Addis Ababa University
College of Health Sciences
Department of internal medicine

Prevalence of Osteoporosis in Rheumatoid Arthritis Patients and Associated Risk Factors at Tikur Anbassa Specialized Hospital Lancet Specialized Hospital and Rheum Rheumatology and Internal Medicine Specialized Centre, Addis Ababa, Ethiopia

Principal Investigator: Dr. Mahder Abebe Asres (Internal Medicine Resident)

A Thesis Submitted to Addis Ababa University, College Of Health Sciences, School of Medicine, and Department of Internal Medicine In Preparation for Partial Fulfillment of The Requirement for a Specialty Certificate in Internal Medicine.

April, 2025 G.C
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Principal Investigator: Dr. Mahder Abebe Asres (Internal Medicine Resident)

Advisors: Dr. Becky Abdissa (MD, Consultant Internist and Rheumatologist)
and
Dr. Birhanu Demelash (MD, Consultant Internist and Rheumatologist)

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Abbreviations and Acronyms

AAU-Addis Ababa University

ACR -American College of Rheumatology

BMD - Bone Mineral Density

BMI-Body Mass Index

CI – Confidence Interval

DAS28-ESR - Disease Activity Scores Using Erythrocyte Sedimentation Rate

DXA - Dual-energy X-ray Absorptiometry

GC - Glucocorticoid

GIOP - Glucocorticoid-Induced Osteoporosis

HAQ - Health Assessment Questionnaire

MTX- Methotrexate

OP - Osteoporosis

OPFs - Osteoporotic Fractures

OR – Odd Ratio

RA -Rheumatoid Arthritis

RF -Rheumatoid Factor

TASH - Tikur Anbessa Specialized Hospital

TBV - Trabecular Bone Volume

VFs - Vertebral Fracture

Summary

Background: One of the most well-known extra-articular consequences of RA is osteoporosis (OP), which affects nearly twice as many RA patients as the general population. Approximately 30% of RA patients had osteoporosis, compared to 17% of age and sex-matched controls who had the condition. Complex processes, including the generation of inflammatory cytokines, the activation of osteoclasts, and the use of glucocorticoids to treat RA, lead to bone fragility in the disease.

Objective: -Assessment of the prevalence and associated risk factors of osteoporosis in rheumatoid arthritis patients at Tikur Anbessa Specialized Hospital, Lancet Specialized Hospital and Rheum Rheumatology and Internal Medicine Specialized Centre.

Methods: A hospital based cross-sectional study was conducted at Tikur Anbessa specialized Hospital, Lancet Specialized Hospital and Rheum Rheumatology and Internal Medicine Specialized Centre, from October 1 to November 30. Data were collected using a structured chart review administered questionnaire and data extraction form. Data were analyzed using SPSS V25. To identify associated risk factors in osteoporosis of patients with rheumatoid arthritis, bivariable and multivariable analysis were done. In our study, multivariable analysis was used, a P-value of less than 0.05 was considered statistically significant. Text, tables, and graphs were used to convey the results, which were then evaluated to provide useful information.

Results: The prevalence of osteoporosis was 58% among RA patients. The determinant factors of osteoporosis were age >60 compared to age 40-60 years (AOR=10.3), duration of RA >15 years compared to those with duration of RA <15 years (AOR=7.3), use of prednisolone medication (AOR=7.5), and HDL ≤40 mg (AOR=6.1). The continuous variables of age, duration of RA, serum creatinine mg/dl, and diastolic and systolic blood pressure showed a positive significant relationship with BMD.

Conclusion: In this study, the prevalence of osteoporosis was 58% among RA patients. Age, duration of RA, Serum creatinine, and diastolic and systolic blood pressures were significantly associated with increased risk of osteoporosis.

1. Introduction

1.1 Background

One of the most prevalent autoimmune diseases, rheumatoid arthritis (RA) is characterized by persistent synovitis, progressive destruction of symmetrical multi-joints, intra-articular manifestations such as decreased bone mass, subchondral lesions, and decreased generalized bone density (5-7). The disease's early stages include swelling of the tissue surrounding the joint, pain and symmetrical swelling of the small joints of the hands and feet, and morning stiffness and fatigue (1-4).

About 1% of the general population has RA, although it is more prevalent in people in their 50s and 60s and affects more women than males (8). One of the most well-known extra-articular consequences of RA is osteoporosis (OP), which is about twice as frequent in RA patients as in the general population (9–11). Because of active systemic inflammation, corticosteroid usage, and limited mobility, it is more prevalent in RA patients than in the general population (12–13).

Reduced bone mineral density and its consequence, increased fragility and fracture due to decreased resistance to torsion and compression, are the hallmarks of OP, a systemic skeletal illness (14–15). In contrast to the 17% of age and sex-matched controls who had osteoporosis, about 30% of RA patients had the condition (16). Bone fragility is caused by different mechanisms, such as the production of inflammatory cytokines, osteoclast activation, and the usage of glucocorticoids to treat RA. Dual-energy X-ray absorptiometry (DXA), a standard diagnostic technique for osteoporosis that evaluates bone mineral density (BMD), is therefore crucial for RA patients to prevent osteoporotic fractures (17).

With the growing use of glucocorticoids (GC), which were used to treat RA, glucocorticoid-induced osteoporosis (GIOP) became more prevalent. In order to worsen patients' dysfunction and disability, GIOP may also lead to osteoporotic fractures (OPFs) and a decrease in bone strength. According to the Iranian study, 10.75% of the 328 RA patients had OPF (18). The prevalence of OPF in female RA patients may rise to 21.7% (19). Although GC therapies were the most frequent cause of secondary OP, they may potentially increase the risk of fractures by causing bone quality to deteriorate (20).

The prevalence of widespread osteoporosis in RA patients varies from 6.3 to 36.3 percent in the hip and from 12.3 to 38.9 percent in the lumbar spine (21-23). Above all, patients with RA have a twofold or greater risk of vertebral fractures (VFs), and those with chronic RA have been found to have a sixfold increased risk (24).

The prevalence of OP at all ages is twice as high in RA patients as in the general population, and around one-third of RA patients receive an OP diagnosis after menopause (21). The risk of fragility fractures (vertebral and non-vertebral) linked to OP in RA patients is doubled when compared to age and sex-matched healthy subjects (24).

Age, disability, low body mass index (BMI), prior non-vertebral fractures, chronic illness, and glucocorticoids are risk factors for osteoporosis and osteoporotic fractures in RA patients. Specifically, people on glucocorticoids should be evaluated for osteoporosis regardless of other risk factors. Despite recent increases in healthcare professionals' awareness, osteoporosis is still underdiagnosed and undertreated (25).

1.2 Statement of the Problem

Rheumatic illness morbidity and mortality are increased by OP and associated fragility fractures, characterized by low bone mass and structural deterioration of bone tissue. The cause of OP in rheumatic diseases is complex. Although OP has a high rate of prevalence among rheumatic disease patients, many patients are not diagnosed, evaluated, and treated appropriately (8, 12, 16, and 22).

OP, an increased risk of fractures, significantly impacts the quality of life and overall health outcomes of RA patients. The problem lies in the complex interplay of RA-related factors such as: disease activity, duration, and medication use, as well as general osteoporosis risk factors, including age, sex, menopausal status, and lifestyle habits (2, 14, and 19). Identifying the prevalence of osteoporosis in RA patients and understanding the associated risk factors are crucial for improving early detection, prevention, and treatment strategies.

Addressing this issue could reduce fracture risk and improve the overall health and functional outcomes in RA patients. Therefore, this study aimed to explore the prevalence of osteoporosis among RA patients and identify the specific risk factors contributing to the development of osteoporosis in Tikur Anbessa Specialized Hospital, Lancet Specialized Hospital and Rheum Rheumatology and Internal Medicine Specialized Center.

1.3 Significance of the Study

This study is significantly addressing the critical gap of OP prevalence and its risk factors among RA patients. The study will help to carry out early diagnosis and targeted intervention. This can help in preventing fractures, lessen pain, and enhance their general quality of life for. The findings of the study will be important for healthcare providers to be better equipped to screen and manage osteoporosis in RA patients.

Early detection strategies can be improved by identifying specific risk factors that may otherwise be overlooked. The study will provide evidence that can support the revision or development of clinical guidelines and protocols regarding the co-management of RA and osteoporosis.

Osteoporotic fractures significantly increase healthcare costs due to prolonged hospitalizations, surgical interventions, and rehabilitation. Identifying risk factors and implementing preventive measures in RA patients can reduce fracture incidence and lowering the economic burden on healthcare systems. This research adds to the growing body of literature on the interrelationship between chronic autoimmune diseases and bone health. It will inform future research on effective strategies to mitigate osteoporosis in RA patients.

2. Literature Review

OP is a common comorbidity in patients with RA, which is characterized by a loss of bone mass and structural deterioration, leading to an increased risk of fractures. RA, a chronic inflammatory disorder, exacerbates bone loss both locally (at joints) and systemically, raising the prevalence of osteoporosis. Numerous studies have reported a higher incidence of osteoporosis in RA patients compared to the general population. A meta-analysis by Jin et al. highlighted that RA patients are likely to develop osteoporosis twice (26).

Osteoporosis significantly increases fracture risk in RA patients, particularly at sites such as the vertebrae, hips, and wrists. Fractures in RA patients are often associated with greater morbidity and mortality due to the compounded effects of RA-related disability. Verstraeten et al. noted that RA patients have a higher rate of vertebral fractures, even in the absence of clinical symptoms, underscoring the importance of screening (27).

According to a systematic review of 57 summarized studies on the prevalence of osteoporosis in RA patients, there were 227,812 instances of RA and 64,290 cases of OP, resulting in an estimated 27.6% prevalence of OP in RA patients (28). According to a Kang-won National University study on osteoporosis prediction in RA patients, risk variables for osteoporosis included body mass index, age, menopause, waist and hip circumferences, RA surgery, and monthly income (29).

A study done on prevalence and risk factors associated with glucocorticoid-induced osteoporosis in Chinese patients with rheumatoid arthritis revealed that RA with GC group had a significantly greater prevalence of OP (41.6%) than the RA without GC group (29.4%). Compared to the group of RA without GC (13.3%), the prevalence of OPF was higher in the group of RA with GC (21.0%). Body mass index (BMI) was the protective factor for OP, whereas age, female gender, and GC use were risk factors for the development of OP and OPF in RA. Among groups with various treatment courses with GC, the prevalence of GIOP and OPF was statistically significant (30).

The prevalence of OP and VOPF was 33.6% and 20.2%, respectively, among 865 RA patients, according to a study on the risk factors and prevalence of vertebral osteoporotic fractures in RA patients. In comparison to patients without OP or VOPF, patients with OP or VOPF were older, used glucocorticoids (GCs) for longer periods of time, had higher daily and cumulative doses, had longer disease duration, and had higher Sharp and Health Assessment Questionnaire (HAQ) scores ($P < 0.05$). The daily dosage or treatment course of GCs-VOPF had cutoff values in the area under the curve (AUC) of 9 mg and 37.5 days, respectively. Higher BMI was a protective factor for OP in RA patients, but older age, female sex, and a higher Sharp score were risk factors. Risk factors for VOPF in RA patients were advanced age and a high daily dose of GC (31).

According to a study on osteoporosis in RA patients, the frequency of osteoporosis in RA patients (mean age 63 years, 75% female) fell from 20% in 2007 to 6% in 2017, according to trends in the German National Database 2007–2017. Both long-term (>10-year disease duration: 28% to 20%) and short-term (≤2-year disease duration: 9% to 3%) RA patients were impacted, as were women (22% to 17%) and men (14% to 8%) across all age categories. Osteoporosis was more common in patients who have high disease activity and those taking GC than in those in remission or not taking GC.

According to a study on the increased risk of osteoporosis in male RA patients, the frequency of osteoporosis at the hip or spine was significantly higher in RA patients than in controls (22.4% vs. 10.5%), and the total hip bone mineral density (BMD) was significantly lower in RA patients than in controls (0.92±0.14 vs. 0.96±0.1 g/cm2). The average 28-joint Disease Activity Scores for male RA patients, based on body mass index (BMI) and erythrocyte sedimentation rate (DAS28-ESR), were 22 kg/m2 and 3.28 kg/m2, respectively. Two independent risk variables for osteoporosis at either site in male RA patients were BMI = 22 kg/m2 and DAS28-ESR > 3.2 in multivariable logistic regression models (33).

According to a study on the prevalence and clinical prediction of osteoporosis in a current cohort of patients with rheumatoid arthritis, 91 patients (29.9%) had osteoporosis at the spine or whole hip, while 157/903 (17.4%) of the controls were age and gender matched. Female gender, age, time since menopause, BMI, ESR, Larsen score, and co-morbidities were all linked to osteoporosis; however, logistic regression analysis revealed that the only independent predictors were age and BMI.

Osteoporotic fractures were found in 81 (16.9%) patients in a study on the prevalence and fracture risk of osteoporosis in rheumatoid arthritis patients. Using the FRAX criteria with and without BMD and the WHO criteria, there were 226 (47.2%), 292 (61%), and 160 (33.4%) candidates for pharmaceutical intervention, respectively. According to the FRAX criteria, only 69.2%–77% of the individuals in the high-risk group were undergoing osteoporosis treatment. According to the WHO criteria, the following were significant: age, BMI, and female status.

According to a study on the prevalence of osteoporosis and its risk factors in Korean patients with rheumatoid arthritis, 619 patients (40.8%) had osteoporosis (T-score ≤ −2.5 SD). Compared to those in other categories, RA patients with osteoporosis experienced more prior fractures, particularly femur and wrist fractures. Independent risk factors for osteoporosis included being older (≥70 years), having a lower body mass index (<25), having had the condition for a longer period of time (≥10 years), using more glucocorticoids throughout time, and having a higher score on the Health Assessment Questionnaire (37).

3 Objective

3.1 General Objective

Assessment of the prevalence and associated risk factor of osteoporosis in rheumatoid arthritis patients at Addis Ababa hospitals, a multicenter study.

3.2 Specific Objectives

- ✓ To determine the prevalence of osteoporosis in rheumatoid arthritis patients at Tikur Anbessa Specialized Hospital, Lancet Specialized Hospital and Rheum Rheumatology and Internal Medicine Specialized Centre.

- ✓ To identify the associated risk factor of osteoporosis among rheumatoid arthritis patients at Tikur Anbessa Specialized Hospital, Lancet Specialized Hospital and Rheum Rheumatology and Internal Medicine Specialized Centre.

4. Methodology

4.1 Study Area

The study was conducted in the rheumatology clinic at Tikur Anbessa Specialized Hospital, Lancet Specialized Hospital and Rheum Rheumatology and Internal Medicine Specialized Centre. The Rheumatology clinic is one of the clinics that provide care and follow-up for patients with different rheumatologic problems. The study will be incorporated on tertiary level public hospital and two private hospitals having high patient follow in RA unit.

4.2 Study Period

The study was conducted from OCT 2024 to Apr 2025.

4.3 Study Design

A hospital-based cross-sectional study design was used from OCT 2024 up to Apr 2025 at Rheumatology Outpatient Clinic.

4.4 Source and Study Population

The study population encompasses all patients with Rheumatoid Arthritis attending the Rheumatology clinic at Tikur Anbessa Specialized Hospital, Lancet Specialized Hospital and Rheum Rheumatology and Internal Medicine Specialized Center.

4.5 Sample Size Determination

The sample size was calculated using the single population proportion formula. Considering a z value of 1.96 for 95% confidence interval, 27.6% prevalence of osteoporosis among systematic review in RA (28) and 5% of margin of error, The formula to estimate a single population proportion was used to determine the minimum sample size (n) needed for the investigation.

$$n = \frac{Z_{\frac{\alpha}{2}}^{2} P (1 - P)}{d^{2}}$$

Zα/2 = critical value for normal distribution at 95% confidence interval= 1.96 (α = 0.05).

n = required sample size

d = margin of error= 5%

P = Proportion = 50%

n=1.96 x 1.96 x 0.276(1-0.276)/0.05 x 0.05

n=307 after adding 10% non-response rate the final sample size was 338

But the number of patients during our study time was <10000. Therefore, using correction formula

nf=n/1+n/N, where n is the calculated sample and N is the population

so, nf=338/1+338/120=89. Therefor the final required sample for this study was=>89.

4.6 Sampling Techniques

We used an enumerating sampling technique to select participants and digital record number of the patient (I-care) as the code number of the patient. Our sampling frame is 89 patients.

4.7 Eligibility Criteria

4.7.1 Inclusion Criteria

All Rheumatoid arthritis patient who fulfilled the 2010 American College of Rheumatology/ the European League against Rheumatism (EULAR) classification criteria for RA.

Patients 18 years and above.

4.7.2 Exclusion Criteria

- ✓ Those patients with concomitant other rheumatologic disease during their follow up period.
- ✓ Those who do not fulfill the inclusion criteria.

4.8 Variables

3.8.1 Dependent Variable

- ➢ Osteoporosis

4.8.2 Independent Variable

- ➢ Age

- Sex
- Body weight
- Duration of Illness
- Duration of treatment
- Medical treatment
- Comorbidity

4.9 Data Collection Instruments and Technique

Data were collected by trained GP using standard questionnaires from charts of patients diagnosed by a consultant Rheumatologists and/or Residents working in the clinic. Standard questionnaire chart review was used to extract the necessary data.

4.10 Data Quality Control

A-one-day training was given to data collectors. Every day of data collection, the acquired data was examined for consistency and completeness. The principal investigators and designated supervisors conducted daily monitoring and supervision.

4.11 Data Analysis

After manually verifying that the data were complete, they were imported into Epi-data version 3.1 and examined using SPSS version 26.. During the analysis P- value < 0.05 with 95% confidence interval (CI) for OR (odds ratio) was used in judging the significance of the associations. Binary logistic regression was used to do a bivariate analysis between the dependent and independent variables. To account for potential confounding variables, multivariable analysis was performed. Tables, graphs, and charts were used to display the data.

4.12 Ethical Considerations

Ethical clearance was obtained from institutional review board of College Health Science AAU. Then permission letters were asked from the patients' data responsible person. They received assurances that the information they provided would remain private. The responsible body's verbal consent was acquired prior to the start of data collection.

Operational Definitions

Bone Mineral Density (BMD) Measurement via DXA (Dual-Energy X-ray Absorptiometry)

DXA scan is the gold standard for diagnosing osteoporosis. It measures BMD at key sites, typically the hip and lumbar spine. BMD results are provided as **T-scores** (comparison to a healthy young adult) and **Z-scores** (comparison to an age-matched population). A T-score of **-2.5 or lower** at the hip or spine is indicative of osteoporosis.

Osteoporosis: WHO definition, BMD T-score is -2.5 SD or less from the young adult mean.

Fragility fracture: fractures that result from a fall that are less than standing height are to the wrist, hip, and spine.

5. Results

5. 1 Socio-demographic Characteristics of the Study Participants

With a mean age of 59.19±9.14 years, 59% of patients were between the ages of 40 and 60. 70.5% lived in an urban area, and 84% were female.

Table 1: The socio-demographic characteristics of the study participants.

Variable	Frequency	Percent
Age of the study participants in years		
40-60	52	59.1
≥60	36	40.9
Sex of the study participants		
Female	74	84.1
Male	14	15.9
Residence of the study participants		
Urban	62	70.5
Rural	26	29.5

5.2 The RA Related Characteristics of the Study Participants

Sixty percent of the participants had more than 15 years duration of RA diagnosis and 50% of them were diagnosis at the age of >45 years age eighty percent of them received methotrexate treatment followed by prednisolone (54.5%), chloroquine (15.9%) and leflunomide (12.5%).

Table 2: The RA related characteristics of the study participants.

Variable	Frequency	Percent
Duration of RA in years		
<15	35	39.6
≥15	53	60.2
Age at RA diagnosis		
<45	44	50
≥45	44	50
Types of treatment for RA		
Methotrexate	71	80.7
prednisolone	48	54.5
leflunomide	11	12.5
Chloroquine	14	15.9
Hydroxychloroquine	10	11.4

5.3 Physical Examination & Laboratory Investigation Characteristics of the Study Participants

Two-third of the study participants were underweight and 68.2% had SBP of <139 and 72.7% had a DBP of <89. Eighty-five percent of the RA patients had a total cholesterol level of <200mg/dl as shown in the table 3 below.

Table 3: The physical examination & laboratory investigation characteristics of the study participants

variable	frequency	Percent
Body mass index		
Underweight	56	63.6
Overweight	32	36.4
SBP		
<139	60	68.2
≥140	28	31.8
DBP		
<89	64	72.7
≥90	24	27.3
Total cholesterol in mg/dl		
<200	75	85.2
≥200	13	14.8
HDL in mg/dl		
<40	57	64.8
≥40	31	35.2
LDL in mg/dl		
<70	17	19.3
≥70	71	80.7
Triglyceride mg/dl		

<150	76	86.4
≥150	12	13.6
Serum creatinine in mg/dl		
<1	79	89.8
≥1	9	10.2

5.4 The Characteristics of Osteoporosis and Its Risk Factors

Sixty-percent of the study participants had chronic medical disease and from those disease, hypertension accounts 79.2% followed by dyslipidemia (39.8%), DM (18.9%) and hyperthyroidism (11.3%).

Table 4: The study participants characteristics on risk factor of fracture and osteoporosis.

variable	frequency	Percent
Chronic medical disease		
Yes	53	60.2
No	35	39.8
Types of chronic disease (n=53)		
Dyslipidaemia	25	39.8
Hypertension	42	79.2
DM	10	18.9
Hyperthyroidism	6	11.3

5.5 The Correlation between the BMD and Independent Variables

There is a substantial positive correlation between study participants' ages ($r(88) = 0.339$, $p = 0.001$), suggesting that the likelihood of developing osteoporosis rises with age. There is a substantial correlation between the length of RA and $r(88) = 0.219$, $p = 0.041$, suggesting that that the likelihood of developing osteoporosis rises with increase in duration of illness. Systolic and diastolic blood pressure, as well as serum creatinine mg/dl, were found to have a significant positive correlation with osteoporosis.

Table 5: The correlation between the BMD and independent variables

Variable		BMD
Age in years	Pearson Correlation	.339**
	Sig. (2-tailed)	**0.001**
Duration of RA	Pearson Correlation	.219*

	Sig. (2-tailed)	**.041**
Age onset of RA	Pearson Correlation	.364**
	Sig. (2-tailed)	**0.000**
BMI	Pearson Correlation	-.113
	Sig. (2-tailed)	.295
systolic BLOOD pressure	Pearson Correlation	.278**
	Sig. (2-tailed)	**0.009**
diastolic blood pressure	Pearson Correlation	.395**
	Sig. (2-tailed)	**0.000**
Total serum cholesterol mg/dl	Pearson Correlation	.174
	Sig. (2-tailed)	.105
Serum HDL cholesterol mg/dl	Pearson Correlation	-.006
	Sig. (2-tailed)	.953
Serum triglycerides mg/dl	Pearson Correlation	-.091
	Sig. (2-tailed)	.397
Serum creatinine mg/dl	Pearson Correlation	.263*
	Sig. (2-tailed)	**0.013**
**. Correlation is significant at 0.01 (2-tailed).		
*. Correlation is significant at 0.05 (2-tailed).		

5.6 The Prevalence of Osteoporosis among RA Patients

The picture below illustrates the study's findings, which showed that 58% of people had osteoporosis.

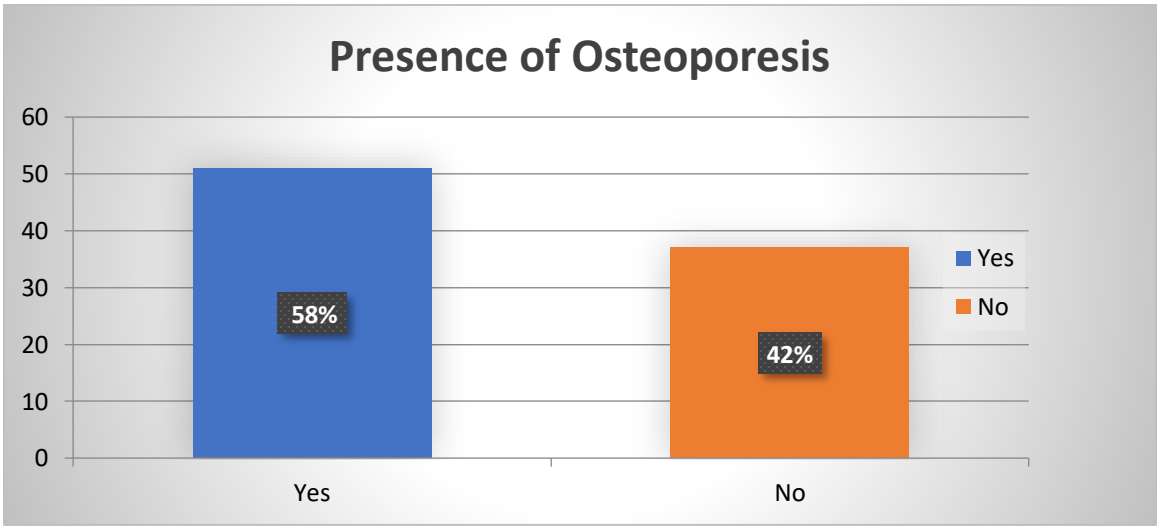

Figure 1: The prevalence of osteoporosis among type RA patients

5.7 The Determinant Factors Affecting Osteoporosis

In this study age, duration of RA, methotrexate and prednisolone medication utilization were associated with osteoporosis among RA patients by bivariate logistic regression. The multivariate logistic regression revealed that the odds of age>60 years had 10.3 times increased risk in osteoporosis compared to age of 40-60 years (AOR=10.3, 95%CI=2.32, 45.44, P=0.000) and the odds of duration of RA >15 years had 7.3 times increased risk of osteoporosis compared to those of duration of RA <15 years (AOR=7.3, 95%CI=1.16, 46.06, P=0.034). Prednisolone users were 7.5 times more likely to develop osteoporosis than non-users (AOR=7.5, 95%CI=1.78, 31.53, P=0.006), and HDL ≤40 mg users were 6.1 times more likely to develop osteoporosis than those in the opposite compartment (AOR=6.1, 95% CI= 1.39, 26.72, P=0.016).

Table 6: The bivariate and multivariate logistic regression of association between osteoporosis among RA patients

Variable	Osteoporosis		p-value	COR with 95% CI	P-value	AOR with 95% CI
	Present	Absent				
Age						
40-60	23	29	1			
>60	28	8	0.002	4.4(1.69, 11.49)	0.000	**10.3(2.32, 45.44)**
Sex						
female	46	28	0.074	2.9(0.90, 9.72)	0.528	1.6(0.36, 7.24)
male	5	9	1			
Residency						
Urban	31	31	1			
rural	20	6	0.023	3.3(1.18, 9.42)	0.205	24(0.62, 9.36)
Duration of RA						
<15	17	18	1			
≥15	34	19	0.149	1.9(0.79, 4.52)	0.034	**7.3(1.16, 46.06)**
Age at diagnosis						
<45	22	22	1			
≥45	29	15	0.133	1.9(0.82, 4.56)	0.090	5.4(0.77, 37.69)
Talking methotrexate						
Yes	45	26	0.041	3.2(1.05, 9.59)	0.907	0.89(0.14, 5.82)
no	6	11	1			
Prednisolone						
Yes	34	14	0.008	3.3(1.36, 7.95)	0.006	**7.5(1.78, 31.53)**
no	17	23	1			

HDL cholesterol in mg						
<40	30	27	1			
≥40	21	10	0.173	1.9(0.76, 4.72)	0.016	**6.1(1.39, 26.72)**

6. Discussion

In this study, the prevalence of osteoporosis was 58%. This finding was higher than the study done on systematic review by Samaneh Moshayedi, et al(27.6%) (28) and study done in chines (41.6%) (30). This may be due to patients receiving higher doses or longer durations of corticosteroid therapy to manage inflammation. This could increase the risk of osteoporosis compared to earlier studies, where corticosteroid use may have been more cautious or limited. Although biologic agents are effective in managing RA, there is some evidence to suggest that they may also impact bone metabolism in different ways compared to traditional treatments, potentially influencing bone density in RA patients. Advances in imaging techniques might detect osteoporosis at earlier stages, leading to a higher prevalence being reported in the current study. Previous studies might not have had access to these more sensitive diagnostic tools. Changes in lifestyle factors, such as dietary habits and levels of physical activity, can influence bone health. If the current study includes a population with lower calcium or vitamin D intake, or less physical activity, it might contribute to the observed higher prevalence of osteoporosis compared to previous studies. The current study is cross-sectional, it might capture a snapshot of bone health at a particular point in time, while previous studies may have been longitudinal, where the effects of RA and treatment on bone health were measured over a period.

The odds of age>60 years had 10.3 times increase its osteoporosis compared to age of 40-60 years (AOR=10.3, 95%CI=2.32, 45.44). This finding was congruent with the study done in Kang-won National University (29), Korean (37). This was may be due to as older RA patients are more likely to have been on long-term corticosteroid therapy, a common treatment for managing inflammation in RA. Corticosteroids inhibit bone formation. This significantly

increases the risk of developing osteoporosis, especially in older individuals who are already at risk for bone loss

The odds of duration of RA >15 years had 7.3 times increase its osteoporosis compared to those of duration of RA <15 years (AOR=7.3, 95%CI=1.16, 46.06). This finding was congruent with the study done in Korean (37). This may be due to the longer a patient takes corticosteroids, the more the risk of osteoporosis increases. With a longer duration of RA, the patient is more likely to have been on corticosteroids for an extended period, amplifying the risk of bone loss.

The odds of prednisolone medication user were 7.5 times increase its osteoporosis compared to those of non-prednisolone user (AOR=7.5, 95%CI=1.78, 31.53). This finding was congruent with the study done in Korea (37). the odds of HDL ≤40mg were 6.1 times increase its osteoporosis compared to its opposite compartment (AOR= 6.1, 95% CI= 1.39, 26.72). This finding was congruent with the study done in Korean (37). This might be due to one of the most common treatments for RA is corticosteroids, which help reduce inflammation. However, long-term use of corticosteroids is a well-established risk factor for osteoporosis.

7. Conclusion

The prevalence of osteoporosis was 58% among RA patients. The continuous variable of age, duration of RA, Systolic and diastolic blood pressure, as well as serum creatinine mg/dl, were all the continuous variables that showed a positive significant relation with BMD and the determinant factor of osteoporosis were age>60 compared to age of 40-60 years (AOR=10.3, 95%CI=2.32, 45.44), duration of RA >15 years compared to those of duration of RA <15 years (AOR=7.3, 95%CI=1.16, 46.06), prednisolone medication user (AOR=7.5, 95%CI=1.78, 31.53) and HDL ≤40mg (AOR=6.1, 95%CI=1.39, 26.72).

8. Recommendation

In this study the prevalence of osteoporosis was significantly palpable. Therefore, the recommendation goes to

- Corticosteroids, like prednisolone, significantly contribute to bone loss. Gradual tapering the dose to the lowest effective level, if possible, while maintaining adequate control of RA symptoms.

- Ensure that the patient is receiving adequate calcium and vitamin D, which are essential for bone health
- Regular bone density screening should be done to monitor bone health, especially if the patient is on long-term corticosteroid therapy. This can help detect osteopenia or osteoporosis early, allowing for timely intervention.
- Periodic reassessment of RA medications, corticosteroid doses, and osteoporosis therapies is crucial to ensuring optimal bone and joint health as the patient ages.

9. Dissemination of Results

- The study's results will be presented to the internal medicine department as one of the requirements for a specialized certificate in internal medicine. Every attempt shall be made to present the findings at national scientific conferences and publish them in regional and international publications.

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Annexes

Annex-I: Information Sheet

Dear Sir/Madam/Doctor**,** Hello, my name is _____, and I am a data collector for a research study taking place in this hospital. This study is being conducted by Dr. Mahder Abebe, who is pursuing a specialty in internal medicine at Addis Ababa University, College of Health Sciences. I would like to take a moment to explain the purpose of the study and discuss your selection as a participant. Your attention is greatly appreciated. Thank you!

Title: Prevalence of osteoporosis in rheumatoid arthritis patients and associated risk factors at Tikur Anbessa Specialized Hospital, Lancet Specialized Hospital and Rheum Rheumatology and Internal Medicine Specialized Center.

Introduction: You are being invited to participate in a research study that aims to evaluate the Prevalence of osteoporosis in rheumatoid arthritis patients and associated risk. This study is being conducted by the department of internal medicine, college of medicine and health sciences, AAU and is intended to contribute to the understanding of impact of osteoporosis and its contributing factor.

Purpose: The purpose of this study is to analyze how rheumatoid arthritis and other contributing risk factors an impact for osteoporosis. We hope together valuable data that can help healthcare providers better manage osteoporosis.

Risks and Benefits: There are no risks associated with participating in this study, as the questionnaire involves questions that can be acquired from medical record data and does not require any procedures.

Confidentiality: Every piece of data gathered for this study will be kept private. No publications or reports arising from this study will reveal your identify. The study's conclusions will not be specific to any one person; rather, they will be generic for the group under investigation. To prevent names from being displayed, the questionnaire will be coded. No information that could connect research participants to the study will be mentioned in written or spoken reports.

Whom to Contact: The research project is approved by research ethical committee school of Medicine, department of internal medicine, Addis Ababa University. If you have any questions about this study or your participation, please feel free to contact any of the following individuals and you may ask at any time you want:

Principal Investigator: Dr. Mahder Abebe (MD, IM Resident)
Phone Number (+251918032172)
Email: mediabe51@gmail.com

Annex-II: Questionnaire on the Magnitude of Osteoporosis and Its Associated Factors Among Patients with Rheumatoid Arthritis (RA)

Medical Record (i-Care) Number: _____

Date of Interview: _____ / 2024

Section 1: Patient Demographics

1. Age: _____ years

2. Gender:
   a. Female
   b. Male

3. Residence:
   a. Rural
   b. Urban

Section 2: Rheumatoid Arthritis History

4. How long have you had RA? _____ years

5. At what age were you diagnosed with RA? _____ years

6. What type(s) of treatment are you currently taking for RA? (Select all that apply)
   _____

7. What is your total daily dose of the selected medication(s)? _____ mg

Section 3: Physical Examination & Laboratory Results

8. Weight: _____ kg

9. Systolic Blood Pressure (SBP): _____ mmHg

10. Diastolic Blood Pressure (DBP): _____ mmHg

11. Total Serum Cholesterol: _____ mg/dL

12. Serum HDL Cholesterol: _____ mg/dL

13. Serum LDL Cholesterol: _____ mg/dL

14. Serum Triglycerides: _____ mg/dL

15. Serum Creatinine: _____ mg/dL

Section 4: Osteoporosis Risk Factors

16. Have you ever had any of the following medical conditions? (Select all that apply)

- a. Hypertension
- b. Rheumatoid arthritis
- c. Untreated long-standing hyperthyroidism
- d. Malabsorption
- e. Dyslipidemia
-

- f. Chronic liver disease
- g. Epilepsy
- h. None of the above

17. Have you used any of the following medications in the past year? (Select all that apply)

- a. Oral glucocorticoids (e.g., currently using or used for ≥3 months at a dose equivalent to prednisolone 5 mg/day)
- b. Hormone replacement therapy
- c. Anticonvulsants
- d. Osteoporosis prevention or treatment medications
- e. Aromatase inhibitors
- f. Thiazide diuretics
- g. Testosterone
- h. SGLT2 inhibitors or Metformin
- i.Proton pump inhibitors
- j. Loop diuretics
- k. Oral contraceptives
- l. Thyroid replacement therapy
- m. None of the above

Section 6: Osteoporosis Measurement Tools

Results of DXA Scan:

1. T-score: _____

2. Z-score: _____

3. MBD Total Result: _____