Med Pregl 2025; LXXVIII (3-4): 71-75. Novi Sad: mart-april.

ORIGINAL STUDIES
ORIGINALNI NAUČNI RADOVI

BONE MINERAL DENSITY IN PATIENTS WITH PSORIATIC ARTHRITIS

KOŠTANA MINERALNA GUSTINA KOD PACIJENATA SA PSORIJAZNIM ARTRITISOM

Irma OVČINA[1,2], Snježana POPOVIĆ PEJIČIĆ[2,3], Jelena MRĐA[1,2] and Ljubinka BOŽIĆ MAJSTOROVIĆ[1,2]

ORCID NUMBER
Irma Ovčina – 0009-0007-0489-5576
Snježana Popović Pejičić – 0000-0002-6071-4860
Jelena Mrđa – 0009-0002-4307-036X
Ljubinka Božić Majstorović – 0009-0002-4654-0224

University Clinical Centre of the Republic of Srpska, Banjaluka[1]
University of Banjaluka, Faculty of Medicine, Banjaluka[2]
Academy of Science and Arts of the Republic of Srpska, Banjaluka[3]

Original study
Originalni naučni rad
UDK 616.72-002.77:616.517
UDK 616.71-007.234
https://doi.org/10.2298/MPNS2504071O

Abstract

Introduction. Psoriatic arthritis is an inflammatory arthritis with a complex clinical presentation. The aim of this study was to assess the correlation between clinical features and bone density in patients with psoriatic arthritis, and to compare bone densitometry results with those of healthy controls. **Material and Methods.** The study included 20 patients with psoriatic arthritis and 14 healthy controls. Demographic and clinical data were collected, including nail changes and the Psoriasis Area and Severity index. All participants underwent dual-energy-X-ray absorptiometry and evaluation using the Fracture Risk Assessment Tool. **Results.** The mean age of participants was 58 ± 9.1 years, with 55% being male. Rheumatoid factor was positive in 30% of patients, nail lesions were present in 60%, and the mean Psoriasis Area and Severity Index score was 10.37 ± 10.13. A significant correlation was observed between rheumatoid factor positivity and reduced bone density (p = 0.002), as well as between nail lesions and higher fracture risk (p = 0.005). Higher psoriasis index scores were significantly associated with increased fracture risk (p = 0.03). No other statistically significant correlations were identified. Although differences were found in bone mineral density and Fracture Risk Assessment Tool scores between patients with psoriatic arthritis and controls, these did not reach statistical significance. **Conclusion.** This study demonstrated an association between reduced bone density and rheumatoid factor positivity, as well as a high fracture risk in psoriatic arthritis patients with nail lesions. These findings support the consideration of routine bone density assessment in diagnostic algorithm for psoriatic arthritis, particularly in patients with rheumatoid factor positivity and nail involvement.

Key words: Bone Density; Arthritis, Psoriatic; Osteoporosis; Psoriasis; Densitometry; Rheumatoid Factor

Sažetak

Uvod. Psorijazni artritis je zapaljenski artritis sa složenom kliničkom prezentacijom. Glavni cilj ovog rada je utvrditi korelaciju između kliničkih karakteristika i koštane gustine kod pacijenata sa psorijaznim artritisom te uporediti rezultate osteodenzitometrije između ovih pacijenata i zdravih ispitanika. **Materijali i metode.** U istraživanje je uključeno 20 pacijenata sa psorijaznim artritisom i 14 zdravih osoba. Prikupili smo demografske i kliničke podatke, kao i promene na noktima i indeks oblasti i težine psorijaze. Pacijenti su podvrgnuti dvoenergetskoj rendgenskoj apsorpciometriji i alatu za određivanje rizika od fraktura. **Rezultati.** Prosečna starost bila je 58 ± 9,1 godina, a bilo je 55% muškaraca. Pozitivan reumatski faktor imalo je 30% pacijenata, 60% je imalo promene na noktima, a prosečni indeks oblasti i težine psorijaze bio je 10,37 ± 10,13. Postojala je značajna korelacija između reumatskog faktora i smanjene gustine kostiju (p = 0,002) te zahvaćenosti noktiju i visokog rizika od preloma (p = 0,005). Indeks oblasti i težine psorijaze je bio u značajnoj korelaciji sa alatom za određivanje rizika od frakture (p = 0,03). Nije bilo drugih statistički značajnih korelacija. Postojala je razlika između gustine kosti i alata za određivanje rizika od frakture, koja nije bila statistički značajna. **Zaključak.** Ovo istraživanje pokazalo je korelaciju između gustine kostiju kod pacijenata sa psorijaznim artritisom i pozitivnim reumatskim faktorom, kao i visok rizik od preloma kod pacijenata s promenama na noktima. Stoga treba uzeti u obzir uvođenje redovnog merenja koštane gustine u dijagnostički algoritam psorijaznog artritisa, posebno kod onih pacijenata kod kojih je potvrđen pozitivan reumatski faktor i promene na noktima.

Ključne reči: gustina kosti; psorijazni artritis; osteoporoza; psorijaza; denzitometrija; reumatoidni faktor

Introduction

Psoriatic arthritis (PsA) is a chronic inflammatory arthritis with a heterogeneous clinical presentation, most often occurring in association with psoriasis. The incidence is relatively low, estimated at about 5 per 100,000 inhabitants per year, compared to rheumatoid arthritis (RA), which has an incidence of approximately 208 per 100,000 inhabitants per year [1]. Despite this, PsA often follows one of the most

✉ Corresponding author: Irma Ovčina, E-mail: irma.o93@hotmail.com

Abbreviations

BMD	– bone mineral density
DXA	– dual-energy X-ray absorptiometry
FRAX	– Fracture Risk Assessment Tool
HR	– Hazard ratio
IL	– interleukin
Ig	– immunoglobulin
NHANES	– National Health and Nutrition Examination Survey
PASI	– psoriasis area and severity index
PsA	– psoriatic arthritis
RA	– rheumatoid arthritis
RANK	– receptor activator of nuclear factor κB
RANKL	– receptor activator of nuclear factor κB ligand
RF	– rheumatoid factor
SD	– standard deviation
TBS	– trabecular bone score
TNF	– tumor necrosis factor

aggressive clinical courses among inflammatory arthritides, leading to erosions and bone destruction, features classically associated with rheumatoid arthritis (RA). For this reason, PsA has historically been underestimated in terms of its impact on bone health [2]. Over the past decade, growing attention has been directed toward bone quality in PsA and the increased frequency of fragility fractures that require prevention. Fragility fractures represent a serious clinical, social, and economic burden for patients and their families. Less than 20% of women with a hip fracture regain their pre-fracture level of functionality, while more than 40% remain unable to move independently. In addition, fracture-related mortality is significantly increased [3].

At the molecular level, the receptor activator of nuclear factor κB (RANK) and its ligand (RANKL) play a key role in maintaining the balance between osteoblast and osteoclast activity. In osteoporosis, this balance is disrupted. In PsA, RANK and RANKL expression is significantly elevated in the synovium, leading to accelerated osteoclast activation. Moreover, tumor necrosis factor-alpha (TNF-α) and interleukin-17 (IL-17) further promote osteoclastogenesis independently of RANKL [4].

Findings from clinical studies remain inconsistent. A German study demonstrated reduced bone mineral density (BMD) in PsA patients, with bone mass loss beginning early in the disease course [5]. In the United States, a large study involving 28,765 PsA patients reported osteopenia in 285 (0.99%), osteoporosis in 1,293 (4.5%), and fragility fractures in 176 (0.61%) patients, with statistically significant differences compared to controls ($p < 0.001$) [6]. Similarly, Frediani et al. found decreased bone density in PsA patients, accounting for age and menopausal status in women [7]. A large population-based study in the United Kingdom also showed a significantly increased risk of all fractures (Hazard ratio (HR) = 1.26) in 9,788 PsA patients. Notably, an increased fracture risk was also observed in patients with psoriasis without arthritis [8].

Conversely, two large studies reported no evidence of lower BMD or higher fracture rates in PsA patients compared to the general population [9,10].

Given these conflicting results, the aim of the present study was to investigate the correlation between clinical features and the frequency of decreased bone density in PsA patients, as well as to compare bone densitometry findings between PsA patients and healthy controls.

Material and Methods

This study included 20 patients with psoriatic arthritis (PsA) and 14 healthy control individuals. Demographic characteristics, clinical features, Psoriasis Area and Severity Index (PASI), and relevant laboratory parameters were recorded for all patients. Bone mineral density (BMD) was assessed by dual-energy X-ray absorptiometry (DXA) using a Hologic densitometer, and the risk of fracture was calculation using the Fracture Risk Assessment Tool (FRAX) [11].

Psoriasis severity was evaluated with PASI, which divides the body into four regions: head (10% of body surface area), upper extremities (20%), trunk (30%), and lower extremities (40%). For each region, erythema, desquamation and induration are scored, and these scores are summed to yield the final PASI value. Disease severity is classified as mild (<7), moderate (7–12), or severe (>12).

DXA was performed at the lumbar spine (L1–L4) and hip. T-scores, based on reference values from the National Health and Nutrition Examination Survey (NHANES) provided by the manufacturer, were used for classification. A T-score > -1.0 standard deviation (SD) was considered normal, between -1.0 and 2.5 SD indicated osteopenia, and ≥-2.5 SD indicated osteoporosis. In addition, FRAX was applied to estimate the 10-year probability of major osteoporotic fractures.

Statistical analyses were performed using SPSS version 22.0. Descriptive statistics included arithmetic mean, standard deviation, and median values. Quantitative data were expressed as absolute numbers and percentages. Categorical variables were compared using the chi-square test, while numerical variables were analyzed with either t-test or Mann-Whitney U test. Correlations between numerical variables were assessed using Pearson's or Spearman's correlation coefficients. A p-value < 0.05 was considered statistically significant.

Table 1. Features of patients and control

	Patients	Controls
Total, n	20	14
Sex (M), n (%)	11 (55)	7 (50)
Age, mean value ± SD	58±9.1	55.93±7.4
Alcohol, n (%)	1 (5)	2 (14.28)
Smoking, n (%)	4 (20%)	5 (35.71)
Glucocorticoids, n (%)	7 (35)	/
RF, n (%)	6 (30)	/
Nails, n (%)	12 (60)	/
PASI, mean value ±SD	10.37±10.13	/
Weight, mean value ±SD	76.75±15.34	73.25±11.46
BMI, mean value ±SD	26.35±3.83	26.82±2.01

BMI - body mass index; M - male; PASI - psoriasis area and severity index, RF- rheumatoid factor

Table 2. FRAX values in patients and controls

	Patients	Controls
FRAX major fracture (%, ±SD)	10.85±8.05	8.38±3.49
FRAX hip (%, ±SD)	3.71±3.24	2.48±1.30

FRAX - Fracture Risk Assessment Tool

Table 3. Correlation between clinical features, T-score and FRAX in patients with PsA

	RF	Nails	PASI	Duration of disease
L1-L4 T-score	0.03*	p>0.05	p>0.05	p>0.05
LF T-score	p>0.05	0.02*	p>0.05	p>0.05
RF T-score	0.02*	0.01*	p>0.05	p>0.05
FRAX major fracture	p>0.05	p>0.05	0.03*	p>0.05
FRAX hip	p>0.05	0.01*	p>0.05	p>0.05

FRAX - Fracture Risk Assessment Tool; L1-L4: lumbar spine 1-4; LF - left femur; PsA - psoriatic arthritis; RF - right femur
*p<0.05-statistically significant

This study was approved by the Ethics Committee of the Clinical Center, and written informed consent was obtained from all participants.

Results

The mean age of patients with PsA was 58 ± 9.1 years, while the mean age in the control group was 55.93 ± 7.4 years. In the control group, 50% of the participants were male. Both patients and controls were predominantly in the pre-obese category. Among patients, 5% reported alcohol consumption, 20% were smokers, and 35% were treated with glucocorticoids. Rheumatoid factor (RF) was positive in 30% of patients, nail involvement was present in 60%, and the mean PASI score was 10.37 ± 10.13. The mean body mass index (BMI) in the PsA group was 26.35 ± 3.83. Within this group, 9 patients (45%) had normal BMI, 7 (35%) were overweight, and 4 (20%) were obese. More detailed characteristics are presented in **Table 1**.

Although differences in bone density and FRAX scores were observed between patients and controls, these were not statistically significant ($p > 0.05$). In the PsA group, 2 patients (10%) had normal bone density, 11 (55%) had osteopenia, and 7 (35%) had osteoporosis. In the control group, 3 participants (21.42%) had normal bone density, 9 (64.29%) had osteopenia, and 2 (14.29%) had osteoporosis. These findings are illustrated in **Figures 1 and 2**, and summarized in **Table 2.**

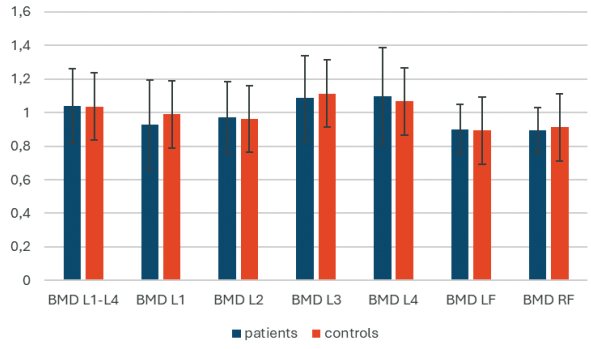

Figure 1. BMD in patients and controls The Figure shows medians with standard deviations. BMD-bone mineral density; LF-left femur; RF-right femur

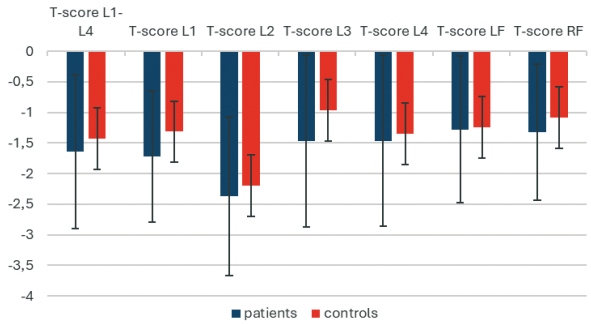

Figure 2. T-score in patients and controls The Figure shows medians with standard deviations. LF-left femur; RF-right femur group

Significant correlations were identified between RF positivity and reduced bone density of the spine and right hip ($p = 0.03$ and $p = 0.02$, respectively), as well as between nail lesions and reduced hip bone density ($p = 0.02$ and $p = 0.01$). Nail involvement was also significantly associated with higher FRAX scores ($p = 0.01$). Furthermore, a negative correlation was observed between PASI score and FRAX score for major fractures ($p = 0.03$, $r = -0.48$). Additional data are presented in **Table 3**.

Discussion

In our study, the mean age of patients was 58 ± 9.1 years, whereas previous research has reported mean ages ranging from 45.9 to 65.6 [12,13]. This variation may be attributed to differences in clinical presentation and diagnostic challenges. Gender distribution in our cohort was approximately equal, which coincides consistent with findings from other studies [13,14]. The proportion of patients consuming alcoholic or cigarettes was low, both in our study and in previous reports [12,15].

Rheumatoid factor (RF) positivity was observed in 30% of patients, with a statistically significant correlation between RF positivity and lower T-scores at the lumbar spine (L1-L4) and right hip. Although RF is primarily associated with rheumatoid arthritis (RA), it can also be detected in a proportion of healthy individuals. By binding to the Fc region of immunoglobulin (IgG), RF forms immune complexes that trigger cytokine release, inflammatory cascades, and osteoclastogenesis [16]. Our findings align with those of a Korean study, which also reported a significant correlation between RF and bone density, independent of age [17]. This supports the hypothesis that RF-mediated immune complexes promote osteoclast maturation [18].

Nail involvement was present in 60% of our patients. Previous studies have shown that PsA patients with nail lesions often experience a more aggressive disease course [19]. However, our results did not fully correspond with these findings. A possible explanation is that many of our patients were in the early disease phase and had not yet received biological therapy. Biological agents not only improve nail disease but also exert antiresorptive effect on bone [20].

We also observed a statistically significant correlation between the PASI score and FRAX for the hip. Similarly, Wang et al. reported a correlation between PASI score and bone density. This association may be explained by the cytokine-driven inflammatory cascade in active disease, which affects osteometabolism [12]. Furthermore, psoriasis itself has been linked to an increased risk fracture risk, with a hazard ratio of 2.23 (1.54–3.22) [8].

Although differences in bone density were found between PsA patients and controls, they did not reach statistically significance. A likely explanation is that we did not assess trabecular bone score (TBS), a measure that captures early microarchitectural deterioration and porosity, which may precede reductions in BMD or T-scores. Previous studies have demonstrated significant differences in TBS between PsA patients and healthy controls [5,22].

The inconsistency of results across studies may be due to variations in ethnicity or absence of biological therapy in some cohorts [6,12,21,23].

Our study has several limitations. The mostly important is the relatively small sample size, largely due to the low prevalence of PsA and the short observation period. Additionally, we did not include data on disease activity indices or menopausal status, both of which are important determinants of bone health. Future studies with larger cohorts, longer follow-up, and more comprehensive clinical data, are planned to provide more robust insights.

Conclusion

Our study demonstrated a correlation between reduced bone density and rheumatoid factor positivity in patients with psoriatic arthritis, as well as an increased fracture risk in those with nail lesions.

These findings suggest that routine bone density assessment should be considered as part of the diagnostic and monitoring algorithm for psoriatic arthritis, particularly in patients with confirmed rheumatoid factor positivity or nail involvement.

References

1. Lembke S, Macfarlane GJ, Jones GT. The worldwide prevalence of psoriatic arthritis-a systematic review and meta-analysis. Rheumatology. 2024;63(12):3211-20.

2. Ingegnoli F, Castelli R, Gualtierotti R. Rheumatoid factors: clinical applications. Dis Markers. 2013;35(6):727-34.

3. Del Puente A, Esposito A, Costa L, Benigno C, Del Puente A, Foglia F, et al. Fragility fractures in patients with psoriatic arthritis. J Rheumatol Suppl. 2015;93:36-9.

4. Ritchlin CT, Haas-Smith SA, Li P, Hicks DG, Schwarz EM. Mechanisms of TNF-alpha- and RANKL-mediated osteoclastogenesis and bone resorption in psoriatic arthritis. J Clin Invest. 2003;111(6):821-31.

5. Kocijan R, Englbrecht M, Haschka J, Simon D, Kleyer A, Finzel S, et al. Quantitative and qualitative changes of bone in psoriasis and psoriatic arthritis patients. J Bone Miner Res. 2015;30(10):1775-83.

6. Kathuria P, Gordon KB, Silverberg JI. Association of psoriasis and psoriatic arthritis with osteoporosis and pathological fractures. J Am Acad Dermatol. 2017;76(6):1045-53.

7. Frediani B, Allegri A, Falsetti P, Storri L, Bisogno S, Baldi F, et al. Bone mineral density in patients with psoriatic arthritis. J Rheumatol. 2001;28(1):138-43.

8. Ogdie A, Harter L, Shin D, Baker J, Takeshita J, Choi HK, et al. The risk of fracture among patients with psoriatic arthritis and psoriasis: a population-based study. Ann Rheum Dis. 2017;76 (5):882-5.

9. Modalsli EH, Åsvold BO, Romundstad PR, Langhammer A, Hoff M, Forsmo S, et al. Psoriasis, fracture risk and bone mineral density: the HUNT study, Norway. Br J Dermatol. 2017;176 (5):1162-9.

10. Busquets N, Vaquero CG, Moreno JR, Vilaseca DR, Narvaez J, Carmona L, et al. Bone mineral density status and frequency of osteoporosis and clinical fractures in 155 patients with psoriatic arthritis followed in a university hospital. Reumatol Clin. 2014;10(2):89-93.

11. Matijević R. Osteoporosis. Med Pregl. 2020;73(5-6):135-8.

12. Wang Y, Song ZB, Deng XR, Zhang XH, Zhang ZL. Risk factors associated with osteoporosis and fracture in psoriatic arthritis. Chin Med J. 2021;134(21):256-72.

13. Krajewska-Włodarczyk M, Owczarczyk-Saczonek A, Placek W. Changes in body composition and bone mineral density in postmenopausal women with psoriatic arthritis. Reumatologia. 2017;55(5):215-21.

14. Lo Giudice LF, Scolnik M, Pierini FS, Marin Zucaro NM, Jaramillo Gallego JF, Soriano ER. Fragility fractures in psoriatic arthritis patients: a matched retrospective cohort study. Clin Rheumatol. 2020;39(12):3685-91.

15. Gulati AM, Michelsen B, Diamantopoulos A, Grandaunet B, Salvesen Ø, Kavanaugh A, et al. Osteoporosis in psoriatic arthritis: a cross-sectional study of an outpatient clinic population. RMD Open. 2018;4(1):e000631.

16. Soltys AI, Axford JS, Sutton BJ. Rheumatoid factors: where are we now? Ann Rheum Dis. 1997;56(5):285-6.

17. Hwang J, Ahn JK, Lee J, Koh EM, Cha HS. Rheumatoid factor positivity is associated with lower bone mass in Korean male health examinees without clinically apparent arthritis. J Rheum Dis. 2019;26(1):31-40.

18. Seeling M, Hillenhoff U, David JP, Schett G, Tuckermann J, Lux A, et al. Inflammatory monocytes and Fcγ receptor IV on osteoclasts are critical for bone destruction during inflammatory arthritis in mice. Proc Natl Acad Sci U S A. 2013;110(26):10729-34.

19. Zahran E, Youssof A, Shehata W, Bahgat A, Elshebiny E. Predictive role of serum rheumatoid factor in different disease pattern of psoriasis and psoriatic arthritis. Egypt J Intern Med. 2021;33(1):1-7.

20. Gulyás K, Horváth Á, Végh E, Pusztai A, Szentpetery A, Petho Z, et al. Effects of 1-year anti-TNF-α therapies on bone mineral density and bone biomarkers in rheumatoid arthritis and ankylosing spondylitis. Clin Rheumatol. 2020;39(1):167-75.

21. Grazio S, Cvijetić S, Vlak T, Grubišić F, Matijević V, Nemičić T, et al. Osteoporosis in psoriatic arthritis: is there any? Wien Klin Wochenschr. 2011;123(23-24):743-50.

22. Toussirot E, Winzenrieth R, Aubin F, Wendling D, Vauchy C, Desmarets M. Areal bone mineral density, trabecular bone score and 3D-DXA analysis of proximal femur in psoriatic disease. Front Med (Lausanne). 2024;11:1341077.

23. Attia EA, Khafagy A, Abdel-Raheem S, Fathi S, Saad AA. Assessment of osteoporosis in psoriasis with and without arthritis: correlation with disease severity. Int J Dermatol. 2011;50(1):30-5.

Rad je primljen 20. V 2025.
Recenziran 17. VII 2025.
Prihvaćen za štampu 5. VIII 2025.
BIBLID.0025-8105:(2025):LXXVIII:3-4:71-75.