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Relationship between sarcopenia and nutritional status in patients with rheumatological diseases A single-center observational study.

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Abstract

Introduction: Sarcopenia is a chronic disease characterized by the gradual loss of strength and muscle mass that impacts an individual's quality of life. The objective of the present study was to evaluate the relationship between sarcopenia and the nutritional status of rheumatological patients.

Methods: The present case study (CA) of rheumatological patients and controls (COs) was conducted at the IHRED-Guayaquil Medical Center. Manual dynamometry, bioimpedanciometry, and autonomous response capacity to the frequency of food consumption, physical exercise, and complementary tests were recorded.

Results: There were 60 controls—81.7% women—and 59 patients—84.7% women. The prevalent age group at which CO was prevalent was 51 to 60 years; in CA, it was 19 to 48 years (P<0.01). There was no difference in body composition between the two groups, with similar distributions of muscle mass and visceral fat (P >0.05). The groups did not differ in protein, carbohydrate, or fat intake. There were more cases of sarcopenia in the CA group, and the number of falls per year was significantly greater. The presence of rheumatological diseases was associated with a risk of sarcopenia in patients with difficulty getting up from the chair or climbing stairs [OR 3.22 (95% CI 1.22-8.5) P=0.018] and [OR 3.31 (95% CI 1.36-8.05) P= 0.008], respectively.

Conclusions: In this study, it was deduced that rheumatological diseases are an independent and additional risk factor for chronic noncommunicable diseases associated with the development of sarcosis.

Keywords:

MeSH: Sarcopenia, Nutritional Status, Rheumatology, Noncommunicable Diseases, Hand strength.

Abbreviations
Not declared.

Supplementary information
No supplementary materials are declared.

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Author contributions
Viviana Katherine Idrovo Chiriboga: Conceptualization, data curation, formal analysis, funding acquisition, research, writing - original draft.
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Introduction

The World Health Organization defines chronic noncommunicable diseases as diseases of slow progression and long duration [1]. Currently, these diseases are the leading cause of death worldwide, with the most common being cardiovascular, respiratory, oncological, and endocrine diseases, accounting for 63% of deaths worldwide.

Within the long list of chronic diseases that harm the population, we find sarcopenia, described for the first time in 1989 by Rosemberg as an ailment in the development of which a series of hormonal changes, variations in protein synthesis, food habits, and muscle integrity are involved [2]. Currently, sarcopenia is characterized by the loss of muscle mass, which deteriorates quality of life and gradually decreases strength. It is considered a chronic and progressive disease, which is why the idea of associating it with inflammatory diseases arises. Systemic chronic evolution is accompanied by an increased catabolic response that predisposes individuals to a high loss of skeletal mass [3], worsening the individual's quality of life and increasing morbidity and mortality, which worsens after the fourth decade of life, at an approximate rate of one percent per year [4].

It is also well known that there is a bidirectional relationship between sarcopenia and variation in food intake because physiological, psychological, and social factors generate evident decreases in appetite and food consumption, including loss of taste. difficulty chewing, smelling, and swallowing as the years advance [5]. Based on this premise, protein intake gives the body the amino acids necessary for various essential functions, such as protein synthesis. Therefore, inadequate protein intake is one of the many causes of sarcopenia. Other nutrients related to sarcopenia, frailty, and protein intake include vitamins such as D, E, and C; carotenoids; and minerals such as selenium and long-chain polyunsaturated fatty acids [6].

The reason we relate sarcopenia in patients with rheumatic diseases to nutritional status is that a decrease in muscle mass has been associated with increased fat mass, age, decreased nutritional intake, inactivity, and even more so in inflammatory diseases. Chronic diseases such as rheumatoid arthritis and osteoarthritis hinder mobility and muscle strengthening. Although muscle atrophy is expected to occur in rheumatic patients, this problem has been studied very little [3, 7].

Due to this and after a review of previously published articles, it became evident that there is little literature on preventing sarcopenia [7]. The main objective of the present study was to evaluate the relationship between sarcopenia and nutritional status in rheumatological patients from a medical center specializing in rheumatological diseases in Guayaquil, Ecuador.

Materials and methods

Study design

The present study was observational and was a case–control study. The source is prospective.

Scenery

The study was conducted in the outpatient service of the IRHED Medical Center of the Samborondón in Guayaquil, Ecuador. The study period was from January 1, 2022, to August 30, 2023.

Participants

Adult patients older than 18 years were included. Two groups were formed:

Patients: Patients diagnosed with a rheumatological disease.

Controls: Patients who attended medical consultation with patients with noncommunicable diseases.

The groups were matched by sex. Patients who were followed up with manual dynamometry, bioimpedanciometry, or nutritional surveys were excluded, and the SARC-F questionnaire was not completed. Patients without the ability to respond to the questionnaire were also excluded. Patients with sarcopenia due to amputation and prostration were excluded.

Variables

The variables were age, weight, height, sex, presence of sarcopenia, nutritional survey, manual dynamometry, and electrical bioimpedance.

Data sources/measurements

The source was direct; an electronic form was completed using the survey data. The information was confidential; no personal data were included in identifying the study subjects. The Strength, Ambulation, Rising from a chair, Stair climbing, and History of Falling (SACR-F) scale was used to assess sarcopenia; this scale comprises five self-suggestive assessments of strength, assistance when walking, and difficulty getting up from a chair. Moreover, the number of falls in the last year was classified as "none, little or many" for each variable.

Biases

To avoid interviewer, information, and memory biases, the leading researcher always maintained the data with a guide and records approved in the research protocol. Observation and selection bias were avoided by applying participant selection criteria. Two researchers independently analyzed each record in duplicate, and the variables were registered in the database once their agreement was verified.

Study size

The ™ program (version 7.2.5; CDC, Atlanta, USA; September 2022.) Concerning unmatched case–controls, the total number of Kelsey patients was 60, and that of Fleiss controls was 57. The confidence intervals were 95% and 80% for power; the case–control ratio was 1.5; the percentage of exposed controls was 40%; the odds ratio was 5.0; and the rate of patients with exposure was 76.9%.

Quantitative variables

Descriptive and inferential statistics were used. The results of categorical variables are expressed as the frequency and percentage. The scaled variables are defined as the mean and standard deviation.

Statistical analysis

Inferential statistics were used for comparative analysis between the groups. Categorical data were analyzed, and the chi-square test was used to establish associations or differences. The data are presented as odds ratios (ORs), 95% confidence intervals (CIs), and P values.

Participants

The study included 60 cases and 60 age-matched controls. One patient in the case group was eliminated from the analysis because more than 80% of the data were missing at the end of the study; thus, the sample comprised 59 patients and 60 controls.

Description of the Study Groups

There were no differences according to sex because sex was the matching variable. The most prevalent group of patients in the control cohort was between 51 and 60 years old, and the most prevalent group of rheumatological patients was between 19 and 48 years old ($P < 0.01$).

Body composition

The two groups had no difference in body composition; they had similar distributions of muscle mass and visceral fat, with P values >0.05 for each item. (Table 2). There was also no difference in protein, carbohydrate, or fat intake between the groups. (Table 2).

Sarcopenia test

There were more cases of sarcopenia in the group of patients with rheumatological diseases. The two groups were not significantly different in terms of strength, walking assistance, or difficulty climbing ten steps as usual (Table 3). There was a statistically significant difference in which the group of patients with rheumatological diseases had more difficulty getting up from the chair according to the SACR-F test and a significantly greater number of falls per year.

Results

Table 1. Description of the study groups.

	Cases n=59	Controls n=60	OR (95%CI)	Q
		Sex		
Men	9 (15.3%)	11 (18.3%)	0.80 (0.31-2.11)	0.653
Women	50 (84.7%)	49 (81.7%)		
		Age		
19-48 years	37 (62.7%)	-	261 (14.9-4558)	**0.0001**
49 to 50 years	2 (3.4%)	10 (16.7%)	0.140 (0.0289-0.6832)	**0.0150**
51-60 years	8 (13.6%)	25 (41.7%)	0.1405 (0.0533-0.3706)	**0.0001**
71-80 years	1 (1.7%)	8 (13.3%)	0.0911 (0.0109-0.7624)	**0.0271**
81-90 years	1 (1.7%)	-	2.69 (0.11-67.8)	0.548

OR: odd ratio. CI Confidence interval.

The absence of rheumatological disease was a protective factor against a better response to getting up from a chair or climbing stairs [OR 0.2862 (0.1089-0.7519) P =0.0111] and [OR 0.2957 (95% CI 0.125-0.699) P =0.0055], respectively].

In contrast, the presence of rheumatological diseases was associated with a risk of sarcopenia with difficulty getting up from the chair and climbing stairs [OR 3.2179 (95% CI

1.218-8.50) *P* =0.0183] and [OR 3.3065 (95% CI 1.3577-8.048) *P* =0.0085., respectively (Table 3).

Strength in the upper limbs

Upper limb strength was analyzed independently of body function. Strength in the upper extremities was more significant in the group of patients with rheumatological diseases than in the control group with chronic noncommunicable diseases. The odds ratio was 0.0001 (CI=0.0000-0.0036; P=0.0111) (Table 3).

Discussion

The present study demonstrated that patients with rheumatological diseases are prone to experiencing sarcopenia in the lower extremities and trunk. Sarcopenia is associated with a more significant limitation on the ability to get up from a chair and the risk of more incredible falls per year. Compensatoryly, these patients developed greater muscle strength in the upper extremities. Based on the influence of nutritional factors and their interaction with the development of sarcopenia and malnutrition-sarcopenia syndrome, Kaluzniak et al. (2022) recorded the presence of malnutrition in 22.6% of the participants in that study, in whom compromised motor function was recorded. Additionally, a course of sarcopenia was reported in 12.9% of the participants, with a total of 12 patients in this group presenting malnutrition as a concurrent disorder [8]. In the present study, restrictions in daily caloric intake were recorded, with values ranging between 600 and 999 kcal daily in 66.1% of the participants in the case group. Trevisan et al., 2021 [8].

Table 2. Body composition and type of diet of the study group.

	Variable	Cases n=59	Controls n=60	OR (95% CI)	*Q*
muscle mass	8-19.9%	2 (3.4%)	3 (5%)	0.67 (0.11-4.14)	0.664
	20-25.9%	34 (57.6%)	30 (50%)	1.36 (0.66-2.80)	0.405
	26-29.9%	14 (23.7%)	13 (21.7%)	1.13 (0.48-2.65)	0.788
	30- 35.9%	6 (10.2%)	12 (20%)	0.45 (0.16-1.30)	0.141
	36-37.2%	3 (5.1%)	2 (3.3%)	1.55 (0.25-9.65)	0.636
visceral fat	2-9%	37 (62.7%)	28 (46.7%)	1.92 (0.92-3.40)	0.080
	10-15%	18 (30.5%)	29 (48.3%)	0.54 (0.26-1.14)	0.107
	16-19%	4 (6.8%)	1 (1.7%)	3.75 (0.40-34.83)	0.245
	20-25%	-	1 (1.7%)	0.33 (0.01-8.21)	0.497
	26-27%	-	1 (1.7%)	0.33 (0.01-8.21)	0.497
Daily kilocalorie intake _	300-999 kcal	13 (22%)	13 (21.7%)	1.00 (0.419-2.389)	1.00
	1000-1999 kcal	39 (66.1%)	35 (58.3%)	1,337 (0.633-2,827)	0.447
	2000-2999 kcal	7 (11.9%)	11 (18.3%)	0.600 (0.215-1.671)	0.328
	3000-4000 kcal	-	1 (1.7%)	0.333 (0.0133-8.349)	0.504
Daily protein intake (g)	10-50	5 (8.5%)	8 (13.3%)	0.591 (0.182-1.923)	0.382
	50-99	31 (52.5%)	33 (55%)	0.805 (0.387-1.676)	0.563
	100-199	23 (39.0%)	16 (26.7%)	1,637 (0.751-3,569)	0.215
	200-299	-	3 (5%)	0.138-(0.007-2.733)	0.194
Daily fat intake (g)	1-99	51 (86.4%)	53 (88.3%)	0.842 (0.285-2.491)	0.756
	100-500	8 (13.6%)	5 (8.3%)	1.725 (0.529-5.619)	0.365
	1000-1999	-	2 (3.3%)	0.197 (0.009-4.185)	0.297
Daily carbohydrate intake (g)	10-99	11 (18.6%)	13 (21.7%)	0.829 (0.338-2.034)	0.681
	100-500	48 (81.4%)	45 (75%)	1,455 (0.605-3,499)	0.403
	501-999	-	1 (1.7%)	0.333 (0.013-8.349)	0.504
	1000-1999	-	1 (1.7%)	0.333 (0.013-8.349)	0.504

OR: Odds ratio. CI: confidence interval.

Table 3. Sarcopenia test and measurement of muscle strength in the study groups.

	Variable	Cases n=59	Controls n=60	OR (95% CI)	*Q*
Strength (SACR-F)	None	39 (66.1%)	40 (66.7%)	1.83 (0.50-2.35)	0.840
	little	12 (20.3%)	16 (26.7%)	0.733 (0.31-1.73)	0.478
	A lot	6 (10.2%)	4 (6.7%)	1,647 (0.44-6.17)	0.459
Walking assistance (SACR - F)	None	51 (86.4%)	55 (91.7%)	0.772 (0.22-2.69)	0.685
	little	4 (6.8%)	5 (8.3%)	0.830 (0.21-3.26)	0.790
	A lot	2. 3. 4%)	-	5,451 (0.26-116.0)	0.277
Difficulty getting up from a chair (SACR-F)	None	39 (66.1%)	53 (88.3%)	0.2862 (0.1089-0.7519)	**0.0111**
	little	17 (28.8%)	7 (11.7%)	3.2179 (1.2183-8.4990)	**0.0183**
	Much/impossible	1 (1.7%)	-	3,210 (0.12-80.5)	0.478
Difficulty climbing ten stairs (SACR-F)	None	40 (67.8%)	47 (78.3%)	0.651 (0.28-1.50)	0.314
	little	16 (27.1%)	12 (20.0%)	1,561 (0.66-3.68)	0.308
	Much/impossible	1 (1.7%)	1 (1.7%)	1.054 (0.06-17.25)	0.971
Falls the last year (SACR-F)	None	34 (57.6%)	50 (83.3%)	0.2957 (0.1250-0.6992)	**0.0055**
	< 3 falls	21 (35.6%)	9 (15.0%)	3.3065 (1.3577-8.0482)	**0.0085**
	4 or more falls	2 (3.4%)	1 (1.7%)	2.146 (0.189-24.33)	0.539
Average strength _ in kg on both arms	0.81-1 kg	-	1 (1.7%)	0.0001 (0.0000-0.0036)	**<0.0001**
	1-1.9 kg	-	21 (35%)		
	2-2.9 kg	-	24 (40%)		
	3-3.9 kg	-	10 (16.7%)		
	4-4.9 kg	-	3 (5%)		
	5-6.0 kg	-	1 (1.7%)		
	10-19 kg	14 (23.7%)	-		
	20-39 kg	16 (27.1%)	-		
	40-42 kg	1 (1.7%)	-		

SACR-F: Strength, Ambulation, Rising from a chair, Stair climbing, and History of Falling.

Depending mainly on the variables of age and sex, the series of eventualities and conditions that affect the appearance of sarcopenia or the progression toward a more severe condition are considered to be the same at approximately 10 years for a group of 3219 participants, with 35.8% of the participants being male. It should be noted that approximately 63.2% of the subjects did not suffer from sarcopenia at the beginning of the study, and 90.4% of them were likely to remain in this condition until the final phase; however, after the period established in the study, a decrease in this figure was reported to approximate 40.4%, mainly involving male subjects [9].

Álvarez., 2018 In a sample of 65 participants aged older than 65 years, the presence of sarcopenia was recorded in approximately 46.16% of the subjects, 43.08% of whom were female. About the muscle strength parameter, approximately 89% of the female individuals presented compromise of this factor; it should be noted that the nutritional status of the sample studied was classified as average in 92.31% of individuals with the study condition, according to the parameters of the Mini Nutritional Assessment [10]; For consideration, in the present study figures regarding the participants are reported that range between 81.7% and 84.7% for female individuals in the control group and cases, respectively, with the majority reported in the age range between 51 and 70 years, representing approximately 41.7% of participants in this group, compromise in the strength parameter is reported in 23.7% of the group of cases.

In their work, Chun et al. (2022) considered the association between sarcopenia and frailty in type 2 diabetes mellitus (DM2) patients, a condition that favors the occurrence of complications in the course of chronic diseases, especially in geriatric patients. The study participants formed groups of cases and controls; for DM2, 78 male individuals represented the case group, and 48 were the control group. Notably, the risk of sarcopenia was significantly greater in this group of patients, accounting for 52.6% of whom had compromised motor function and increased fragility. Additionally, a decrease in muscle strength was recorded in participants with variations in their anthropometric measurements of caloric imbalances in their diet; however, the authors primarily linked this eventuality to DM2 [10].

Xiang et al., 2022, evaluated the usefulness of determining geriatric nutritional risk as a factor related to the early detection of sarcopenia in a population of 3829 participants;

sarcopenia was confirmed in 516 individuals, mainly in the male population, whose percentage ranged from approximately 21.2%. To be considered, the variability in anthropometric measurements, mainly the circumference of the midline and calf, as well as the calculation of the geriatric nutritional index, were considered by the authors to be highly sensitive measures for their study. In addition, Je et al., 2021, established obesity as a sensitive factor in the prediction of sarcopenia; in their study consisting of 466 participants, with sarcopenia occurring in 11.4% of individuals, primarily affecting male individuals. To highlight, in this study population, a more significant relationship was reported between participants with malnutrition and sarcopenia, after the multivariate analysis, which reported ORs =0.599 for a P =0.001 in the face of a high body mass index (BMI) [11, 12].

Conclusions

The present study demonstrated that patients with rheumatological diseases are prone to experiencing sarcopenia in the lower extremities and trunk. This sarcopenia could explain the more significant limitation on the ability to get up from a chair and the risk of more incredible falls per year. Compensatoryly, these patients developed greater muscle strength in the upper extremities.

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Statements

Ethics committee approval and consent to participate

The bioethics committee of the Medical School of the Universidad Católica Santiago de Guayaquil approved the study.

Publication consent
Patient-specific images, X-rays, and studies were not available for publication.

Conflicts of interest
The authors declare that they have no conflicts of interest.

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