Falls and Related Factors in Female Patients with Rheumatoid Arthritis

Romatoid Artritli Kadın Hastalarda Düşme ve İlişkili Faktörler

 Halime Kibar, **Derya Buğdaycı**

University of Health Sciences Türkiye, İstanbul Physical Medicine and Rehabilitation Training and Research Hospital, Clinic of Physical Medicine and Rehabilitation, İstanbul, Türkiye

Abstract

Objective: Falls are associated with significant mortality, morbidity, and loss of function. It has been shown that the risk of falls is increased in patients with rheumatoid arthritis (RA). The purpose of the study was to evaluate the prevalence of falls in female RA patients and its association with clinical data, disease-related outcomes, functionality, and balance.

Materials and Methods: Ninety-four female patients included in this cross sectional observational study. The following were recorded: age, disease duration, body mass index, visual analog scale (0-100 mm), medication, disease activity score-28, Health Assessment Questionnaire, 6-meter walking time, Berg balance scale (BBS), use of a walking aid, and lower extremity arthritis. Patients were asked about falling in the past 12 months. In addition, it was questioned whether the patients had a fear of falling. The relationship between falls and patient data was investigated. Data on patients with and without a history of falling were compared.

Results: Ninety patients completed this study. Thirty percent of the patients had at least one fall in the last 12 months, and 52% had a fear of falling. Falls were correlated positively with balance problems. There was a significant difference in age, fear of falling, and BBS values between the patients with and without a history of falling. There were no differences in disease activity, pain, body mass index, medications, and functional parameters.

Conclusion: Awareness should be raised about falling in patients with RA. We suggest that balance should be evaluated to predict fall risk in patients with RA. Elderly patients with RA need to be followed more carefully, as falls will increase with age. Since the risk of osteoporosis is higher in RA, precautions should be taken to prevent falling and any problems it may cause.

Keywords: Balance, falls, female, rheumatoid arthritis

Öz

Amaç: Düşme ciddi mortalite, morbidite ve fonksiyon kaybıyla ilişkilidir. Romatoid artritli (RA) hastalarda düşme riskinin arttığı gösterilmiştir. Çalışmanın amacı kadın RA hastalarında düşme prevalansı ve bunun klinik veriler, hastalıkla ilişkili sonuçlar, işlevsellik ve denge ile ilişkisini değerlendirmektir.

Gereç ve Yöntem: Kesitsel gözlemsel çalışmaya 94 kadın hasta dahil edildi. Yaş, hastalık süresi, vücut kitle indeksi, visuel ağrı skalası (0-100 mm), ilaç kullanımı, hastalık aktivite skoru-28, Sağlık Değerlendirme Anketi, 6 metre yürüme süresi, Berg denge skalası (BBS), yürüme yardımcısı kullanımı alt ekstremite artriti kaydedildi. Hastalara son 12 aydaki düşmeleri soruldu. Ayrıca hastaların düşme korkusu olup olmadığı da sorgulandı. Düşmeler ile hasta verileri arasındaki ilişki araştırıldı. Düşme öyküsü olan ve olmayan hastaların verileri karşılaştırıldı.

Bulgular: Doksan hasta bu çalışmayı tamamladı. Hastaların %30'unda son 12 ayda en az bir kez düşme yaşanmış, %52'sinde ise düşme korkusu mevcuttu. Düşmeler denge problemi ile pozitif yönde ilişkiliydi. Düşme öyküsü olan ve olmayan hastalar arasında yaş, düşme korkusu ve BBS değerleri açısından anlamlı fark vardı. Hastalık aktivitesi, ağrı, vücut kitle indeksi, ilaçlar ve fonksiyonel parametreler arasında fark bulunmadı.

Sonuç: RA'lı hastalarda düşme konusunda farkındalık artırılmalıdır. RA hastalarında düşme riskini öngörmek için dengenin ve düşme korkusunun değerlendirilmesi gerektiğini öneriyoruz. Yaş arttıkça düşmeler artacağından yaşlı RA'lı hastaların daha dikkatli takip edilmesi gerekir. RA'da osteoporoz riski daha yüksek olduğundan düşme ve yol açabileceği problemler oluşmadan önlem alınmalıdır.

Anahtar kelimeler: Denge, düşme, kadın, romatoid artrit

2 Kibar and Buğdaycı.
Falls and Related Factors in Rheumatoid Arthritis

Turk J Osteoporos
2025;31(1):1-5

Introduction

Rheumatoid arthritis (RA) is a systemic inflammatory autoimmune disease characterized by painful, swollen joints that can severely impair physical function (1). RA is 3:1 more common in women than men (2). Joint damage and deformity, muscle weakness, pain, and balance problems may occur in RA. These affect gait and mobility and increase the risk of falls (3-5). It has been previously reported that patients with RA have a higher risk of falling than the healthy population (6).

Falls are associated with mortality and morbidity and the need for early care. History of falls, gait deficit, balance disorder, use of assistive devices, and arthritis are risk factors for falling (7). Patients with RA from illness or corticosteroid-induced bone fragility are at greater risk of fracture and fall-related complications than the general population (8,9). The experience of falls may also result in a fear of falling, which has been linked to a lack of physical activity (10,11).

It is critical to assess the likelihood of falling and identify the risk factors for falling for these reasons. If fall-related factors are identified, measures can be taken. While some factors were found to be similar in previous studies, some results were different (6,12,13). It was stated that there was no complete standardization and there were few studies on this subject. This revealed the need for more studies.

The aim of this study was to evaluate falls in the last 12 months in female RA patients and their association with clinical data, disease-related outcomes, functionality, and balance.

Materials and Methods

Ninety-four female patients with RA who were admitted to the out-patient clinic between February 2023-May 2023 were included consecutively in this cross-sectional observational study. 4 patients were missing data. Ninety patients completed study. We performed a face to face interview and physical examination. All patients were previously diagnosed according to the American College of Rheumatology 1987 or 2010 diagnostic criteria patients >18 years with a good mental capacity were included in the study.

Exclusion criteria were having cognitive problems, diabetic foot, infection in lower extremities, vertigo, Parkinson, use of psychiatric drugs, lower extremity traumatic problems and surgical procedures.

Demographic and clinical features were recorded. Age, disease duration, body mass index (BMI) and medication were recorded. Disease activity score-28 (DAS-28) was calculated with an erythrocyte sedimentation rate (ESR) for disease activity.

Patients were asked about falling in the past 12 months. In addition, it was questioned whether the patients had a fear of falling or not.

The use of walking aid by the patients was questioned. The lower extremity arthritis (hip, knee, ankle, foot) joint involvements of the patients were asked and recorded.

Functions were measured by the Turkish version of Health Assessment Questionnaire (HAQ), a 6-meter walking test (14). The Turkish version of Berg balance scale (BBS) was used for balance assessment (15). A visual analog scale (VAS, 0-100 mm) was used for the patient's pain assessment.

We evaluated the prevalence of falls in female RA patients and its association with clinical data, disease-related outcomes, functionality, and balance.

Patients with RA were divided into 2 according to their history of falling in the last year: fallers and non-fallers. The characteristics of these groups were compared.

This study Bakırköy Dr. Sadi Konuk Training and Research Hospital Clinical Research Ethics Committee and written informed consent was obtained from the patients (decision no: 2023-01-30, date: 09.01.2023). All procedures were designed with the Helsinki Declaration.

Statistical Analysis

Statistical analysis are made using SPSS version 22.0 package program. Descriptive statistics are summarized as mean and standard deviation. Categorical variables is presented by using percentages. The suitability of variables to normal distribution was examined using analytical methods (Anderson-Darling test) and verified with visuals. Normally distributed continuous data were compared with 2 Sample's t-tests, non-normally distributed continuous data were compared with Mann-Whitney U test and Fisher's exact test. Pearson Correlation test was used in correlation analysis. Multiple regression analysis and binary logistic regression analysis were performed. The p-value is taken as 0.05 in all statistics.

Results

The demographic and clinical characteristics are shown in Table 1. Correlations between falls in the last 12 months and other clinical and disease parameters are shown in Table 2. 33% of the patients had at least one fall in the last 12 months, and 52% had a fear of falling. Falls were correlated positively with BBS.

Table 3 presents to compare fallers and non-fallers. There was a significant difference in age, corticosteroid use, fear of falling and BBS values between the 2 groups.

Discussion

In this study, factors associated with falls were investigated in female patients with RA and the data of patients with and without a history of falling in the last 12 months were compared. We found that 33% female patients with RA had at least one fall in the last 12 months, and 52% had a fear of falling. We found a relationship between only falls and balance. When we compared the parameters of fallers and non-fallers, we found a difference between the two groups' age, balance scores, fear of falling and corticosteroid use.

Turk J Osteoporos
2025;31(1):1-5

Kibar and Buğdaycı.
Falls and Related Factors in Rheumatoid Arthritis

3

Table 1. Characteristics of patients

Age (years) (mean±SD)	55.5±12.75
Disease duration (years) (mean±SD)	12.51±9.66
BMI (kg/cm²) (mean±SD)	28.6±5.6
ESR (mm/hour) (mean±SD)	24.12±19.43
DAS-28 (mean±SD)	3.76±1.26
VAS (0-100 mm) (mean±SD)	49.01±6.79
HAQ (mean±SD)	0.73±0.56
6 mt walking time (second) (mean±SD)	7.89±4.8
BBS (mean±SD)	49.01±6.79
Walking aid (no/yes) (%)	80/10 (91/9)
Falls history in the last year (no/yes) (%)	60/30 (67/33)
Fear of falling (no/yes) (%)	43/47 (48/52)
Low extremity arthritis (no/yes) (%)	55/35 (71/39)
Syn DMARDs/biy DMARDs (%)	74/16 (82/18)
Corticosteroids (no/yes) (%)	49/41 (55/45)

Data are means, BMI: Body mass index, ESR: Erythrocyte sedimentation rate, VAS: Visual analog scale, HAQ: Health Assessment Questionnaire, mt: Meter, BBS: Berg balance scale, Syn: Synthetic, Biol: Biological, DAS-28: Disease activity score-28

The frequency of falls in RA was found in different ranges in different studies. In studies in other countries, falls in patients with RA in the last 12 months were and 48.8% in Brazil, 28% in Japan and 28% in Türkiye (12,13,6). In a one-year prospective study in Germany, 20.2% of patients with RA had a fall experience (16). We think that the wide range in the literature is related to the habits and life-styles of societies. Factors such as nutrition, exercise and social support can affect falls. In addition, the methodology of the studies and the heterogeneity in the inclusion criteria affect the rates. For example, the inclusion of patients with vertigo may affect the rate of falls. In our study, patients diagnosed with vertigo and Parkinson's were excluded from the study. In general, although female patients are high in all studies on RA, our study only included women.

We identified a fear of falling in 52% of the patients. The fear of falling in patients with RA was reported 65.5% and 74.5% in previous studies, respectively (6,17). There was no relationship between the fear of falling and falls, but there was a difference between the fear of falling and the patient's fall history. The rate of fear of falling in the fallers was higher.

Balance has been defined as a multidimensional domain of muscle function, one of the most important indicators for predicting falls (7,18). Our study suggests that balance impairment may

Table 2. Multiregression analysis and odds ratios

Coefficients

Term	Coef	SE coef	z-value	p-value	VIF	Odds ratio	95% CI
Constant	8.6	6.99	1.23	0.219			
Disease duration (years)	-0.068	0.0375	-1.81	0.07	1.81	0.9343	(0.8680, 1.0056)
VAS (mm/100)	-0.0214	0.0173	-1.24	0.217	2.57	0.9788	(0.9461, 1.0126)
DAS-28	-0.162	0.426	-0.38	0.704	3.56	0.8508	(0.3694, 1.9598)
ESR	0.028	0.0199	1.41	0.159	1.66	1.0284	(0.9891, 1.0693)
HAQ	0,477	0.725	0.66	0.51	2.08	1.6119	(0.3894, 6.6722)
Age (years)	0.0227	0.0355	0.64	0.522	2.07	1.023	(0.9543, 1.0966)
6 mt walking time (sn)	0.0652	0.0969	0.67	0.501	1.88	1.0673	(0.8828, 1.2905)
BMI	-0.0558	0.0514	-1.09	0.277	1.14	0.9457	(0.8552, 1.0458)
BBS	-0.196	0.104	-1.88	0.06	4.32	0.8222	(0.6704, 1.0083)
Walking aid	-1.89	1.6	-1.18	0.239	2.85	0.1517	(0.0066, 3.4958)
Fear of falling	0.919	0.67	1.37	0.17	1.36	2.5062	(0.6746, 9.3100)
Low ekstremity arthritis	0.6	0.696	0.86	0.388	1.51	1.8229	(0.4657, 7.1358)
Syn DMARDs/biol DMARDs	1.107	0.887	1.25	0.212	1.62	3.0249	(0.5320, 17.1981)
Corticosteroids	0.992	0.675	1.47	0.142	1.45	2.6954	(0.7173, 10.1284)
Model summary							
Deviance	Deviance	AIC	AICc	BIC	Area under		
R-Sq	R-Sq (adj)				ROC curve		
99.17%	73.86%	60.95	92.48	135.95	1		
Binary logistic regression: falls in the previous year versus BBS							
Coefficients							
BBS							
Term	Coef	SE coef	z-value	p-value	VIF		
Constant	6.91	2.25	3.07	0.002			
BBS	-0.1562	0.046	-3.4	0.001	1		

Data are means, BMI: Body mass index, ESR: Erythrocyte sedimentation rate, VAS: Visual analog scale, HAQ: Health Assessment Questionnaire, mt: Meter, BBS: Berg balance scale, Syn: Synthetic, Biol: Biologi, DAS-28: Disease activity score-28, CI: confidence interval

4   Kibar and Buğdaycı.
Falls and Related Factors in Rheumatoid Arthritis

Turk J Osteoporos
2025;31(1):1-5

be a determining factor in falling. This result was compatible with the literature (6,18). We found that the balance evaluation of non-fallers was better than fallers. In the previous studies, BBS was used for balance assessment like our study. There are studies with the same result as our study (6,17). However, it was also stated that there is no difference between the balance of fallers and non-fallers (12,13). Toprak et al. (19) reported that balance disorders cause inactivity in patients with RA, which in turn increases the risk of falling and osteoporosis (19). They also stated that lower extremity problems may have increased the risk of balance disorder. We could not find a relationship between falling and lower extremity arthritis. We also compared lower extremity arthritis of fallers and non-fallers patients but found no difference. In addition, we could not determine a relationship between falling and the use of a walking aid and could not find a difference between the use of walking aids in the 2 groups.

We did not found relationship between patients' age, disease duration, disease activity and falls. Lourenço et al. (12) found the same result. Mikos et al. (20) stated that they did not find a relationship between falls and the disease duration. However, when we compared fallers and non-fallers, there was a difference in their ages. The average age of fallers was higher than non-fallers. There was no difference between disease duration. Wiegmann et al. (21) also reported the same results. However, in other studies, no difference was found between age and disease duration of fallers and non-fallers (6,13).

We evaluated ESR as an indicator of inflammation in patients and calculated disease activity with DAS-28. We did not found difference between the patients' inflammation and DASs. The same result was found in other studies where inflammation and disease activity were evaluated by the same method (6,13). Wiegmann et al. (21) evaluated disease activity with CRP and they found no difference between the disease activity of the two groups. Zonzini et al. (17) evaluated disease activity with clinical disease activity index and found that the disease activity of with recurrent fallers was higher than non-fallers (17).

We found no relationship between falls and pain. Mikos et al. (20) did not found any relationship between falls and pain, too. While on the other hand Akyol et al. (6) stated that the pain of the fallers were higher than non-fallers. Akyol et al. (6) included only RA patients using biological agents in their studies. We included patients in our study without discrimination in terms of biological disease-modifying anti-rheumatic drugs (DMARDs), synthetic DMARDs and corticosteroid use. There was no relationship between falls and patients' medications. When we compared the medications of patients, there was no difference in the use of biological DMARDs and synthetic DMARDs, but there was a difference in the use of corticosteroids. The rate of corticosteroid use was higher in faller group. Inflammation levels may actually be higher in the group using corticosteroids, and pain and disease activity may be suppressed due to the level of inflammation with corticosteroid use. Thus, there may be no difference in these parameters between fallers and non-fallers. It is known that corticosteroids have affects negatively on bone density and muscle mass. However, in our study, no measurements or evaluations were made regarding muscle density, muscle strength or bone mineral evaluation. This constitutes a limitation in our study. For this reason, we cannot comment on how corticosteroids affect falls.

We evaluated the functionality of patients with Health Assessment Questionnaire (HAQ) and 6 meter walking time. We did not find a relationship between functionality and falls. We also did not find a difference when we compared the functionality of fallers and non-fallers. HAQ was used as a method of evaluation in functionality in previous studies. However, when the relationship between falls and functionality was investigated, different results were found (12,16,20). When the results of fallers and non-fallers were compared, Zonzini et al. (17) and Akyol et al. (6) found that the functionality of non-fallers was better. But, in parallel with our results, it was shown that there was no difference in the two groups (12,14).

We did not found relationship between falls and BMI. We found

Table 3. Comparision of non-fallers and fallers			
	Non-fallers (n=60)	**Fallers(n=30)**	**p-value**
Age (years)	52.5 ± 12.2	61.47 ± 11.85	0.001
Disease duration (years)	12.43 ± 8	12.66 ± 11.39	0.732
BMI (kg/cm²)	29.0 ± 6.47	28.6 ± 4.9	0.59
ESR (mm /hour)	21.8 ± 17.6	28.8 ± 22.2	0.062
DAS28 score	3.70 ± 1.15	3.90 ± 1.47	0.51
VAS (0-100 mm)	40.16 ± 25.67	42.83 ± 28.93	0.774
HAQ	0.68 ± 0.48	0.57 ± 0.86	0.248
6 mt walking time (second)	7.06 ± 1.7	9.5 ± 7.7	0.59
BBS	51.0 ± 5.7	45.0 ± 7.0	<0.001
Walking aid (No/Yes)(%)	56/4 (94/6)	24/6 (80/20)	0.078
Fear of falling (No/Yes)(%)	36/24 (60/40)	7/23(23.3/76.6)	0.002
Low extremity arthritis (No/Yes)(%)	38/22 (63.4/36.6)	17/13 (55.7/43.3)	0.647
Syn DMARDs/Biy DMARDs (%)	50/10 (83.3/16.6)	24/6 (80/20)	0.772
Corticosteroids (No/Yes)(%)	37/23 (61.7/38.3)	12/18 (40/60)	0.047
Data are means, BMI: Body mass index, ESR: Erythrocyte sedimentation rate, VAS: Visual analog scale, HAQ: Health assessment questionnaire, mt: Meter, BBS: Berg Balance Scale, Syn: Synthetic, Biol: Biological			

Turk J Osteoporos
2025;31(1):1-5

Kibar and Buğdaycı.
Falls and Related Factors in Rheumatoid Arthritis

5

no difference between the BMI values of fallers and non-fallers. The same result was found in previous studies (13,16,17). But, Akyol et al. (6) found that the BMI value of fallers was significantly higher than non-fallers.

Study Limitations

This study has some strengths and limitations. In a study on balance, Bouchaala et al. (22) reported that balance was affected by the stiffness of the ecliptic during the hours of the day. In our study, patients were evaluated between the hours of 9-12 in the morning. We find our study strong in this aspect. The first limitation of the study was designed as a cross-sectional one. For this reason, a cause-and-effect relationship cannot be established. The second limitation is that the study did not have a control group. We included only female patients in our study because most of our patients were women. Analyses of male patients might show different results.

Conclusions

As a result, awareness should be raised about falls in patients with RA. RA patients are already at risk for osteoporosis because of their disease. While the risk of falling in the normal population increases in elderly patients, elderly patients with RA should be followed more closely. This is essential for the prevention of fractures and subsequent complications. We suggest that balance should be evaluated to predict fall risk in RA patients. Patients should be informed about falls and medical and social precautions should be taken. In particular, corticosteroid use and the follow-up should have been made considering the risk of falling. It is important in preventing falls and their consequences. There were no declared conflicts of interest that would have affected this article.

Ethics

Ethics Committee Approval: This study was approved by the Clinical Research Ethics Committee of Bakırköy Dr. Sadi Konuk Training and Research Hospital (decision no: 2023-01-30, date: 09.01.2023).

Informed Consent: Written informed consent was obtained from the patients.

Footnotes

Authorship Contributions

Concept: H.K., D.B., Design: H.K., D.B., Data Collection or Processing: H.K., Analysis or Interpretation: H.K., D.B., Literature Search: H.K., D.B., Writing: H.K., D.B.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declare that this study received no financial support.

References

1. Sparks JA. Rheumatoid arthritis. Ann Intern Med. 2019;170:ITC1-16.

2. Favalli EG, Biggioggero M, Crotti C, Becciolini A, Raimondo MG, Meroni PL. Sex and management of rheumatoid arthritis. Clin Rev Allergy Immunol. 2019;56:333-45.

3. Stanmore EK, Oldham J, Skelton DA, O'Neill T, Pilling M, Campbell AJ, et al. Risk factors for falls in adults with rheumatoid arthritis: a prospective study. Arthritis Care Res (Hoboken). 2013;65:1251-8.

4. Brenton-Rule A, Dalbeth N, Menz HB, Bassett S, Rome K. Are Foot and ankle characteristics associated with falls in people with rheumatoid arthritis? A prospective study. Arthritis Care Res (Hoboken). 2017;69:1150-5.

5. Metli NB, Kurtaran A, Akyüz M. Impaired balance and fall risk in rheumatoid arthritis patients. Ann Rheum Dis. 2014;73:906

6. Akyol Y, Ulus Y, Tander B, Tomak L, Zahiroğlu Y, Bilgici A, et al. Falls, fear of falling, and associated factors in ambulatory patients with rheumatoid arthritis: a comparative study with healthy controls. Turkish J Phys Med Rehabilitation. 2018;64:213–21.

7. Guideline for the prevention of falls in older persons. American Geriatrics Society, British Geriatrics Society, and American Academy of Orthopaedic Surgeons Panel on Falls Prevention. J Am Geriatr Soc. 2001;49:664-72.

8. 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;29:1263-75.

9. Nampei A, Hashimoto J, Koyanagi J, Ono T, Hashimoto H, Tsumaki N, et al. Characteristics of fracture and related factors in patients with rheumatoid arthritis. Mod Rheumatol. 2008;18:170-6.

10. Jamison M, Neuberger GB, Miller PA. Correlates of falls and fear of falling among adults with rheumatoid arthritis. Arthritis Rheum. 2003;49:673-80.

11. Yamagiwa K, Iijima S, Furuya T, Ikai T, Inoue E, Taniguchi A, et al. Incidence of falls and fear of falling in Japanese patients with rheumatoid arthritis. Mod Rheumatol. 2011;21:51-6.

12. Lourenço MA, Carli FVBO, de Assis MR. Characterization of falls in adults with established rheumatoid arthritis and associated factors. Adv Rheumatol. 2018;58:16.

13. Kawabata K, Matsumoto T, Kasai T, Chang SH, Hirose J, Tanaka S. Association between fall history and performance-based physical function and postural sway in patients with rheumatoid arthritis. Mod Rheumatol. 2021;31:373-9.

14. Küçükdeveci AA, Sahin H, Ataman S, Griffiths B, Tennant A. Issues in cross-cultural validity: example from the adaptation, reliability, and validity testing of a Turkish version of the Stanford Health Assessment Questionnaire. Arthritis Rheum. 2004;51:14-9.

15. Sahin F, Yilmaz F, Ozmaden A, Kotevolu N, Sahin T, Kuran B. Reliability and validity of the Turkish version of the Berg balance scale. J Geriatr Phys Ther. 2008;31:32-7.

16. Wiegmann S, Armbrecht G, Borucki D, Buehring B, Buttgereit F, Detzer C, et al. Association between sarcopenia, physical performance and falls in patients with rheumatoid arthritis: a 1-year prospective study. BMC Musculoskelet Disord. 2021;22:885.

17. Zonzini Gaino J, Barros Bértolo M, Silva Nunes C, de Morais BC, Sachetto Z, Davitt M, et al. Disease-related outcomes influence prevalence of falls in people with rheumatoid arthritis. Ann Phys Rehabil Med. 2019;62(2):84-91.

18. Pizzigalli L, MichelettiCremasco M, Mulasso A, Rainoldi A. The contribution of postural balance analysis in older adult fallers: A narrative review. J Bodyw Mov Ther. 2016;20(2):409-17.

19. Toprak C, Duruöz MT, Gündüz OH. Static and dynamic balance disorders in patients with rheumatoid arthritis and relationships with lower extremity: a prospective controlled study. Arch Rheumatol.2018;15;33(3):328-334.

20. Mikos M, Kucharska E, Lulek AM, Kłosiński M, Bogdan Batko. Evaluation of Risk risk factors for falls in patients with rheumatoid arthritis. 2020; 26: e921862-1–e921862-9.

21. Wiegmann S, Armbrecht G, Borucki D, Buehring B, Buttgereit F, Detzer C et al. Balance and prospective falls in patients with rheumatoid arthritis BMC Musculoskelet Disord. 2022; 23: 549.

22. Bouchaala F, Laatar R, Lahiani M, Zouabi A, Borji R, Rebai H, et al. Time of day effect on balance performance, functional capacities and risk of fall in women with rheumatoid arthritis. Chronobiol Int. 2020;37:227-35.