



**Original Article**

## Foot Disorders in Rheumatoid Arthritis Patients and their Impact on Functional Ability and Quality of Life.

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### ABSTRACT

**Background:** Rheumatoid Arthritis (RA) is the commonest type of inflammatory arthritis and commonly affects the hands, feet, wrists, ankles and knees. For some people, the foot is the first area of the body to present with signs and symptoms of RA. This study aimed to determine frequency of foot disorders in RA patients, find relation between RA disease activity and foot disorders and find out their impact on functional ability and quality of life.

**Patients and methods:** This study included a total of 300 RA patients. They were 240 females and 60 males, their ages ranged from 18-74 years. All patients were subjected to the following; full history taking, complete clinical examination, and disease activity assessment by modified DAS28. Measurement of foot pain and disability was done using Manchester Foot Pain and Disability Index (MFPDI). Measurement of functional ability of foot was done using Foot and Ankle Ability Measure (FAAM). Measurement of quality of life in RA patients was done using Rheumatoid Arthritis Quality of Life (RAQoL). Laboratory investigations included complete blood count (CBC), erythrocyte sedimentation rate (ESR), c-reactive protein (CRP), rheumatoid factor (RF) titre, and anti-cyclic citrullinated peptide (anti-CCP Ab) titre.

**Results:** We found that 178 patients (59.3%) had foot complaint. Among the studied RA patients, there were 122 patients (46.7%) had ankle affected, 91 patients (30.3%) had subtalar affected, 73 patients (24.3%) had interphalangeal affected, 70 patients (23.3%) had midtarsal affected and 64 patients (21.3%) had metatarsophalangeal affected. 31.6% of the study patients had foot deformities. RA patients who had older age, high disease activity, high BMI and long disease duration were more susceptible to foot disorders. There were high significant differences between RA patients with foot disorders and those without foot disorders regarding physical function and quality of life. Patients with high disease activity had more foot pain and disability, also they had more impairment of physical function and quality of life.

**Conclusion:** Significant high frequency of foot disorders among RA patients. It affected 59.3% of the studied RA patients. 31.6% had foot deformities. RA patients with high risk of developing foot disorders had high BMI, high disease activity and longer disease duration. Foot disorders had great impact on functional ability and quality of life in RA patients.

**Keywords:** Foot Disorders ; Rheumatoid Arthritis ; Functional Ability ; Quality of Life



### INTRODUCTION

Rheumatoid arthritis (RA) is an autoimmune disease characterized by inflammation and

pannus formation, subsequently resulting in joint destruction and systemic complications [1]. About 30 to 90% of RA patients reported foot problems.

For some people, the foot is the first area of the body to present with signs and symptoms of RA [2]. Clinical involvement of feet in RA patients may include articular features such as joint pain, stiffness and swelling; extra articular features such as bursa, nodules and numbness; structural deformities such as hallux valgus and toe deformities; and cutaneous lesions such as callosities, nail pathologies and ulceration [3]. Various types of foot deformities can result according to the pattern of joint involvement in RA. Within the foot, the subtalar and mid-tarsal joints are more frequently involved than the ankle joint. The ankle is usually quite stable, but reduced dorsal flexion may interfere with walking ability. The subtalar and talonavicular joints are commonly affected in RA. Synovitis causes pain and stiffness and sometimes leads to subtalar dislocation [4]. Pharmacological management of RA has additional consequences for foot health, with medications being associated with increased risk of infection. The sequelae of this spectrum of foot pathology are loss of function, reductions in mobility, quality of life and social participation and a potential negative impact on self-image [5]. Foot involvement in RA caused walking disability in three-quarters of the cases and four times as often as the knee or the hip. It was the only one to subjectively impair gait [6]. Despite the number of patients reporting foot complaints and the consequences for daily activities, the rheumatoid foot has so far received little attention in scientific research especially in Zagazig University. The aim of this study was to evaluate the foot disorders in RA patients and their impact on functional ability and quality of life.

## METHODS

This study was performed in Rheumatology and Rehabilitation department of Zagazig University Hospitals, after review and approval by the Institutional Review Board, Faculty of Medicine, Zagazig University. This study included a total of 300 RA patients. They were 240 females and 60 males, and their mean age (range) was  $43.7 \pm 10.05$  (18-74) years. Disease duration ranged from 1-20 years. Our patients fulfilled the revised 2010 ACR/EULAR classification criteria for Rheumatoid Arthritis [7]. Written informed consent was obtained from all participants. This study was done according to The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

### Clinical assessment;

All patients were subjected to full clinical history taking, general examination with stress on body weight, height, body mass index (BMI), lower limb edema, and gait of the patient. Local examination

of ankle and foot was done for joint swelling, skin abnormalities, arthritis, arthralgia, numbness, deformities, tenosynovitis and subcutaneous nodules.

Disease activity in RA patients was assessed by modified DAS 28 [8].

### Assessment of function and quality of life;

Pain and disability for all patients were assessed using Manchester foot pain and disability Index (MFPDI). MFPDI is a patient reported outcome consisting of 19 items assessing foot pain and disability. Each of which has three possible response categories: "none of the time", "on some days" or "on most/every day (s) with a total score from 0 to 38. [9]. Functional ability in our patients was assessed using foot and ankle Ability measure (FAAM). FAAM is a 29-item questionnaire divided into two subscales: 21-item activities of daily living subscale and 8-item sports subscale. Each item is scored on a 5-point Likert scale (4 to 0) from 'no difficulty at all' to 'unable to do'. Higher scores represent higher levels of function for each subscale, with 100% representing no dysfunction [10]. Quality of Life was assessed for all patients using rheumatoid arthritis quality of life (RAQoL), which is an outcome measure used to determine the effect rheumatoid arthritis on a patient's quality of life. The RAQoL has 30 items with a yes and no response format. Scores on the RAQoL are a sum of all the individual item scores with a range from 0-30, with a lower score indicating better quality of life [11]. Unfortunately, none of these measures has validated Arabic version, and their questions are translated to our study patients.

### Laboratory investigations;

All patients were subjected to the following laboratory tests: complete blood count (CBC), erythrocyte sedimentation rate (ESR), c-reactive protein (CRP), rheumatoid factor (RF) titre, and anti-cyclic citrullinated peptide (anti-CCP Ab) titre.

### Statistical methods

All data were collected, tabulated and statistically analyzed using SPSS 23.0 for windows (SPSS Inc., Chicago, IL, USA 2011). Quantitative data were expressed as the mean  $\pm$  SD & median (range), and qualitative data were expressed as absolute frequencies (number) & relative frequencies (percentage). Continuous data were checked for normality by using Shapiro Walk test. Independent samples Student's t-test was used to compare between two groups of normally distributed variables while Mann Whitney U test was used for non-normally distributed variables. Anova test was used to compare between more than two

groups of normally distributed variables. Percent of categorical variables were compared using Chi-square test or Fisher's exact test when appropriate. McNemar test was used to compare between paired categorical variables. All tests were two sided. p-value < 0.05 was considered statistically significant (S), p-value < 0.001 was considered highly statistically significant (HS), and p-value ≥ 0.05 was considered statistically insignificant (NS).

**RESULTS**

The study RA patients were 240 females (80%) and 60 males (20%), and their mean age (range) was 43.7± 10.05 (18-74) years. Demographic and clinical characteristics of RA patients are shown in table 1. Among RA patients, there were 178 patients (59.3%) had foot complaint. Among the studied RA patients, there were 122 patients (46.7%) had ankle affected, 91 patients (30.3%) had subtalar affected, 73 patients (24.3%) had

interphalangeal affected, 70 patients (23.3%) had midtarsal affected and 64 patients (21.3%) had metatarsophalangeal affected (figure 1). Foot manifestations including deformities in the study RA patients are shown in table 2. There was significant positive correlation between foot disorders among RA patients and; age, BMI, disease duration, morning stiffness, DAS28 and ESR (p,0.0001) (table 3). There were high significant difference between RA patients with foot disorders, and those without foot disorders regarding physical function and quality of life indices including, MFPDI, daily living subscale and RAQOL (P, .0001) (table 4). Patients with high disease activity had more foot pain and disability (assessed by MFPDI), also they had more impairment of physical function (assessed by Daily living subscale) and more impairment of quality of life (assessed by RAQOL (P, .0001) (table 5)

**Table (1):** Demographic and clinical characteristics of RA patients (n=300):

|                                   | n           | %    |
|-----------------------------------|-------------|------|
| <b>Age ( years)</b>               |             |      |
| • Mean ±SD                        | 43.7± 10.05 |      |
| • Median (Range)                  | 43 (18—74)  |      |
| <b>Sex</b>                        |             |      |
| • Female                          | 240         | 80.0 |
| • Male                            | 60          | 20.0 |
| • Female/male ratio               | 4:1         |      |
| <b>BMI</b>                        |             |      |
| Normal                            | 54          | 18.0 |
| Overweight                        | 100         | 33.3 |
| Obese                             | 146         | 48.7 |
| • Mean ±SD                        | 30.8±5.4    |      |
| • (Range )                        | (22-47.7)   |      |
| <b>Disease duration (years)</b>   |             |      |
| • Mean ±SD                        | 6.34±5.2    |      |
| • Median (Range)                  | 5(1-20)     |      |
| <b>Morning stiffness (minute)</b> |             |      |
| • Mean ±SD                        | 19.5±14.2   |      |
| • (Range )                        | (0-90)      |      |
| <b>ESR (mm/hr.)</b>               |             |      |
| • Mean ±SD                        | 34.37±22.8  |      |
| • (Range )                        | (2-130)     |      |
| <b>RF(U/ml)</b>                   |             |      |
| • Mean ±SD                        | 56.63±49.2  |      |
| • (Range )                        | (2-373)     |      |

**BMI:** body mass index. **SD:** standard deviation. **RA:** rheumatoid arthritis. **ESR:** erythrocyte sedimentation rate. **RF:** rheumatoid factor.

**Table (2):** Foot manifestations in RA patients:

|                                | N   | %     |
|--------------------------------|-----|-------|
| <b>Arthralgia</b>              | 177 | 59.0% |
| <b>Arthritis</b>               | 104 | 34.7% |
| <b>Deformities</b>             | 95  | 31.6  |
| <b>Skin</b>                    | 58  | 19.3% |
| <b>Subcutaneous nodules</b>    | 36  | 12.0% |
| <b>Neurological</b>            | 88  | 29.3% |
| <b>Tarsal Tunnel syndrome</b>  | 12  | 4.0%  |
| <b>Secondary vasculitis</b>    | 19  | 6.3%  |
| <b>Nail</b>                    | 5   | 1.7%  |
| <b>Tenosynovitis</b>           | 23  | 7.7%  |
| <b>Tendon achilles rupture</b> | 0   | 0.0   |

**Table (3):** Relation between foot disorders among studied RA patients and their socio demographic and clinical characteristics:

|   | Foot disorders              |                           | U test           | P             |
|---|-----------------------------|---------------------------|------------------|---------------|
|   | Yes (n=178)                 | No(n=122)                 |                  |               |
| <b>Age (years)</b><br>Mean ±SD<br>(Range)                       | 45.47±10.1<br>(22-74)       | 41.2±9.4<br>(18-60)       | t=3.7            | 0.0001<br>(S) |
| <b>Sex</b><br>Female (240)<br>Male (60)                         | 140<br>38                   | 100<br>22                 | $\chi^2$<br>0.49 | 0.48          |
| <b>Disease duration(years)</b><br>Mean ±SD<br>(Range)           | 7.73±5.6<br>(1-20)          | 4.3±3.6<br>(1-20)         | 5.7              | .0001(S)      |
| <b>Disease Activity (DAS28)</b><br>Mean ±SD<br>Median (Range)   | 4.57±1.28<br>4.7(0.49-7.78) | 3.43±1.2<br>3.21 (.9-7.1) | 7.27             | .0001(S)      |
| <b>Morning stiffness (minutes)</b><br>Mean ±SD<br>Median(Range) | 25.8±14.8<br>20(5-90)       | 10.3±5.6<br>10(0-30)      | 11.1             | .0001(S)      |
| <b>ESR (mm/hr.)</b><br>Mean ±SD<br>(Range)                      | 38.55±24.2<br>(2-130)       | 28.27±18.9<br>(4-120)     | 3.76             | .0001(S)      |

$\chi^2$ ; Chi square test, t; test of significant, U; Mann-Whitney U test of significant test, (S); significant p<0.05

**Table (4):** Physical disability and quality of life in rheumatoid arthritis patients (n=178):

|   | Patients with<br>foot disorder<br>( n.178) | Patients without<br>foot disorder<br>( n.122) | t    | p      |
|---|--|---|------|--------|
| <b>Manchester (38)*</b><br>Mean ±SD<br>(range)            | 23.38±5.7<br>(10-35)                       | 1.86±1.05<br>(0-3)                            | 46.6 | 0.0001 |
| <b>Daily living subscale (84)*</b><br>Mean ±SD<br>(range) | 51.53±10.5<br>(30-77)                      | 25.57±6.1<br>(15-35)                          | 26.9 | 0.0001 |
| <b>RAQOL (30)*</b><br>Mean ±SD<br>(range)                 | 20.27±3.46<br>(11-28)                      | 9.61±3.37<br>(5-16)                           | 26.4 | 0.0001 |

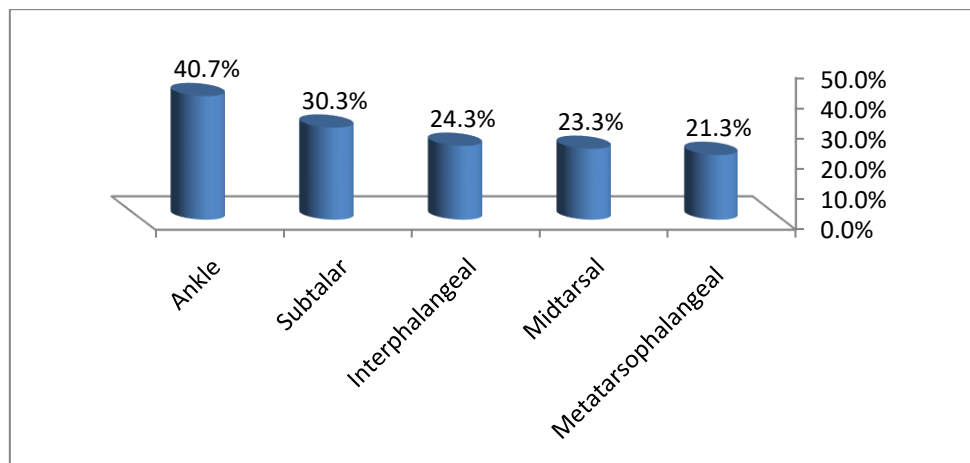
t; test of significant

\* maximum score, RAQOL; rheumatoid arthritis quality of life

**Table (5):** Relation between DAS28 for foot affected patients and study indices (n = 178):

|   | DAS28 for foot affected patients |                           |                       | F            | p         | Post hoc(P) |            |           |
|---|----------------------------------|---------------------------|-----------------------|--------------|-----------|-------------|------------|-----------|
|   | low activity<br>n=29             | moderate activity<br>n=83 | high activity<br>n=66 |              |           | L&M         | L&H        | M&H       |
| <b>Manchester</b><br>Mean ±SD<br>Range            | 19.5±4.4<br>14-32                | 23.7±5.9<br>14-35         | 24.6±5.4<br>10-34     | 9.<br>0<br>7 | .00<br>01 | .00<br>1    | 0.00<br>01 | 0.38      |
| <b>Daily living subscale</b><br>Mean ±SD<br>Range | 45.5±8.3<br>30-61                | 51.7±10.<br>5<br>32-71    | 53.9±10.6<br>30-77    | 6.<br>8<br>5 | .00<br>1  | .00<br>6    | 0.00<br>01 | 0.18      |
| <b>RAQOL</b><br>Mean ±SD<br>(Range)               | 18.3±2.8<br>11-22                | 19.99±3.<br>2<br>13-26    | 21.47±3.5<br>13-28    | 9.<br>5      | .00<br>01 | 0.0<br>2    | 0.00<br>01 | 0.00<br>7 |

Data were expressed as mean ±SD & median (range). F; anova test, p<0.05; significant, p<0.001; highly significant



**Figure (1):** Frequency of foot joints affected in RA patients

**DISCUSSION**

RA is an autoimmune disease that typically affects the small joints of the hands and feet. It is usually manifested with constant pain, stiffness, progressive joint destruction. Inflammation of foot joints and synovial tissues leads to articular damage and structural deformities. Impairment of the quality of life has been reported in RA[12]. Foot problems can lead to reduced walking distance, impaired health-related quality of life and an increased risk of falls [13]. The present study aimed to evaluate the foot disorders in RA patients and their impact on functional ability and quality of life.

This study included 300 RA patients (240 females and 60 males). This study showed that 59.3% RA patients had foot involvement (figure 1), which is in agreement with a study found that seventy-four patients (61.7%) had a foot or ankle RA involvement [14]. On the other hand our percentage is a somewhat lower than prevalence in previous reports such as a study reported that 89% patients had experienced foot complaints [4]. The reasons for our lower prevalence are that our patients were relatively young, their disease was of

short duration, and many were receiving biological and DMARDs agents.

Results of our study showed that the frequency of foot joint affection was [ankle 122 patients (46.7%) , subtalar 91 patients (30.3%), interphalangeal 73 patients (24.3%) , midtarsal 70 patients (23.3%) and metatarsophalangeal 64 patients (21.3%) ] (figure 1). This came in agreement with a study which found that foot joint affection was ankle (36%) and forefoot (30%) followed by hindfoot (17%) and midfoot (7%) currently[4].

In the current study (table 2), there were 177 patients (59.0%) had arthralgia, 104 patients had arthritis (34.7%), 88 patients had neurological finding (tingling and numbness).There were (31.6%) had foot deformities. This came in agreement with **González-Fernández et al.**, who found that foot pain among RA patients is high. According to his study, foot pain including metatarsalgia was the most prevalent type of pain, in RA patients represent 30–94.1% of patients [15]. Similarly the study of **Hooper, et al** in 2012 found that clinical issues involving the feet include articular features such as joint pain, stiffness and swelling; extra articular features such as bursae,

nodules and numbness, and cutaneous lesions such as callosities, nail pathologies and ulceration [16]. In the current study, there was statistically significant difference between RA patients with and without foot affection regarding disease activity (DAS28). Factors including BMI, disease duration and disease activity increase prevalence of foot disorders occurrence (table 3). This is in agreement with a study which found that the group with foot or ankle involvement had higher median DAS28 scores ( $p < 0.05$ ) than the group without foot or ankle involvement [14]. Also, this was in agreement with **van der Leeden et al** in 2007 who showed that longer disease duration is associated with impaired foot function [17].

The present study showed that foot affection in RA lead to more pain and less functional ability and quality of life that were assessed by Manchester, daily living subscale and RAQOL, than RA patients without foot affection (table 4). In agreement with our study, another study found that foot joint involvement in patients with RA can lead to joint instability, difficulty walking, and functional limitations, affecting the activities of daily living [18]. Similarly a study on 26 egyptian early RA patients, the QoL was impaired also [19]. In the current study, RA patients with high disease activity had more foot pain and disability ( $P .0001$ ), and more impairment of physical function and quality of life ( $P .0001$ ), (table 5). In agreement with our study, another study explored the impact of disease activity and functional disability on health related QoL and found that the higher disease activity, the more impairment of quality of life and more functional disability ( $p < 0.001$ )[20].

### CONCLUSION

This study demonstrated a significant high frequency of foot disorders among RA patients. It was about 59.3% of total studied patients. RA patients with high risk of developing foot disorders had high BMI, high disease activity and longer disease duration. Foot disorders had great impact on functional ability and quality of life in RA patients. More attention should be given to evaluate, and treat foot disorders in RA patients as soon as they are diagnosed to avoid disability and its impact on foot function and quality of life.

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