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Article

SARC-F as a Screening Tool in Rheumatoid Arthritis: Real-World Burden of Sarcopenia Risk, Sex Differences, and Clinical Correlates

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Abstract

Background/Objectives: Sarcopenia is increasingly recognized as a relevant comorbidity in rheumatoid arthritis (RA), yet systematic case finding is rarely implemented in clinical practice. The SARC-F questionnaire offers a simple, validated, patient-reported tool for sarcopenia screening, but its performance in RA remains largely unexplored. We aimed to evaluate the burden of sarcopenia risk, defined by abnormal SARC-F scores (≥ 4), and its clinical correlates in RA compared with age- and sex-matched controls. **Methods:** We conducted an observational case-control study including 275 RA patients (69.5% women) aged >50 years and 300 matched controls. Clinical, laboratory, and patient-reported outcomes were recorded. Sarcopenia risk was assessed using SARC-F (cutoff ≥ 4). RA patients also underwent grip strength and gait speed testing. Multivariable regression analyses were used to identify independent correlates of abnormal SARC-F results. **Results:** A SARC-F score ≥ 4 was observed in 28.8% of RA patients. Compared with controls, the burden was significantly higher in women with RA (34.0% vs. 24.7%, $p < 0.05$) but not in men (10.7% vs. 15.0%). Within the RA cohort, abnormal SARC-F was independently associated with female sex (OR 3.14, 95% CI 1.24–7.95) and higher RAPID3 scores (OR 1.25, 95% CI 1.18–1.33). More than half of RA patients exhibited low grip strength, with partial overlap with SARC-F findings. **Conclusions:** The SARC-F questionnaire revealed a notable burden of sarcopenia risk in RA, particularly among women. Combined with simple grip strength testing, it offers a feasible, low-cost approach to case finding, directly applicable in routine rheumatology practice. Incorporating this strategy may enhance recognition and management of sarcopenia in RA.

Keywords: rheumatoid arthritis; sarcopenia; SARC-F; sex differences; patient-reported outcomes

Introduction

Sarcopenia [1], defined as the progressive loss of muscle mass and strength, is increasingly recognized as a major determinant of functional decline, impaired health-related quality of life, and increased morbidity and mortality in chronic diseases. In rheumatoid arthritis (RA), the combined effect of persistent systemic inflammation, chronic pain, and reduced physical activity creates an environment that favors secondary sarcopenia [2], with the potential to amplify disability and compromise treatment outcomes.

Over the past decade, the incorporation of patient-reported outcome measures (PROMs) has transformed the assessment of RA impact [3]. The SARC-F questionnaire [4] is a brief, equipment-free PROM recommended by the European Working Group on Sarcopenia in Older People (EWGSOP2) [5] as a first-line case-finding tool. However, despite its suitability for high-throughput clinical settings, little is known about its performance in routine rheumatology practice or its value in guiding clinical decision-making. Consequently, it remains unclear whether systematic

implementation of SARC-F in RA is effective, which patient profiles might benefit most, and to what extent its results align with relevant clinical and functional parameters.

To address this gap in real-world evidence, we conducted an age- and sex-matched case-control study to quantify the burden of sarcopenia risk in RA compared with individuals without inflammatory arthritis, using SARC-F as the screening tool. In addition, we sought to explore potential sex differences and to identify the clinical correlates of SARC-F scores within the RA population, with the ultimate goal of informing more targeted and patient-centered screening strategies in rheumatology practice.

Method

Study Population

We conducted an observational case-control study including participants aged >50 years. Consecutive patients with RA fulfilling the 2010 ACR/EULAR classification criteria were recruited during routine visits to a tertiary university hospital rheumatology clinic. Controls were selected from a hospital-based population without inflammatory arthritis and matched to RA cases by sex and age. Each patient was paired with controls of the same sex and similar age, but no matching was performed between men and women with RA. Control participants were enrolled from three sources: accompanying relatives of rheumatology outpatients, individuals with non-inflammatory musculoskeletal complaints (predominantly soft-tissue disorders), and hospital attendees presenting for non-musculoskeletal reasons.

To minimize confounding, both cases and controls were excluded if they had conditions associated with secondary sarcopenia (active malignancy, heart or respiratory failure, chronic liver disease, or chronic kidney disease). All participants provided written informed consent, and the study protocol was approved by the local ethics committee (reference PR057/20).

Study Variables

Sociodemographic and Anthropometric Data

These variables were recorded for both RA patients and controls. We included:

- Sex
- Age
- Body Mass Index (BMI): Calculated as weight (kg) divided by height squared (m²). Participants were classified as:
 - Underweight: < 18.5 kg/m²
 - Normal weight: 18.5–24.9 kg/m²
 - Overweight: 25–29.9 kg/m²
 - Obese: ≥ 30 kg/m²
- Smoking Status: Categorized as never smokers, current smokers, or former smokers.
- Physical Activity: Defined by self-reported frequency and intensity:
 - None
 - Occasional
 - Regular, low intensity
 - Regular, high intensity

Hemoglobin level

Hemoglobin level was assessed in both RA patients and controls, using the most recent available value for each participant.

RA Assessment

- Clinical history and serology. We documented key RA characteristics including disease duration, seropositivity for rheumatoid factor (RF) and anti-citrullinated peptide antibodies

(ACPA) with their respective titers, and current pharmacotherapy—namely, glucocorticoids, conventional synthetic DMARDs, biologic DMARDs, and Janus kinase inhibitors.

- Laboratory Parameters. The most recent blood tests were reviewed for erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP).
- Disease Activity. Two validated composite indices were employed:
 - DAS28 [6] integrates tender and swollen joint counts (out of 28 joints), the patient's global assessment (visual analogue scale), and the ESR. Scores < 2.6 denote remission; 2.6–3.2, low activity; > 3.2–5.1, moderate activity; and > 5.1, high activity.
 - RAPID3 [7] comprises patient-reported measures of pain, physical function, and global disease assessment, each on a 0–10 scale. Total scores ≤ 3 indicate remission; 3.01–6, low activity; 6.01–12, moderate activity; and > 12, high activity.

Assessment of Health-Related Quality of Life

It was assessed in both RA patients and controls using the SF-12 questionnaire [8]. This 12-item tool captures patient-reported perceptions of functional health and overall, well-being, generating two composite indices: a Physical Component Summary (PCS) and a Mental Component Summary (MCS). As a streamlined adaptation of the SF-36, the SF-12 minimizes respondent burden while retaining robust psychometric properties. Each participant's responses yielded a PCS and an MCS score, both scaled from 0 to 100, with higher values denoting better perceived health status.

SARC-F Screening and Complementary Measures

SARC-F screening was performed in both RA patients and controls. The SARC-F [4] is a patient-reported tool that assesses five domains—perceived muscle strength, need for assistance in walking, ability to rise from a chair, stair climbing capacity, and history of falls—each scored from 0 (no difficulty) to 2 (severe difficulty), yielding a total score from 0 to 10. A composite score of ≥ 4 identifies individuals at elevated risk of sarcopenia.

In addition, RA patients underwent objective assessment of muscle strength and physical performance. Handgrip strength was measured using a calibrated handheld Jamar-type dynamometer (Kern digital hand grip dynamometer 80K1). Two trials were performed for each hand, and the highest value obtained from the dominant hand was recorded. Values <27 kg in men and <16 kg in women were classified as low muscle strength.

Gait speed (m/s) was assessed using the 6-meter walk test, in which participants walked at their usual pace along a straight 6-m track while the time was recorded with a stopwatch. A gait speed <0.8 m/s was considered the threshold for impaired physical performance.

Statistical Analysis

Given the exploratory design, no formal a priori sample size calculation was performed. We aimed to include a substantial proportion of eligible RA patients attending our clinic during the study period, together with age- and sex-matched controls, to ensure robust comparisons and preserve real-world applicability.

Continuous variables are presented as mean ± standard deviation or median (interquartile range), and categorical variables as number (percentage). Normality of distributions was examined using the Kolmogorov–Smirnov test. Between-group differences were tested with Student's t test or ANOVA for normally distributed variables, Mann–Whitney U or Kruskal–Wallis tests for non-normal variables, and the χ^2 test for categorical variables.

The primary outcome was the SARC-F score, analyzed both as a continuous variable and as a dichotomous variable (SARC-F ≥4). Comparisons of RA patients with controls were performed separately in men and women.

To identify independent correlates of SARC-F within the RA cohort, multivariable regression models were constructed. For SARC-F as a continuous variable, linear regression was applied; for

SARC-F ≥ 4 , logistic regression was used. Covariates included age, BMI, hemoglobin level, physical activity, RA disease duration, composite disease activity indices (DAS28, RAPID3), and current pharmacotherapy (glucocorticoids, conventional synthetic DMARDs, biologic DMARDs, Janus kinase inhibitors).

All tests were two-sided, and $p < 0.05$ was considered statistically significant.

Results

A total of 575 participants were included: 275 patients with RA and 300 controls, all aged >50 years. Within the RA cohort, 69.5% ($n = 191$) were women and 30.5% ($n = 84$) were men. Baseline sociodemographic and clinical characteristics of RA patients are summarized in Table 1.

Table 1. Characteristics of the 275 RA patients, stratified by sex into men ($n = 84$) and women ($n = 191$). Association with the study variables.

	Men	Women	Unadjusted parameter estimate (95% CI)	p-value	Adjusted* parameter estimate (95% CI)	p-value
Age (years)	71.9 $\pm$ 8.5	67.5 $\pm$ 8.8	-4.45 (-6.71, -2.19)	<0.001	-	-
BMI (kg/m ²)	27.5 $\pm$ 3.5	27.9 $\pm$ 5.4	-	ns	-	-
Underweight (n, %)	1 (1.2%)	0	-	ns	-	-
Normal range (n, %)	18 (21.4%)	64 (33.5%)	R	-	-	-
Overweight (n, %)	49 (58.3%)	72 (37.5%)	2.42 (1.28, 4.57)	<0.01	2.44 (1.28, 4.69)	<0.01
Obese (n, %)	16 (19.1%)	55 (29%)	-	-	-	-
Smoking						
Never (n, %)	72 (85.7%)	164 (87.2%)	-	ns	-	-
Former (n, %)	1 (1.2%)	2 (1.1%)				
Current (n, %)	11 (13.1%)	22 (11.7%)				
Physical activity						
None (n, %)						
Sporadic (n, %)	31 (37%)	94 (50.3%)				
Regular with low intensity (n, %)	16 (19%)	36 (19.3%)	-	ns	-	-
Regular with high intensity (n, %)	33 (39.2%)	55 (29.4%)				
	4 (4.8%)	2 (1.1%)				
Hemoglobin (g/dL)	14.2 $\pm$ 1.5	13.3 $\pm$ 1.2	-0.84 (-1.16, -0.52)	<0.001	-1.01 (-1.33, -0.69)	<0.001
Disease duration (years)	12.5 $\pm$ 9.6	16.8 $\pm$ 10.3	3.86 (1.16, 6.57)	<0.01	4.61 (1.84, 7.37)	<0.01
RF + (n, %)	50/83	123/168 (73%)	-	ns	-	-
RF titer (UI/L)	(60.2%) 175 $\pm$ 224	208 $\pm$ 415	-	ns	-	-
ACPA + (n, %)	52/83	115/167 (69%)	-	ns	-	-
ACPA titer (U/L)	(62.6%) 571 $\pm$ 1040	369 $\pm$ 672	-	ns	-	-
Current medication						
Glucocorticoids (n, %)	46 (54.7%)	89 (46.5%)	-	ns	-	ns
cDMARDs (n, %)	73 (86.9%)	172 (90%)	-	ns	-	ns
bDMARDs (n, %)	20 (23.8%)	68 (36%)	0.75 (0, 2.11)	<0.001	-	ns
Jak inhibitors (n, %)	2 (2.4%)	10 (5%)	-	ns	-	ns
ESR (mm/h)	24.3 $\pm$ 26.2	24.8 $\pm$ 20.8	-	ns	-	-
CRP (mg/dL)	10.1 $\pm$ 18.3	5.2 $\pm$ 6.1	-3.67 (-7.16, -0.17)	<0.05	-6.30 (-10.64, -2.0)	<0.01
DAS28	2.5 $\pm$ 1.2	2.9 $\pm$ 1.1	0.46 (0.16, 0.75)	<0.01	0.49 (0.13, 0.84)	<0.01
	49 (58.3%)	77 (40.5%)	R	ns	R	-

Remission (n, %)	16 (19%)	47 (24.5%)	-	ns	-	ns
LDA (n, %)	15 (17.9%)	61 (32%)	0.39 (0.20, 0.75)	<0.01	0.37 (0.14, 0.90)	<0.05
MDA (n, %)	4 (4.8%)	6 (3%)	-	ns	-	ns
HDA (n, %)						
RAPID3	5.8 ± 5.5	9.7 ± 6.9	3.59 (1.78, 5.40)	<0.001	2.46 (0.63, 4.28)	<0.01
Remission (n, %)	37 (44%)	38 (24%)	R	-	R	-
LDA (n, %)	11 (13.1%)	13 (8%)	-	ns	-	ns
MDA (n, %)	27 (32.1%)	55 (34%)	-	ns	-	ns
HDA (n, %)	9 (10.8%)	55 (34%)	0.19 (0.08, 0.45)	<0.001	0.24 (0.07, 0.76)	<0.05
SF-12						
Mental health	51.5 ± 10.0	45.1 ± 11.4	-6.46 (-9.35, -3.56)	<0.001	-5.30 (-8.64, -1.95)	<0.01
Physical health	42.5 ± 9.6	36.8 ± 9.5	-5.71 (-8.22, -3.20)	<0.001	-	ns
SARC-F (median, interquartile range)	1 [0-2]	2 [1-4]	1,10 (0.75, 1.45)	<0.001	0.87 (0.41, 1.34)	<0.001
SARC-F ≥ 4 (n, %)	9 (10.7%)	65 (34.0%)	2.76 (1.71, 4.47)	<0.001	3.14 (1.24, 7.95)	<0.05
Low grip strength (n, %)	36 (42.9%)	108 (56.8%)	1.76 (1.05, 2.95)	<0.05	-	ns
Low gait speed (n, %)	12 (14.3%)	50 (26.5%)	2.16 (1.08, 4.31)	<0.05	-	ns

***Each analysis was adjusted for all variables that were found to be significant in the previous rows of the table.CI: confidence interval; BMI, body mass index; R, reference category; RF, rheumatoid factor; ACPA, anti-citrullinated peptides antibodies; ESR, erythrocyte sedimentation rate; CRP, C-reactive protein; DAS28, Disease Activity Score 28; LDA, low disease activity; MDA, moderate disease activity; HDA: high disease activity; RAPID3, Routine Assessment of Patient Index Data 3; HAQ, Health Assessment Questionnaire; cDMARDs, conventional disease-modifying antirheumatic drugs; bDMARDs; biological disease-modifying antirheumatic drugs; e, IQR, interquartile range; SF-12: Short Form Health Survey-12.**

Men were older than women (71.9 ± 8.5 vs. 67.5 ± 8.8 years, p <0.001) but had shorter disease duration (12.5 ± 9.6 vs. 16.8 ± 10.3 years, p <0.01). Hemoglobin was higher in men (14.2 ± 1.5 vs. 13.3 ± 1.2 g/dL, p <0.001). No sex differences were observed for ESR, CRP, or autoantibody status. Women showed higher disease activity, in both DAS28 (2.9 ± 1.1 vs. 2.5 ± 1.2, p <0.01) and RAPID3 (9.7 ± 6.9 vs. 5.8 ± 5.5, p <0.001), and poorer quality of life. In adjusted analyses, the SF-12 mental component remained significantly lower in women (-5.30, 95% CI -8.64 to -1.95, p <0.01), while the physical component did not.

A SARC-F score ≥4 was observed in 26.9% of patients (74/275). Low grip strength was present in 52.4% of patients (144/275); of these, 61.1% (88/144) had a SARC-F score within the normal range. Overall, 20.4% of patients simultaneously presented a SARC-F score ≥4 and low grip strength, thereby fulfilling EWGSOP2 criteria for probable sarcopenia.

Low gait speed was observed in 22.5% of patients (62/275). Among them, 58.1% (36/62) also had a SARC-F score ≥4, and 48.4% (30/62) had concomitant low grip strength.

The prevalence of abnormal SARC-F was higher in women (65/191, 34.0%) than in men (9/84, 10.7%). Sex-related differences were also observed in the proportion of patients with low grip strength (56.8% vs. 42.9%) and low gait speed (26.5% vs. 14.3%). After full adjustment, female sex remained an independent predictor of abnormal SARC-F (OR 3.14, 95% CI 1.24–7.95) along with RAPID3 (OR 1.25, 95% CI 1.18-1.33). In contrast, the associations between sex and low grip strength or low gait speed lost statistical significance once disease activity indices were included in the models. Sequential analyses suggested that RAPID3 and, to a lesser extent, DAS28 acted as major determinants of functional outcomes. RAPID3 explained much of the sex effect on SARC-F. For grip strength, DAS28 emerged as the key determinant, while age also contributed. For gait speed, the most consistent predictors were SARC-F itself and age, with DAS28 playing a smaller role.

As shown in Table 2, no significant differences were observed between men with RA and their age-matched controls, either in median SARC-F score or in the proportion with scores ≥ 4 . Among women with RA, however, both the median SARC-F score and the prevalence of abnormal scores (34.0% vs. 24.7%, $p < 0.05$) were significantly higher than in female controls.

Table 2. Comparison of demographic and clinical characteristics between male and female patients with rheumatoid arthritis RA, and between each sex-specific RA group and their respective age-matched controls.

	Men			Women		
	Patients (n: 84)	Controls (n: 102)	P	Patients (n: 191)	Controls (n: 198)	P
Age (years)	71.9 $\pm$ 8.6	71.1 $\pm$ 9.2	ns	67.5 $\pm$ 8.8	67.3 $\pm$ 9.2	ns
BMI (kg/m ²)	27.5 $\pm$ 3.5	27.4 $\pm$ 4.4	ns	27.9 $\pm$ 5.4	27.8 $\pm$ 5.3	ns
Underweight (n, %)	1 (1.2%)	0		0	4 (2%)	
Normal range (n, %)	18 (21.4%)	33 (32.3%)		64 (34%)	57 (30%)	
Overweight (n, %)	49 (58.3%)	46 (45.1%)		72 (37%)	73 (38%)	
Obese (n, %)	16 (19.1%)	23 (22.6%)	ns	55 (29%)	60 (30%)	ns
Hemoglobin (g/dL)	14.2 $\pm$ 1.4	14.5 $\pm$ 1.6	ns	13.3 $\pm$ 1.2	13.7 $\pm$ 1.1	< 0.01
SF-12						
Mental health	51.5 $\pm$ 10.0	50.8 $\pm$ 9.9	ns	45.1 $\pm$ 11.4	50.2 $\pm$ 10.1	< 0.001
Physical health	42.5 $\pm$ 9.6	46.7 $\pm$ 10.6	< 0.01	36.8 $\pm$ 9.5	44.0 $\pm$ 11.5	< 0.001
SARC-F (median, interquartile range)	1 [0-2]	0 [0-2]	ns	2 [1-4]	1 [0-3.25]	< 0.001
SARC-F ≥ 4 (n, %)	9 (10.7%)	15 (15.0%)	ns	65 (34.0%)	49 (24.7%)	< 0.05

BMI, body mass index; SF-12: Short Form Health Survey-12.

Discussion

This study was designed to evaluate the performance of the SARC-F questionnaire in patients with RA compared with age- and sex-matched controls, focusing on its burden and clinical correlates in routine practice. Our aim was to determine the utility of SARC-F for case finding of sarcopenia in RA and to identify the patient profiles in which its use may be most appropriate. To our knowledge, this is the first study in RA to address these questions using a control group design.

Overall, nearly one-third of patients with RA had a SARC-F score ≥ 4 . When compared with matched controls, this excess burden was evident only among women. In men, the frequency of abnormal SARC-F values did not differ from that of their matched controls, suggesting no substantial increase in sarcopenia risk beyond the background population. In contrast, women with RA had significantly higher scores and a markedly greater prevalence of abnormal results, identifying them as a target group in whom SARC-F case finding is especially warranted.

In our cohort, men were on average older but had a shorter disease duration, whereas women were younger yet had accumulated longer exposure to RA. This pattern has been consistently described in other series [9,10] reflecting the earlier onset of RA in women. Importantly, our analyses were adjusted for age and the excess burden of abnormal SARC-F in women persisted. Thus, the observed sex difference in sarcopenia risk cannot be attributed to demographic imbalance alone but represents an independent association.

Our findings are consistent with previous reports showing that women with RA experience greater disease burden and worse patient-reported outcomes than men, despite comparable levels of objective inflammation. Large cohorts such as QUEST-RA [11] and registry-based studies as BIOBADASER III [12] have described higher disability, poorer quality of life, and greater pain and fatigue among women, in line with our observation that sex disparities were most pronounced in patient-reported and functional measures, including SARC-F. The convergence of our results with these studies suggests that the excess sarcopenia risk identified by SARC-F is part of a broader and well-documented pattern of sex-related vulnerability in RA.

The independent association between female sex and abnormal SARC-F scores is particularly noteworthy. In our cohort, women were more than three times as likely as men to reach the frailty threshold, a difference that persisted after adjustment for demographic and disease-related variables. This excess risk may partly reflect factors not fully captured in our study, such as lower baseline muscle mass and strength in women, longer cumulative disease exposure, or a greater burden of pain and fatigue that may limit physical activity. The persistence of poorer SF-12 mental health scores in women further suggests that psychological and social dimensions could also contribute to frailty risk as identified by SARC-F.

When associations with clinical parameters were examined, marked sex-specific patterns emerged. Female sex and RAPID3 were independent determinants of abnormal SARC-F. This suggests that in women, SARC-F reflects a broader vulnerability that overlaps with—but is not fully explained by—disease activity or health-related quality of life.

Beyond prevalence, our study also contributes to clarify the relationship between SARC-F and objective measures of sarcopenia. More than half of our patients presented low grip strength, and within this group a relevant proportion had SARC-F values within the normal range. This highlights that although SARC-F is valuable as a first-line screening tool, it does not capture all cases of functional impairment. Handgrip strength therefore remains essential, not only as the cornerstone of the EWGSOP2 framework but also as an independent predictor of sarcopenia, disability, and mortality across populations [13,14].

The integration of SARC-F with objective strength measures provides additional insight. Patients with both SARC-F ≥ 4 and low grip strength fulfilled the EWGSOP2 definition of probable sarcopenia and represented a sizeable proportion of our cohort, highlighting the potential clinical relevance of combining these assessments. Published RA cohorts [15–18] that applied the full EWGSOP2 algorithm have reported prevalences of confirmed sarcopenia ranging from 4.5% to 19%, depending on age distribution and sex composition, while figures for probable sarcopenia are typically higher. Considering both our findings and published data, a pragmatic approach based on SARC-F complemented with grip strength might be sufficient to identify most RA women at risk.

In our cohort, one in five patients also showed reduced gait speed. Although gait speed represents the final step toward severe sarcopenia in EWGSOP2, its interpretation in RA is less straightforward, as joint pain, stiffness, and disability may contribute independently on muscle function. Nonetheless, the overlap we observed between slow gait, abnormal SARC-F, and low grip strength supports the internal consistency of our findings and suggests that performance-based measures may add complementary value in selected patients.

Handgrip dynamometry is the reference measure of muscle strength in EWGSOP2; in RA, however, results may be confounded in patients with severe hand involvement (marked activity or structural damage). In such cases, complementary lower-limb tests such as the five-times sit-to-stand can provide a more reliable estimate of overall strength and help avoid misclassification. Confirmation of muscle mass by DXA or BIA may be reserved for situations in which a definitive diagnostic label would alter management.

This study has limitations. First, muscle mass was not assessed with DXA or BIA, preventing definitive EWGSOP2 classification; instead, we focused on SARC-F and muscle strength, the two initial steps of the EWGSOP2 algorithm most relevant for pragmatic implementation. Second, controls were recruited from diverse hospital-based and community sources, which may have introduced heterogeneity despite careful matching and exclusion of conditions associated with secondary sarcopenia. Third, the cross-sectional design precludes causal inference, and the prognostic significance of abnormal SARC-F in RA requires confirmation in longitudinal studies.

Nonetheless, our study also has important strengths. To our knowledge, it is the first to evaluate SARC-F in RA using a control group design, enabling contextualization of prevalence estimates against a matched reference population. We combined self-reported and objective measures, integrating PROM-based screening (SARC-F) with grip strength and gait speed, thereby ensuring internal consistency and clinical applicability. The use of multivariable models further reinforced the

robustness of our findings, showing that the excess risk associated with female sex persisted after adjustment for demographic and disease-related variables. Finally, the focus on sex-stratified analyses allowed a more nuanced interpretation, revealing that the burden of abnormal SARC-F values lies primarily among women. Together, these strengths enhance the validity and clinical relevance of our results.

In conclusion, our study shows that the SARC-F questionnaire identifies a substantial burden of sarcopenia risk in RA, with the excess concentrated among women. When complemented by simple grip strength testing, it provides a pragmatic and feasible strategy for case finding in routine rheumatology practice, even in settings without access to advanced body composition techniques. This approach facilitates timely recognition of vulnerable patients and supports preventive strategies such as exercise and nutritional interventions. Incorporating SARC-F into RA care pathways may represent a low-cost, patient-centered step toward addressing an overlooked comorbidity. Future longitudinal studies should confirm its prognostic value and clarify the impact of targeted interventions in this high-risk population.

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Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The datasets used and analyzed during the current study are available from the corresponding author upon reasonable request.

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References

1. Cruz-Jentoft, A.J.; Sayer, A.A. Sarcopenia. *Lancet* 2019, 393, 2636–2646.
2. Bennett, J.L.; Pratt, A.G.; Dodds, R.; Sayer, A.A.; Isaacs, J.D. Rheumatoid sarcopenia: Loss of skeletal muscle strength and mass in rheumatoid arthritis. *Nat. Rev. Rheumatol.* 2023, 19, 239–251.
3. Küçükdeveci, A.A.; Elhan, A.H.; Erdoğan, B.D.; Kutlay, Ş.; Gökmen, D.; Ateş, C.; et al. Use and detailed metric properties of patient-reported outcome measures for rheumatoid arthritis: A systematic review covering two decades. *RMD Open* 2021, 7, e001707.
4. Malmstrom, T.K.; Morley, J.E. SARC-F: A simple questionnaire to rapidly diagnose sarcopenia. *J. Am. Med. Dir. Assoc.* 2013, 14, 531–532.
5. Cruz-Jentoft, A.J.; Bahat, G.; Bauer, J.; Boirie, Y.; Bruyère, O.; Cederholm, T.; et al. Sarcopenia: Revised European consensus on definition and diagnosis. *Age Ageing* 2019, 48, 16–31.
6. Mäkinen, H.; Kautiainen, H.; Hannonen, P.; Möttönen, T.; Korpela, M.; Leirisalo-Repo, M.; et al. Disease activity score 28 as an instrument to measure disease activity in patients with early rheumatoid arthritis. *J. Rheumatol.* 2007, 34, 1987–1991.
7. Pincus, T.; Bergman, M.J.; Yazici, Y.; Hines, P.; Raghupathi, K.; Maclean, R. An index of only patient-reported outcome measures, routine assessment of patient index data 3 (RAPID3) in two abatacept clinical trials: Similar results to disease activity score (DAS28) and other RAPID indices that include physician-reported measures. *Rheumatology (Oxford)* 2008, 47, 345–349.

8. Ware, J.; Kosinski, M.; Keller, S. A 12-item short-form health survey: Construction of scales and preliminary tests of reliability and validity. *Med. Care* 1996, 34, 220–233.
9. Hallert, E.; Thyberg, I.; Hass, U.; Skargren, E.; Skogh, T. Comparison between women and men with recent onset rheumatoid arthritis of disease activity and functional ability over two years (the TIRA project). *Ann. Rheum. Dis.* 2003, 62, 667–670.
10. Kuiper, S.; van Gestel, A.M.; Swinkels, H.L.; de Boo, T.M.; da Silva, J.A.P.; van Riel, P.L.C.M. Disease activity and functional ability in early rheumatoid arthritis: A comparison between men and women. *J. Rheumatol.* 2001, 28, 1809–1816.
11. Sokka, T.; Toloza, S.; Cutolo, M.; et al. Women, men, and rheumatoid arthritis: Analyses of disease activity, disease characteristics, and treatments in the QUEST-RA study. *Arthritis Res. Ther.* 2009, 11, R7.
12. Vela-Casasempere, P.; Otero-Varela, L.; Gómez Sabater, S.; et al. Gender differences in clinical and prescribing characteristics of biologic and targeted synthetic drugs in naïve patients with rheumatoid arthritis: Data from the BIOBADASER III registry. *Arthritis Res. Ther.* 2025, 27, 103.
13. Soysal, P.; Veronese, N.; Fontana, L.; et al. Handgrip strength is associated with all-cause mortality, cardiovascular mortality, disability, and other health outcomes: An umbrella review. *Age Ageing* 2021, 50, 10–17.
14. Hsu, N.W.; Lin, C.H.; Yang, N.P.; Chen, H.C.; Chou, P. Handgrip strength is associated with mortality in community-dwelling older adults: The Yilan cohort study, Taiwan. *BMC Public Health* 2023, 23, 2194.
15. Brance, M.L.; Di Gregorio, S.; Pons-Estel, B.A.; Quagliato, N.J.; Jorfen, M.; Berbotto, G.; et al. Prevalence of sarcopenia and whole-body composition in rheumatoid arthritis. *J. Clin. Rheumatol.* 2021, 27(Suppl. 6), S153–S160.
16. Dietzel, R.; Wiegmann, S.; Borucki, D.; Detzer, C.; Zeiner, K.N.; Schaumburg, D.; et al. Prevalence of sarcopenia in patients with rheumatoid arthritis using the revised EWGSOP2 and the FNIH definition. *RMD Open* 2022, 8, e002600.
17. Cano-García, L.; Manrique-Arija, S.; Domínguez-Quesada, C.; Vacas-Pérez, J.C.; Armenteros-Ortiz, P.J.; Ruiz-Vilchez, D.; et al. Sarcopenia and nutrition in elderly rheumatoid arthritis patients: A cross-sectional study to determine prevalence and risk factors. *Nutrients* 2023, 15, 2440.
18. Valencia-Muntalà, L.; Gómez-Vaquero, C.; Mora, M.; Berbel-Arcobé, L.; Benavent, D.; Narváez, J.; et al. Evaluating sarcopenia prevalence and SARC-F effectiveness in elderly Spanish women with RA: A comparative study of EWGSOP criteria. *Front. Med. (Lausanne)* 2024, 11, 1392604.

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