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A STUDY OF PREVALANCE OF OSTEOPOROSIS THROUGH DEXA SCAN IN RHEUMATOID ARTHRITIS PATIENTS AT TERTIARY CARE CENTER, RAJASTHAN

General Medicine

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ABSTRACT

Introduction: Osteoporosis (OP) is one of the most common comorbidities associated with rheumatoid arthritis (RA). Literatures reported that the risk for developing OP was strongly associated with duration and severity of RA. We aim to estimate the prevalence of osteoporosis in Rheumatoid arthritis patients using DEXA SCAN. **Material and methods:** The current study is a hospital-based cross sectional observational study. Duration of the study was 1 year. An informed written consent was obtained from all the subjects. A total of 360 consecutive RA patients attending OPD or IPD were taken for study. In all cases the following variables will be analyzed: anthropometric, family and personal history, CBC, RFT, LFT, RBS, lipid profile, ESR, RF, CRP and thyroid profile. Once the sample will be selected its members will be summoned to undergo a bone mineral density scan with DEXA scan of patient's hand, spine or femur with a validated measuring device. **Results:** It is observed that the out of total 360 cases were found to be, 189(52.5%) cases had their T-Score > -1.0 (Normal bone mass), 76(21.1%) cases had their T-score between < -1.0 to >-2.5 (Low bone mass) while 95(26.4%) cases had their T-score <2.5 (Osteoporosis). No case had their T-score >2.5 (severe osteoporosis). Mean age in normal bone mass cases was 45.9617.56 years, in low bone mass mean age was 47.2516.86 years and in osteoporosis group mean age was 43.8917.61 years. On applying ANOVA test, the difference was found statistically insignificant (p>0.05). Out of total 360 cases, 261 were females and 99 were males. Out of total 189 normal bone mass cases, 70.9% and 29.1% cases were females and males respectively. In low bone mass cases 78.9% and 21.1% cases were females and males respectively while in osteoporosis group 70.5% and 29.5% cases were females and males respectively (p>0.05) revealed. **Conclusion:** We concluded that patients of rheumatoid arthritis especially with advanced age, female gender, longer duration of disease, patient not taking treatment, presence of deformity, high body mass index, high ESR, CRP and with high titre of Anti-CCP Antibody should be screened for osteoporosis using DEXA scan, hence helps in improving morbidity and quality of life.

KEYWORDS

Osteoporosis, Rheumatoid arthritis, Frequency, Risk factors, Effects.

INTRODUCTION

Osteoporosis is a well-known extra-articular complication in patients with rheumatoid arthritis (RA) [1]. It is more common in patients with RA than in the general population, due to active systemic inflammation, the use of corticosteroids, and lack of mobility [2, 3]. As a result, patients with RA are at increased risk of fractures, an outcome that impairs quality of life and leads to mortality [4, 5].

The prevalence of osteoporosis in RA patients is reported to be approximately twice that in the general population [4]. The frequency of generalized osteoporosis in patients with RA ranges from 12.3 to 38.9 % in the lumbar spine and from 6.3 to 36.3 % in the hip [4–6]. Above all, there is at least a two-fold increase in the risk of vertebral fracture (VFs) in RA patients and a higher risk, up to six-fold, has been reported in patients with long-standing disease [6, 7]. However, studies on early RA have shown that VFs can be observed in the first year of the disease.

As a result, approximately one-third of women with RA report a fracture within five years of follow up [8]. The risk factors for osteoporosis and osteoporotic fractures in RA patients are age, disability, low body mass index (BMI), previous non-vertebral fracture, long-standing disease, and glucocorticoids. In particular, regardless of additional risk factors, patients taking glucocorticoids should be screened for osteoporosis. Although awareness of osteoporosis by healthcare professionals has increased in recent years, it remains underdiagnosed and undertreated [9].

The increased risk of osteoporosis in RA patients is well reported [1, 2] and may be linked to differences in the distribution and interactions of genetic and environmental factors [10, 11]. However, little information is available on the frequency of osteoporosis and bone mineral density (BMD) measurement rates in RA patients and the associated risk factors in North-West Rajasthan.

Rheumatoid arthritis (RA) is a common autoimmune disease characterized by chronic symmetrical polyarthritis and various extra-articular manifestations[2]. In addition to periarticular osteopenia and bone erosion, patients with RA may also develop generalized bone loss and have increased risk for fractures[3,4]. Indeed, the fracture risk assessment tool (FRAX), an internationally validated tool for fracture risk prediction, includes RA as an independent risk factor for 10-year probability of osteoporotic fractures[5]. Drivers of risk for fracture in RA are multifactorial[6], and fractures can lead to significant morbidity and even increased mortality[7,8]. Since timely intervention could help prevent subsequent fractures, assessment of fracture risk is of vital importance in the long-term management of patients with Ra[9].

The frequency of generalized osteoporosis in patients with RA ranges from 12.3 to 38.9 % in the lumbar spine and from 6.3 to 36.3 % in the hip[33]. Above all, there is at least a two-fold increase in the risk of vertebral fracture (VFs) in RA patients and a higher risk, up to six-fold, has been reported in patients with long-standing disease[34]. However, studies on early RA have shown that VFs can be observed in the first year of the disease. As a result, approximately one-third of women with RA report a fracture within five years of follow up.

Due to limited studies conducted in Rajasthan, we are conducting a study to observe the prevalence of osteoporosis in rheumatoid arthritis at tertiary care center Bikaner, Rajasthan. We aim to estimate the prevalence of osteoporosis in Rheumatoid arthritis patients using DEXA SCAN.

MATERIAL AND METHODS

The current study is a hospital-based cross sectional observational study. Duration of the study was 1 year. An informed written consent was obtained from all the subjects. A total of 360 consecutive RA patients attending OPD or IPD were taken for study.

Sample size:

- 360 consecutive RA patients attending OPD or IPD were taken for study.
- Ethical approval was taken from Institutional Research Ethics Committee.
- Informed consent was taken from all the subjects.

Inclusion Criteria:
- Patients with RA diagnosed based on 2010 American College of Rheumatology (ACR)/EULAR RA criteria.
- Age more than 18 years.
- Patients who gave the consent to participate in the study

Exclusion Criteria:
- All patients of RA with associated illnesses like malignancy, renal failure, liver disease, bronchial asthma, COPD, diabetes, CAD, Hypertension, known thyroid disorders, dyslipidemia or any other endocrinopathy.
- Patients on drugs like heparin, SSRIs, pioglitazone, rosiglitazone, lithium, PPIs, thyroid hormone suppressive therapy, phenytoin, cyclosporine, phenobarbitone, aromatase inhibitors, medroxy-progesterone, tacrolimus.
- Patients of RA with other connective tissue disorders.
- All pregnant and lactating mothers with RA.All patients of RA who smoke.
- Patients not willing to participate in the study

Data Collection:
In all cases the following variables will be analysed: anthropometric, family and personal history, CBC, RFT, LFT, RBS, lipid profile, ESR, RF, CRP and thyroid profile.

Once the sample will be selected its members will be summoned to undergo a bone mineral density scan with DEXA scan of patient's hand, spine or femur with a validated measuring device.

Statistical Analysis
Detailed data of all subjects of case and control group were collected. After complete evaluation all findings were expressed in terms of Mean ± SD. Comparison between case group and control group was done using paired "t" test. All statistical analysis was done using SPSS software version 20.

RESULTS
It is observed that the out of total 360 cases were found to be, 189(52.5%) cases had their T-Score ≥ -1.0 (Normal bone mass), 76(21.1%) cases had their T-score between < -1.0 to >-2.5 (Low bone mass) while 95(26.4%) cases had their T-score ≤2.5 (Osteoporosis). No case had their T-score ≥2.5 (severe osteoporosis). Mean age in normal bone mass cases was 45.9617.56 years, in low bone mass mean age was 47.2516.86 years and in osteoporosis group mean age was 43.8917.61 years. On applying ANOVA test, the difference was found statistically insignificant (p>0.05). (Table-1) Out of total 360 cases, 261 were females and 99 were males. Out of total 189 normal bone mass cases, 70.9% and 29.1% cases were females and males respectively. In low bone mass cases 78.9% and 21.1% cases were females and males respectively while in osteoporosis group 70.5% and 29.5% cases were females and males respectively (p>0.05) revealed. (Table-2) Out of total 360 cases, 261 were females and 99 were males. Out of total 189 normal bone mass cases, 70.9% and 29.1% cases were females and males respectively. In low bone mass cases 78.9% and 21.1% cases were females and males respectively while in osteoporosis group 70.5% and 29.5% cases were females and males respectively (p>0.05). (Table-3). In present study, 65.3% cases had their EULAR score 10 followed by 18.6% cases had their EULAR score 7, 6.7% cases had their EULAR score 8, 3.3% cases each had their EULAR score 6 and 9 while 2.8% cases had their EULAR score 2. Mean EULAR score in normal bone mass, low bone mass and osteoporosis groups were 8.692.09, 9.131.25 and 9.211.33 respectively and this difference was found statistically significant (p<0.05). (Table-4). Above table shows no.5 correlation coefficient of difference parameters with T-score. Parameters like systolic BP, diastolic BP, joint involvement, Z-score had a highly significant difference (p<0.001) and swollen and tender joint involvements, EULAR had a significant difference (p<0.05) while age and swollen joint involvement had an insignificant difference (p>0.05). (Table-5).

Observation Tables

Table-1 Distribution of cases according to T-score

T-Score	No. of Cases	Percentage
> -1.0 (Normal Bone Mass)	189	52.5
< -1.0 - > -2.5 (Low Bone Mass)	76	21.1
< -2.5 (Osteoporosis)	95	26.4
> 2.5 (Severe Osteoporosis)	0	-

Table-2 Distribution of cases according to age group (years)

Age Group	T-Score						Total	
	> -1.0		<-1.0 - >-2.5		< -2.5			
	No.	%	No.	%	No.	%	No.	%
<20	13	6.9	3	3.9	8	8.4	24	6.7
21-40	71	37.6	28	36.8	39	41.1	138	38.3
41-60	63	33.3	30	39.5	29	30.5	122	33.9
>60	42	22.2	15	19.7	19	20.0	76	21.1
Total	189		76		95		360	
Mean	45.96		47.25		43.89		45.69	
SD	17.56		16.86		17.61		17.42	
f	0.832							
p	0.436							

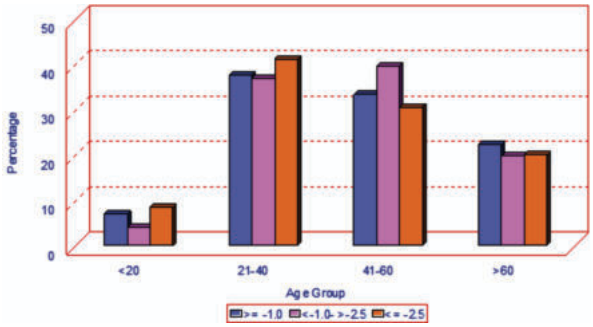

Figure-1 Distribution of cases according to age group (years)

Table-3 Distribution of cases according to gender

Gender	T-Score						Total	
	> -1.0		<-1.0 - >-2.5		< -2.5			
	No.	%	No.	%	No.	%	No.	%
Female	134	70.9	60	78.9	67	70.5	261	72.5
Male	55	29.1	16	21.1	28	29.5	99	27.5
Total	189		76		95		360	
2	2.013							
P	0.365							

Table-4 Distribution of cases according to EULAR Score

EULAR Score	T-Score						Total	
	> -1.0		<-1.0 - >-2.5		< -2.5			
	No.	%	No.	%	No.	%	No.	%
2	10	5.3	0	-	0	-	10	2.8
6	12	6.3	0	-	0	-	12	3.3
7	24	12.7	18	23.7	25	26.3	67	18.6
8	24	12.7	0	-	0	-	24	6.7
9	0	-	12	15.8	0	-	12	3.3
10	119	63.0	46	60.5	70	73.7	235	65.3
Total	189		76		95		360	
Mean	8.69		9.13		9.21		8.92	
SD	2.09		1.25		1.33		1.77	
f	3.503							
p	0.031							

Table-5 Correlation Coefficient of different parameters in relation to T-score

Variables	r value	p value
Age	0.050	0.343
Systolic BP	-0.289	<0.001**
Diastolic BP	0.205	<0.001**
Joint Involvement	-0.306	<0.001**
Swollen Joint Involvement	0.052	0.324

Tender Joint Involvement	0.150	0.004*
EULAR	-0.108	0.041*
Z-Score	0.829	<0.001**

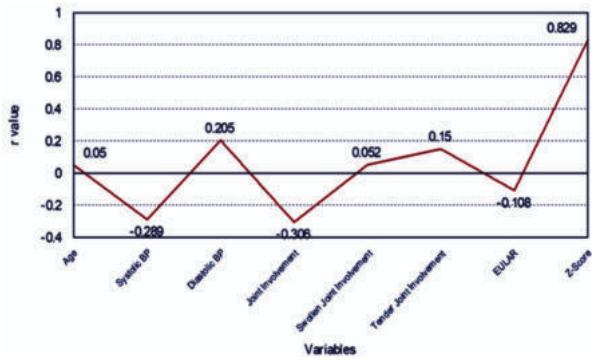

Figure-2 Correlation Coefficient of different parameters in relation to T-score

DISCUSSION

Osteoporosis and fragility-related fractures are one of the most common complications seen in patients with RA and dramatically affect quality of life[89]. The present study was designed to evaluate BMD changes in patients with recent-onset RA, as well as the effect of inflammation, mobility, and drugs (steroids and DMARDS) on these changes.

Osteoporosis is more common in patients with RA than in the general population. The prevalence of concurrent osteoporosis is 50%. Osteoporosis can cause pain and loss of height, and increases the risk of fractures after falling[33]. The chronic synovial inflammation in RA can promote osteoclastogenesis, leading directly to both focal and generalized bone loss and increased risk of fractures. In addition, many indirect factors associated with inflammatory arthritis contribute to the risk of osteoporosis. These include immobility, weight loss, and use of medications known to promote bone loss, such as glucocorticoids[44].

In our study we compared changes in hand BMD, measured by DXR, with changes in generalised BMD in the hip and the spine, measured by DEXA, in 360 patients with recent-onset RA after DAS-steered treatment. There are several important findings. Hand BMD loss was greater than generalised BMD loss in the hip and spine. Patients treated with initial combination therapy with tapered high-dose corticosteroids or anti-TNFa infliximab had less hand BMD loss due to better suppression of inflammation. Both hand and generalised BMD loss were associated with progression of radiographic destruction. Bisphosphonates protected only against generalised BMD loss.

In present study, out of total 360 cases, 189(52.5%) cases had their T-Score $\geq$ -1.0 (Normal bone mass), 76(21.1%) cases had their T-score between < -1.0 to >-2.5 (Low bone mass) while 95(26.4%) cases had their T-score $\leq$2.5 (Osteoporosis).

These findings are in agreement with those of Brand et al[90] who reported that patients with RA have a similar risk of low BMD than normal age- and gender matched populations. Similarly, a study reported by Kim et al[91] showed an low risk of osteoporotic fractures in RA patients in all age groups, regardless of gender, and at various anatomical sites compared with individuals without RA. In contrast, Curtis et al[92] found that the proportion of their RA patients meeting t score criteria for osteoporosis was only 4%, and Yoon et al[93] reported that 52% of their patients with early-onset RA had osteoporosis and 39% were classified as having osteopenia.

In present study out of total 360 cases, majority of cases had their age between 21-60 years (72.2%). Mean age in normal bone mass cases was 45.9617.56 years, in low bone mass mean age was 47.2516.86 years and in osteoporosis group mean age was 43.8917.61 years. On applying ANOVA test, the difference was found statistically insignificant (p>0.05). Overall mean age in our study was 45.6917.42 years. This is consistent with the study done by Zhu et al[88] where they found that the mean age was 47.999.36 years whereas Sharma et al[94] found a lower mean age than our study i.e. 36.95.3 years. Habib et al[95] conducted a study on bone mineral density with early rheumatoid arthritis treated and showed that the mean age of patients was 47.212.0 years which is similar to our study.

In present study majority of patients were females (72.5%). Similar observations were made by Tokumoto et al[96] where they found that 82.9% patients were females. Study by Guler-Yuksel et al[74] were similar to our observation where they found that 71% of cases were females. In present study, 65.3% cases had their EULAR score 10 followed by 18.6% cases had their EULAR score 7, 6.7% cases had their EULAR score 8, 3.3% cases each had their EULAR score 6 and 9 while 2.8% cases had their EULAR score 2.

Mean EULAR score in normal bone mass, low bone mass and osteoporosis groups were 8.692.09, 9.131.25 and 9.211.33 respectively and this difference was found statistically significant (p<0.05).

According to Z-score, 230(63.9%) cases had their Z-score > -1.0, 75(20.8%) cases had their Z-score < -1.0 to >-2.5, 31(8.6%) cases had their Z-score $\leq$-2.5 while 24(6.7%) cases had their Z-score $\geq$2.5.

Mean Z-score in normal bone mass, low bone mass and osteoporosis groups were 0.531.06, -0.560.99 and -1.861.42. On applying ANOVA test, the difference was found statistically highly significant (p<0.001).

In present study, age had a insignificant correlation (p>0.05) while systolic BP (r=-0.289), diastolic BP (4=0.205), joint involvement (r=-0.306) and Z-score (r=0.829) had a highly significant correlation, swollen joint (r=0.052) and tender joint (r=0.150) involvements had a significant correlation.

In present study, pulse rate, respiratory rate, total bilirubin, SGPT, total cholesterol, LDL cholesterol, and HbA_1c had a highly significant difference (p<0.001), height, direct bilirubin had a significant difference (p<0.05) while all other parameters like weight, RBC, SGOT, serum Alp, triglyceride, HDL cholesterol and VLDL cholesterol had an insignificant difference (p>0.05 in all).

CONCLUSIONS

We concluded that patients of rheumatoid arthritis especially with advanced age, female gender, longer duration of disease, patient not taking treatment, presence of deformity, high body mass index, high ESR, CRP and with high titre of Anti-CCP Antibody should be screened for osteoporosis using DEXA scan, hence helps in improving morbidity and quality of life.

Disclosure Statement

This study is investigator initiated. The authors declare that they have no competing/conflict of interests in relation to this article.

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Consent For Publication

- Not applicable.
- Ethics approval and consent to participate.
- The study protocol was approved by the medical ethics committee of the S.P. Medical College, Bikaner, Rajasthan (State), India.

REFERENCES:

1. Chung SJ, Kwon YJ, Park MC, Park YB, Lee SK. The correlation between increased serum concentrations of interleukin-6 family cytokines and disease activity in rheumatoid arthritis patients. Yonsei Med J. 2011;52: 113–20.
2. McInnes IB, Schett G. The pathogenesis of rheumatoid arthritis. N Engl J Med. 2011;365(23):2205–19.
3. Heinlen L, Humphrey MB. Skeletal complications of rheumatoid arthritis. Osteoporos Int. 2017;28(10):2801–12.
4. Jin S, Hsieh E, Peng L, Yu C, Wang Y, Wu C, et al. Incidence of fractures among patients with rheumatoid arthritis: a systematic review and meta-analysis. Osteoporos Int. 2018;29(6):1263–75.
5. Kanis JA, Johnell O, Oden A, Johansson H, McCloskey E. FRAX and the assessment of fracture probability in men and women from the UK. Osteoporos Int. 2008;19(4):385–97.
6. Briot K, Geusens P, Em Bultink I, Lems WF, Roux C. Inflammatory diseases and bone fragility. Osteoporos Int. 2017;28(12):3301–14.
7. Bliuc D, Nguyen ND, Milch VE, Nguyen TV, Eisman JA, Center JR. Mortality risk associated with low-trauma osteoporotic fracture and subsequent fracture in men and women. JAMA. 2009;301(5):513–21.

8. Han GM, Han XF. Comorbid conditions are associated with healthcare utilization, medical charges and mortality of patients with rheumatoid arthritis. Clin Rheumatol. 2016;35(6):1483–92.
9. Tucci JR. Importance of early diagnosis and treatment of osteoporosis to prevent fractures. Am J Manag Care. 2006;12(7 Suppl):S181–S90.
10. Dalle Carbonare L, Giannini S. Bone microarchitecture as an important determinant of bone strength. J Endocrinol Investig. 2004;27(1):99–105.
11. Wegierska M, Dura M, Blumfield E, et al. Osteoporosis diagnostics in patients with rheumatoid arthritis. Reumatologia. 2016;54(1):29–34.
12. Rubin CD. Emerging concepts in osteoporosis and bone strength. Curr Med Res Opin. 2005;21(7):1049–56.
13. Geusens P, Chapurlat R, Schett G, Ghasem-Zadeh A, Seeman E, de Jong J, van den Bergh J. High-resolution in vivo imaging of bone and joints: a window to microarchitecture. Nat Rev Rheumatol. 2014;10(5):304–13.
14. Tan DH, Raboud J, Szadkowski L, et al. Novel imaging modalities for the comparison of bone microarchitecture among HIV+ patients with and without fractures: a pilot study. HIV Clin Trials. 2017;18(1):28–38.
15. Trombetti A, Stoermann C, Chevalley T, van Rietbergen B, Herrmann FR, Martin PY, Rizzoli R. Alterations of bone microstructure and strength in endstage renal failure. Osteoporos Int. 2013;24(5):1721–32.
16. Shanbhogue VV, Hansen S, Frost M, Jørgensen NR, Hermann AP, Henriksen JE, Brixen K. Bone geometry, volumetric density, microarchitecture, and estimated bone strength assessed by HR-pQCT in adult patients with type 1 diabetes mellitus. J Bone Miner Res. 2015;30(12):2188–99.
17. Biver E, Durosier-Izart C, Chevalley T, van Rietbergen B, Rizzoli R, Ferrari S. Evaluation of radius microstructure and areal bone mineral density improves fracture prediction in postmenopausal women. J Bone Miner Res. 2018;33(2):328–37.
18. Paccou J, Edwards M, Moss C, Dennison E, Cooper C. High-resolution imaging of bone and joint architecture in rheumatoid arthritis. Br Med Bull. 2014;112(1):107–18.
19. Kocijan R, Finzel S, Englbrecht M, Engelke K, Rech J, Schett G. Differences in bone structure between rheumatoid arthritis and psoriatic arthritis patients relative to autoantibody positivity. Ann Rheum Dis. 2014;73(11):2022–8.
20. Stemmler F, Simon D, Liphardt A-M, Englbrecht M, Rech J, Hueber AJ, et al. Biomechanical properties of bone are impaired in patients with ACPA-positive rheumatoid arthritis and associated with the occurrence of fractures. Ann Rheum Dis. 2018;77(7):973–80.
21. Zhu TY, Griffith JF, Qin L, Hung VW, Fong TN, Au SK, et al. Alterations of bone density, microstructure, and strength of the distal radius in male patients with rheumatoid arthritis: a case-control study with HR-pQCT. J Bone Miner Res. 2014;29(9):2118–29.
22. Zhu TY, Griffith JF, Qin L, Hung VWY, Fong TN, Au SK, et al. Structure and strength of the distal radius in female patients with rheumatoid arthritis: a case-control study. J Bone Miner Res. 2013;28(4):794–806.
23. Franco-Trepat E, Guillan-Fresco M, Alonso-Perez A, Jorge-Mora A, Francisco V, Gualillo O, Gomez R. Visfatin connection: present and future in osteoarthritis and osteoporosis. J Clin Med. 2019;8(8).
24. Barbour KE, Helmick CG, Boring M, Brady TJ. Vital Signs: Prevalence of doctor-diagnosed arthritis and arthritis-attributable activity limitation - United States, 2013-2015. MMWR Morb Mortal Wkly Rep. 2017;66(9):246–53.