mineral density. Normal BMD (T-score >–1 SD) was found in 14 patients, osteopaenia (T-score between –1 to –2.5 SD) in 8 patients and osteoporosis (T-score <–2.5 SD) in 13 patients.

Subjects with normal BMD were younger (67 ± 6 years) than the patients with osteopaenia and osteoporosis (72 ± 6 and 70 ± 6 years, respectively). BMI and the number of UVB treatments did not differ between groups. The age of onset of psoriasis correlated positively with BMD, in all (not shown).

Medical history. Treated hypothyroidism was more prevalent in psoriatic patients with osteoporosis than in those without (Table V).

Fractures after age 25 years and family history of fractures. All fractures occurred after falling during patients' leisure time and 87% involved a wrist fracture (Table V).

Gynaecological history. Patients with normal BMD had the highest rate of childbirth, latest menopause and longest duration of HRT (Table V).

Nutrient intake. Milk consumption varied from 0 to 5 glasses per day, but did not differ between groups. Coffee consumption varied between 1 and 8 cups/day and was highest in the patients with osteoporosis. Vitamin and mineral supplementations (vitamin E, omega-3, calcium or multivitamin) did not differ between groups. Current smoking was more common in patients with osteopaenia and osteoporosis (Table VI).

Table II. *Covariate analysis with the influence of age, body weight (BW), physical activity (PA), menopause, oestrogen substitution and childbirth on bone mineral density (T-score at the hip) in patients with psoriasis and controls*

Difference in mean T-score between patients and controls	95% CI	when adjusted for
0.946	0.58–1.31	Age
0.762	0.43–1.09	Age+BW
0.747	0.42–1.08	Age+BW+PA
0.730	0.40–1.06	Age+BW+PA+menopause <46 years
0.698	0.37–1.03	Age+BW+PA+menopause <46 years+ oestrogen
0.734	0.40–1.07	Age+BW+PA+menopause <46 years+ oestrogen+childbirth

CI: confidence interval.

Table III. *Covariate analysis with the influence of age, body weight, physical activity, menopause, oestrogen substitution and childbirth on bone mineral density (BMD) (T-score at the hip and lumbar spine) in patients with psoriasis and controls*

	Difference in mean T-score between patients and controls	95% CI	Adjustment
BMD T-score hip	0.946	0.58–1.31	Age-adjusted
BMD T-score hip	0.742	0.40–1.08	*Fully adjusted
BMD T-score lumbar spine	0.434	–0.03–0.90	Age-adjusted
BMD T-score lumbar spine	0.327	–0.13–0.78	*Fully adjusted

*Adjusted for all factors.
CI: confidence interval.

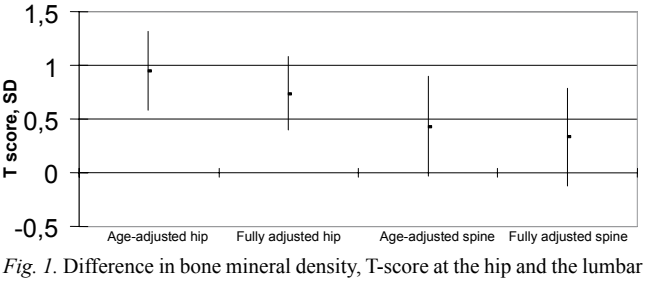

Fig. 1. Difference in bone mineral density, T-score at the hip and the lumbar spine in patients with psoriasis compared with controls. 95% confidence intervals are given. Fully adjusted: adjusted for age, body weight, physical activity, menopause, oestrogen substitution and childbirth. SD: standard deviation.

Table IV. *Bone mineral density (BMD), body mass index (BMI) and number of ultraviolet light B (UVB) treatments in 35 women with psoriasis divided into groups according to bone status (mean ± SD if not otherwise indicated)*

Measurements	Normal BMD ($n=14$)	Osteopaenia ($n=8$)	Osteoporosis ($n=13$)
Age, years	67.2 ± 5.5	72.3 ± 8.0	69.8 ± 5.6
BMI, kg/m^2	27.3 ± 4.7	27.2 ± 4.2	26.7 ± 3.5
Height, cm	164.8 ± 6.2	160.2 ± 6.5	160.5 ± 7.1
BMI at the age of 25 years, kg/m^2	21.8 ± 1.8	23.9 ± 1.0	21.0 ± 1.6
Height at the age of 25 years, cm	167.2 ± 5.2	164.4 ± 5.0	164.1 ± 6.5
BMD T-score of the hip	+0.24 ± 0.67	–0.98 ± 0.67	–1.82 ± 0.97
BMD T-score of the lumbar spine	+0.22 ± 1.01	–1.72 ± 0.66	–2.95 ± 0.7
BMD Z-score of the hip	+1.55 ± 0.75	+0.66 ± 0.64	–0.28 ± 0.85
BMD T-score of the lumbar spine	+2.1 ± 1.09	+0.49 ± 0.51	–0.94 ± 0.8
Median of treatment			
UVB	19.5	22.5	27
TL01	74.5	90	77
Psoriasis onset, mean age, years	29.8 ± 19.8	40.9 ± 28	41.8 ± 23.6

Table V. *Medical and gynaecological history in 35 women with psoriasis divided into groups according to bone status (mean ± SD if not otherwise indicated)*

	Normal BMD ($n=14$)	Osteopaenia ($n=8$)	Osteoporosis ($n=13$)
Medical history			
Hypothyroidism ($n=6$)	1	2	3
Hypertension ($n=10$)	3	3	4
Myocardial infarction ($n=4$)	1	2	1
Angina ($n=3$)	1	2	
Cholecystectomy ($n=12$)	6	1	5
Diabetes ($n=1$)			1
Lactose intolerance ($n=1$)			1
Guts operated ($n=2$)		2	
Rheumatism ($n=1$)		1	
Temporarily immobilized ($n=1$)		1	
Back pain ($n=8$)	3	1	4
Joint pain (sometimes) ($n=22$)	11	5	6
Previous inactivity > 3 months ($n=5$)	2	2	1
Treated osteoporosis ($n=2$)			
Previous fracture after 25 years of age ($n=8$)	2	2	4
Tooth status			
Partial dentures ($n=5$)	2	2	1
Total dentures ($n=5$)	1	2	2
Positive family history of fractures ($n=7$)	2	1	4
Breast cancer in mother ($n=2$)		1	1
Mean age of the mothers (years)	81 ± 16.2	83 ± 10.8	82 ± 12.9
Gynaecological history			
Childbirth	3.0 ± 0.8	2.6 ± 1.1	1.6 ± 1.3
Breastfeeding, months	11 ± 7	11 ± 9	5 ± 7
Menopause, age, years	51.5 ± 3.2	49.1 ± 3.6	49.9 ± 2.9
Postmenopausal symptoms, *n*	6	1	5
HRT, *n*	12	3	4
HRT duration, years	9.5 ± 7.6	2.6 ± 4.1	2.4 ± 4
Previous usage of contraceptives, *n*	7	1	6
Duration of contraceptives, months	6.0 ± 6.9	0.2 ± 0.4	4.1 ± 6.2
Previous gynaecol. operation, *n*	5	2	1
Urine leakage, *n*	2	3	3

HRT: hormonal replacement therapy; BMD: body mineral density

Physical activity. Conditional exercises and physical leisure activities were highest in patients with normal BMD. The activities were mainly described as grade 3 (regular exercise as part of different activities due to season, such as swimming, skiing, walking and gardening). Previous working habits did not differ between groups (Table VI).

Sun exposure and vitamin D. Exposure to sun for 2 h or more during summer was highest in patients with normal BMD. The patients with normal BMD had the highest number of trips to sunny countries in the last 2 years. Spending time outdoors (independent of sun exposure) was similar in all groups and varied between 1 and 2 h/day (Table VI). UVB increased serum 25-OH-vitamin D concentrations from 36.8 ± 17 ng/ml (mean ± SD) before the UVB treatment to 59.6 ± 18.7 ng/ml after ($p < 0.001$). The data is available for 24 of 35 patients.

Use of topical treatment. None of the patients had had systemic treatment with corticosteroids but 27 (77%) had had topical treatment with cortisone ointments alone or in combination with vitamin D analogue (calcipotriol). Patients with normal BMD used more calcipotriol, while osteoporosis patients preferred topical cortisone (Table VI).

DISCUSSION

In this study, women with psoriasis had higher BMD, both at the hip and at the lumbar spine, than age-matched controls. Higher body weight and BMI are factors that may contribute to the higher BMD among patients than controls, as shown in a previous study (7). Data about the prevalence of osteoporosis among patients with psoriasis, and about the epidemiology of risk factors for osteoporosis in this group are sparse. However, a previous study of patients with psoriasis showed no evidence that patients with chronic plaque psoriasis, despite risk factors, had low BMD, although the subgroup with joint involvement appeared to be at a higher risk of osteoporosis and therefore required preventive treatment (6). Reduced BMD has been linked to palmoplantar pustular psoriasis (8). The existence of less severe periarticular osteoporosis is considered possible, but there are no data concerning the existence of systemic osteoporosis in patients with psoriatic arthritis (9). In general, bone loss increases with increasing age. BMD has been shown to be a predictive indicator for bone fracture in healthy subjects and in patients with osteoporosis (10).

Table VI. *Nutrient intake, physical activity, sun habits and usage of topical treatment in 35 women with psoriasis grouped according to bone status. (mean ± SD if not otherwise indicated)*

	Normal BMD ($n=14$)	Osteopaenia ($n=8$)	Osteoporosis ($n=13$)
Nutrient intake			
Glasses of milk per day	2.0 ± 1.3	2.1 ± 1.4	2.2 ± 1.3
Slices of cheese per day	3.7 ± 2.0	3.8 ± 2.8	3.0 ± 1.8
Cups of coffee per day	3.2 ± 1.3	2.9 ± 2.3	3.7 ± 1.7
Calcium supplementation, *n*	3		3
Vitamin and mineral supplementations, *n*	5		4
Smoking, *n*	3	4	5
Physical activity			
Activity during work, grade 1–4	2.3 ± 0.8	2.3 ± 0.9	2.2 ± 0.7
Activity during leisure time, grade 1–4	3.2 ± 0.8	2.1 ± 0.6	3.0 ± 0.9
Sun habits			
Exposure to sun during summer, grade 1–4	3.4 ± 0.9	3.3 ± 0.9	2.8 ± 1
Time outdoors per day, grade 1–4	3.3 ± 0.9	3.3 ± 0.8	3.3 ± 0.6
Sunny travels in the last 2 years, *n*	1.5 ± 2.1	0.6 ± 1.1	0.8 ± 1.3
Sunny travels in the last 10 years, grade 0–4	1.22 ± 0.7	1.25 ± 1.4	1.2 ± 0.9
Usage of topical treatment			
Topical treatment with cortisone, *n*	2	2	4
Topical treatment with calcipotriol, *n*	5	2	2
Topical treatment with cortisone and calcipotriol, *n*	4	4	2
100 grams tubes of cortisone and calcipotriol per year, *n*	3.3 ± 2	4.3 ± 3.1	3.5 ± 2.2

BMD: bone mineral density.

Vitamin D is important for bone metabolism (11). Vitamin D deficiency thus contributes to the pathogenesis of osteoporosis and hip fractures (12). Giving calcium and vitamin D supplements is cost-saving for osteoporotic fracture (13).

The same wavelength range of UVB (290–315 nm) induces synthesis of vitamin D and improves psoriasis. Treatment with UVB in patients with psoriasis is most common during the darker period of the year when there is a lack of UVB in northern countries and lower levels of vitamin D in the body (3). Furthermore, UVB therapy heals psoriasis and supplies these patients with vitamin D similar to population levels (3, 14), which might also have a positive effect on bone status.

Family history, physical activity, smoking and oestrogen substitution all play very important roles for the bone mass (15–17). The age-adjusted risk for any type of fracture increased significantly with lower BMI (17, 18). Low body-weight is related to low skeletal muscle mass and increases the risk of fractures (17, 19). Muscle tissue and strength are important for body balance and prevention of falling (20). Previous findings have confirmed a protective effect of weight gain on fractures (3) Moreover, the relative risk of fractures were positively associated with current height, height at the age of 25 years, and height loss since the age of 25 years, with the exception of fracture of the spine and current height (21). The decrease in height since the age of 25 years in patients with psoriasis with osteoporosis compared with patients with normal BMD was similar to findings from other studies (22).

A positive family history of hip fracture, and especially of kyphosis, was more common in controls than in patients with psoriasis. This could be a possible explanation for the worse BMD at the lumbar spine in the controls than in the patients with psoriasis. Heredity for hip fractures was found mainly in the patients with psoriasis with osteoporosis. A maternal history of hip fracture doubled the risk of hip fracture (16, 19). History of fracture (particularly a family history of hip fracture) confers an increased risk of fracture that is independent of BMD (23). Furthermore, the effect of family history is not a general, but site-specific, predisposition to fracture (24).

Menopause in patients with psoriasis occurred latest in the group with normal BMD. Early menopause is widely regarded as a risk factor for osteoporosis (25). However, bone mass declines and the risk of fractures increases with increasing age, especially after the menopause, with diminishing endogenous secretion of oestradiol (15, 17, 22).

The amount of bone loss following menopause is the same irrespective of the age at which menopause occurs (25). The similar results that enhance importance of the number of years since menopause for demineralization are observed in patients with psoriatic arthritis (9).

Osteoporosis in postmenopausal women is related more to hormonal aberrations than to lifestyle factors (22). The patient who had HRT had even better BMD (22, 26). The duration of HRT was higher in controls than in the patients and within the psoriasis group duration of HRT was longest in patients with normal BMD. The duration of contraceptive usage was considerably longer in psoriasis patients with normal BMD than in the other 2 groups. The prior use of oral contraceptives is associated with higher levels of BMD and the degree of protection from lower BMD is related to duration of exposure (27).

A history of postmenopausal symptoms in psoriasis patients did not influence BMD, which was similar to a previous study in which a history of postmenopausal symptoms, *per se*, was not associated with increased susceptibility to vertebral osteoporosis (28).

Physical activity correlated positively with BMD in patients with psoriasis. Physical activity has been claimed to be beneficial for bone mass and protective against fractures (29). Regular walking in middle-aged and elderly women is associated with a reduced risk of vertebral deformity (30). Subjects who took a daily

walk of at least 30 min had a significantly better climbing capacity, higher BMD and lower concentration of serum triglycerides than subjects who walked less (31). Lifetime exercise was also positively associated with BMD of the hip components, and demonstrated a borderline-significant association with spine BMD (32).

Current smoking correlated positively with osteoporosis in our study. This observation confirms the results of a previous study about the negative influence of smoking on BMD (33, 34). Smoking is widely considered to be a risk factor for future fracture (35, 36).

Treated hypothyroidism correlated negatively with BMD in patients with psoriasis. Thyroxine therapy alone did not represent a significant risk factor for loss of BMD, but there was a risk of bone loss in postmenopausal (but not premenopausal) women with a previous history of thyrotoxicosis treated with radioiodine (37).

Consumption of cheese and coffee correlated positively with BMD in this study.

None of the patients had had systemic treatment with corticosteroids, but 77% had had topical treatment with cortisone ointments alone or in combination with vitamin D analogue (calcipotriol). Usage of topical cortisone was sparse, with no systemic effects at so low a dosage, and could not impair BMD. Prior and current exposure to corticosteroids confers an increased risk of fracture that is of substantial importance beyond that explained by the measurement of BMD (38).

Many of the patients (63%) had joint pain (half of these patients had normal BMD) but none of them had psoriasis arthritis. Higher body weight or BMI were positively associated with joint pain, as was seen in a previous study (39).

A limitation of the present study was the small number of patients with psoriasis. Larger studies are needed before any firm conclusions regarding bone status and possible risk factors can be drawn.

In conclusion, postmenopausal women with psoriasis had higher BMD than age-matched controls. Higher body weight, physical activity and UVB exposure could explain this finding.

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