LUPUS SCIENCE & MEDICINE™

Muscle strength, not muscle mass, determines the health-related quality of life in Indonesian women with systemic lupus erythematosus

Stevent Sumantri ,[1] Euphemia Seto,[1] Iris Rengganis[2]

To cite: Sumantri S, Seto E, Rengganis I. Muscle strength, not muscle mass, determines the health-related quality of life in Indonesian women with systemic lupus erythematosus. *Lupus Science & Medicine* 2023;**10**:e001025. doi:10.1136/lupus-2023-001025

► Additional supplemental material is published online only. To view, please visit the journal online (http://dx.doi.org/10.1136/lupus-2023-001025).

Received 18 August 2023
Accepted 19 October 2023

[1]Allergy and Clinical Immunology Division, Department of Internal Medicine, Faculty of Medicine, Pelita Harapan University, Faculty of Medicine, Tangerang, Banten, Indonesia
[2]Allergy and Clinical Immunology Division, Department of Internal Medicine, Faculty of Medicine, University of Indonesia, Depok, Jawa Barat, Indonesia

Correspondence to
Dr Stevent Sumantri; stevent.sumantri@uph.edu

ABSTRACT

Objective No study evaluated the impact of low muscle strength and mass on the Sarcopenia-related Quality of Life (SarQoL) in women with SLE.

Methods This cross-sectional study recruited 145 women with SLE consecutively; muscle strength was measured with a calibrated Jamar handheld dynamometer, muscle mass was measured with appendicular muscle mass index (Tanita MC-780 MAP body impedance analyser) and health-related quality of life with SarQoL Questionnaire. The cut-off points for low muscle strength, low muscle mass and sarcopenia were derived from the Asian Working Group on Sarcopenia 2019. Statistical analysis was conducted with a t-test for mean difference, and logistic regression was used to evaluate for low muscle strength contributing factors.

Results There was a significant difference in the mean total score of SarQoL in individuals with normal compared with low muscle strength (74.36 vs 64.85; mean difference 9.50; 95% CI 2.10 to 5.33; p<0.001). On the other hand, there was no difference in individuals with normal compared with low muscle mass (71.07 vs 70.79; mean difference 0.28; −5.18 to 5.74; p=0.91). After minimally adjusted with age, we found moderate-severe joint pain (B −9.280; p<0.001) and low muscle strength (B −6.979; p=0.001) to be independently associated with low mean SarQoL total score.

Conclusion There was a lower total SarQoL score in individuals with low muscle strength but not with low muscle mass.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Previous studies evaluating muscle-related quality of life in patients with lupus use general health-related quality of life questionnaires, such as SF-36, EQ5D and EuroQoL. Recently, the Sarcopenia-related Quality of Life (SarQoL) Questionnaire is more sensitive to changes in muscle function, a characteristic of muscle disturbances in patients with lupus.

WHAT THIS STUDY ADDS

⇒ We show that indeed, low muscle strength, not low muscle mass, contributed to lower quality of life according to SarQoL, and moderate-severe joint pain correlated independently with low muscle strength in Indonesian women with lupus.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ Evaluation and management plan focusing on adequately managing joint pain and physical rehabilitation addressing low muscle strength should become standard in managing patients with lupus.

INTRODUCTION

SLE (lupus) is a chronic autoimmune disease that mainly affects women of productive age; the age of onset in Asia ranges between 25.7 and 34.5 years old. Modern medicine and improved early diagnosis improved 10 years of survival of patients with lupus, from less than 50% decades ago to more than 90% in most advanced economies nowadays.[1 2] Unfortunately, improved survival has not been followed by a better quality of life and functional status; in general, patients with lupus reported a lower physical and emotional well-being than the general population.[3] Improvements in the physical and emotional function of patients with lupus should become one of the cornerstones of comprehensive management so that a better quality of life will follow an increase in life expectancy.

Muscle quality disturbances or sarcopenia, as described by decreased muscle function (ie, strength, gait speed) and muscle mass, has gained interest in many conditions (elderly, diabetics, cancer, HIV-AIDS, rheumatoid arthritis) as a predictor of health-related quality of life (HRQoL).[4–7] Our previous study has also established that low muscle strength significantly impacts sarcopenia health-related quality of life (SarQoL) in Indonesian women with lupus.[8] Our study used the SarQoL Questionnaire to evaluate HRQoL

because, unlike generic HRQoL tools, SarQoL specifically measures the specific domains directly related to muscle strength and function.[9]

Interestingly, although many studies in the autoimmune population have shown an increased rate of sarcopenia in the affected subjects, there is still a debate on what is more important, muscle function or strength, in its impact on HRQoL.[10] Following our previous study,[8] we evaluate the impact of muscle function (strength) and muscle mass on SarQoL to better understand the issue in patients with lupus. In addition, we also try to determine associated factors affecting muscle strength to help further intervention in increasing the quality of life of patients with lupus. According to our knowledge, no study evaluated the impact of low muscle strength and mass on SarQoL in women with lupus.

METHODS

Selection and description of participants

This cross-sectional study was done in the Allergy and Clinical Immunology Clinic of a referral hospital in Jakarta, Indonesia, from January to June 2020.

We included consecutive patients with SLE who met the Systemic Lupus International Collaborating Clinics criteria for the classification of lupus. We excluded patients with overlap syndromes and anatomical abnormalities that disturb the measurement of muscle strength and mass.

Data collection and assessment

We collect data on sociodemographic, anthropometric, nutritional status, physical activities and clinical characteristics. Sociodemographic data include age, employment status, monthly living wage, assistance in daily living and peer group support. Anthropometric data include body mass index, gait speed (6-metre walking speed test), muscle strength (calibrated Jamar handheld dynamometer), body impedance analysis (BIA) using Tanita MC-780 MAP (appendicular muscle mass index, skeletal muscle mass, body fat percentage and bone mass).

Nutritional status includes daily protein/kg body weight and daily polyunsaturated fatty acid (PUFA) intake, measured by a certified nutritionist using the Nutrisurvey tool (3-day food record). The International Physical Activity Questionnaire (IPAQ) measured physical activities and functional status by Barthel's Activities of Daily Living (ADL) and Lawton's Instrumental Activities of Daily Living (IADL) Questionnaires. Vitamin D25OH levels were measured using ELISA methods, using Euroimmun kit EQ 6411-9601. Vitamin D25OH levels were measured in ng/mL; deficiency was defined as serum D25OH level <20 ng/mL and severe deficiency <10 mg/mL.

Clinical characteristics data include lupus disease activity using the Mexican SLE Disease Activity scoring system, arthritis pain score with VAS (Visual Analogue Score) and corticosteroid usage measured by equivalent daily prednisone dose in milligrams. We also include relevant clinical laboratory data such as anti-double-stranded DNA, C reactive protein (CRP), erythrocyte sedimentation rate (ESR), creatine kinase, ionised calcium, haemoglobin and kidney function measurements.

Determination of muscle strength, muscle mass, gait speed and sarcopenia status was done by the Asian Working Group on Sarcopenia (AWGS) 2019, which has been validated for the Indonesian population.[11 12] Low muscle strength was defined as hand-grip strength lower than 18 kg as measured by a Jamar handheld dynamometer. Low muscle mass was defined as appendicular muscle mass index lower than 5.7 kg/m^2 for females using BIA measurements. Low gait speed was defined as walking speed slower than 1.0 m/s, measured by 6-metre walking speed measurements. Sarcopenia was defined as an individual with low muscle mass, strength or gait speed. The SarQoL Questionnaire was used to measure HRQoL.[13 14] The SarQoL Questionnaire previously has been validated for the elderly Indonesian population; data could be requested from the referred link (online supplemental file 2).[15]

Statistical analysis

We first tabulated the data using Microsoft Excel, then coded and did the statistical analysis with SPSS V.20.0. A mean difference test (t-test or analysis of variance where appropriate) was done to compare the mean difference of HRQoL in normal versus low muscle strength and muscle mass groups (table 2) and also the relevant factors associated with SarQoL total score (table 3). Age-adjusted analysis with linear regression was also done to control age's effect on muscle strength. Any p values of <0.05 were considered significant.

RESULTS

We managed to recruit 145 Indonesian women with lupus; relevant characteristics of the volunteers can be seen in table 1. Regarding the characteristics of muscle function, we found that 64.8% (n=94 of 145) have good muscle strength, and only 7.6% have good gait speed (n=11 of 145). However, we also found that 18.6% (n=27 of 145) have a low appendicular muscle mass index, and 17.9% have sarcopenia according to the AWGS criteria. Furthermore, most of our volunteers have a disturbance in their body mass index, with 53.1% (n=77 of 145) categorised as underweight/obese and 57.9% (n=84 of 145) having under/overpercentage of body fat.

Regarding nutritional status and physical activities, we found most of our volunteers have vitamin D25OH deficiency (69.7%; n=101 of 145), with 24.1% (n=35 of 145) having a severe deficiency. However, most have sufficient protein per kilogram of body weight (63.4%; n=92 of 145) and daily PUFA intake (54.5%; n=79 of 145). In addition, most are considered to have enough moderate-high physical activity according to IPAQ (65.5%; n=95 of 145); on the other hand, moderate-heavy physical exercise is considered lacking (67.6%; n=98).

Table 1 Relevant sociodemographic, anthropometric, nutrition and clinical characteristics of study volunteers

Variables	Study subjects; n=145 (range; SD)
Demographics	
Age (years, mean (range; SD))	33.04 (16–62; 10.07)
Menopause vs not menopause (%)	89 vs 11
Proportion of aged <40 years vs ≥40 years (%)	73.8 vs 26.2
Employment status; employed/housewife vs unemployed (%)	77.8 vs 22.2
Monthly income; enough vs not enough (%)*	27.1 vs 72.9
Assistance in daily living; present vs not present (%)	17.2 vs 82.8
Peer group support; present vs not present (%)	24.8 vs 75.2
Anthropometrics	
Muscle strength (kg, mean (range; SD))	19.88 (4.00–36.00; 6.49)
Gait speed (m/s, mean (range; SD))	0.755 (0.00–1.12; 0.16)
Body mass index (kg/m^2, mean (range; SD))	22.99 (14.00–39.10; 4.97)
Skeletal muscle mass (kg, mean (range; SD))	34.60 (26.20–45.10; 4.21)
Appendicular muscle mass index (mean (range; SD))	6.49 (4.57–11.61; 0.98)
Body fat percentage (%, mean (range; SD))	33.4 (15.80–56.80; 8.43)
Bone mass (kg, mean (range; SD))	2.04 (1.30–3.00; 0.39)
Nutrition and physical activities	
Vitamin D25OH levels (ng/mL, mean (range; SD))	17.66 (3.84–64.42; 11.29)
Daily protein intake (g/kg BW, mean (range; SD))	1.02 (0.21–4.87; 0.49)
Daily PUFA intake (mg, mean (range; SD))	12.10 (2.00–66.80; 7.52)
Weekly IPAQ score (min, mean (range; SD))	2019 (0–24 759; 2970)
Weekly moderate-heavy physical exercise (min, mean (range; SD))	259.64 (0–4200; 543.23)
Clinical characteristics	
Time diagnosed with lupus (years, mean (range; SD))	5.32 (0–24; 4.77)
30 days Mex-SLEDAI score (points, mean (range; SD))	4.23 (0–17; 3.35)
Pain score (VAS, mean (range; SD))	3.23 (0–9; 2.48)
Anti-dsDNA level (IU/mL, mean (range; SD))	324.82 (2.00–1433.00; 343.29)
Serum CRP level (mg/dL, mean (range; SD))	6.28 (0–219; 25.06)
ESR (mm/hour, mean (range; SD))	49.23 (2–140; 36.16)
Haemoglobin level (g/L, mean (range; SD))	116.2 (54.0–146.0; 18.9)
Kidney function (eGFR, mean (range; SD))	105.11 (10.60–142.20; 30.61)
Calcium ion level (mmol/L; mean (range; SD))	1.14 (0.90–1.31; 0.07)
Creatine kinase level (U/L; mean (range; SD))	53.78 (14–245; 32.35)
Corticosteroid mean dose last 3 months (mg prednisone equivalent, mean (range; SD))	6.33 (0.00–46.81; 6.59)
Corticosteroid usage length (months, mean (range; SD))	44.34 (0–240; 46.40)

*Calculated using Indonesian minimum living wage/month.
anti-dsDNA, anti-double-stranded DNA; BW, body weight; CRP, C reactive protein; eGFR, estimated glomerular filtration rate; ESR, erythrocyte sedimentation rate; IPAQ, International Physical Activity Questionnaire; Mex-SLEDAI, Mexican SLE Disease Activity Index; PUFA, polyunsaturated fatty acid; VAS, Visual Analogue Score.

Our study volunteers have moderate (49.7%; n=72 of 145) or severe lupus activity (31.0%; n=45 of 145), and only 19.3% are considered in remission or with low disease activity. The most frequently encountered organ involvement are arthritis (35.9%), mucocutaneous (32.4%), myopathy (28.3%), lymphopenia (24.8%), nephritis lupus (21.4%) and systemic symptoms (20.7%). Arthritis is especially troublesome, with 35.2% (n=51 of 145) having moderate-severe pain; however, only three volunteers experienced end-stage renal disease and/or dialysis (3%). Inflammatory markers, such as CRP, are elevated in 22.4% (n=17 of 76), and ESR is elevated in 75% (n=72 of 96) of evaluated volunteers. Most of our volunteers used corticosteroids in the previous month (84.8%; n=123 of

Table 2 Comparison of Sarcopenia-related Quality of Life (SarQoL) score*

Domain	Study subjects; n=145 mean (range; SD)	Muscle strength† normal vs low (mean difference; 95% CI)	P value	Muscle mass† normal vs low (mean difference; 95% CI)	P value
► Physical and mental health	70.95 (34–100; 14.34)	**73.52 vs 66.22 (7.29; 2.50 to 12.09)**	0.003	70.93 vs 71.06 (–0.13; –6.19 to 5.93)	0.96
► Locomotion	69.09 (25–100; 17.60)	**72.57 vs 62.68 (9.88; 4.04 to 15.73)**	0.001	69.30 vs 68.21 (1.08; –6.36 to 8.53)	0.77
► Body composition	69.86 (33–100; 15.94)	**72.57 vs 64.87 (7.69; 2.34 to 13.04)**	0.005	70.52 vs 66.98 (3.53; –318 to 10.25)	0.25
► Functionality	81.51 (43–100; 13.748)	**84.94 vs 75.20 (9.74; 5.27 to 14.20)**	**<0.001**	81.56 vs 81.31 (0.25; –5.56 to 6.06)	0.93
► Activities of daily living	66.08 (22–100; 14.93)	**69.90 vs 59.03 (10.78; 6.04 to 15.70)**	**<0.001**	66.43 vs 64.54 (1.88; –4.42 to 8.19)	0.55
► Leisure activities	40.61 (0–100; 24.22)	41.94 vs 38.15 (3.78; –4.54 to 12.12)	0.37	42.00 vs 34.50 (7.50; –2.26 to 17.67)	0.14
► Fears	81.64 (50–100; 16.99)	**84.18 vs 76.96 (7.22; 1.48 to 12.96)**	0.014	80.51 vs 86.57 (–6.06; –13.18 to 1.06)	0.095
► Total score	71.01 (38–97; 12.91)	**74.36 vs 64.85 (9.50; 2.10 to 5.33)**	**<0.001**	71.07 vs 70.79 (0.28; –5.18 to 5.74)	0.91

*SarQoL range 0–100; the higher, the better.
†Bold values denote statistically significant results.

145), with 26.2% (n=38 of 145) of them on high doses (≥7.5 mg prednisone equivalent daily dose).

A comparison of SarQoL according to muscle strength and mass can be seen in table 2; of note, most of the domains of SarQoL are affected by low muscle strength but none with low muscle mass. We also see a decrease in the ADL and IADL scores of individuals with low muscle strength compared with normal muscle strength (ADL 18.00 vs 19.30; mean difference 1.29; p<0.001 and IADL 7.18 vs 7.66; mean difference 0.48; p=0.004).

Table 3 analyses relevant factors associated with the SarQoL total score. We found that there is an association between the SarQoL total score with age more than 40 years old (mean difference 6.80; 95% CI 2.09 to 11.50; p=0.005), low muscle strength (mean difference 9.50; 95% CI 5.33 to 13.66; p<0.001), presence of lupus arthritis (mean difference 5.72; 95% CI 1.39 to 10.05; p=0.01), moderate-severe pain score (mean difference 10.57; 95% CI 6.11 to 15.03; p<0.001) and elevated CRP level (mean difference 7.14; 95% CI 0.47 to 13.81; p=0.036). After minimally adjusting with age (table 4), we found that pain scores (VAS) and muscle strength were independently associated with the SarQoL total score.

DISCUSSION

Our study volunteers generally have similar sociodemographic but different clinical characteristics as populations with lupus in other Asian countries. The most frequently encountered clinical manifestation is arthritis (35.9%); almost all (98%; n=50 of 51) reported moderate-severe pain. The proportion of arthritis involvement in our study is lower than in many other Asian countries' reports,[1] but the severity of arthritis joint pain should be given special note. Renal involvement is also lower (22.9%), but this is mainly because we do not routinely do kidney biopsies in patients with lupus, as another lupus registry study from Bandung, Indonesia also reported relatively similar lower kidney involvement numbers.[16]

We already elaborated the results of our study subjects' anthropometric measurements compared with the general population in Indonesia and other patients with lupus in other relevant countries.[8] In brief, our study subjects have weaker muscle strength and lower gait speed than comparably aged individuals and lower than the community-based elderly group. Meanwhile, our study volunteers seem to have a slightly better mean appendicular muscle mass index (6.49 (0.98)) compared with comparably aged Indonesian women from other study cohorts (Kurniawan *et al*, 6.17 (0.66) kg/m^2 and Wattimena *et al*, 5.98 (0.46) kg/m^2).[17 18]

Results from Andrews *et al*[19] demonstrated that dysfunction in dynamic muscle strength was independently associated with a reduction in physical function in 2 years. Furthermore, they also showed that muscle mass does not impact the quality of life in subjects with SLE; on the other hand, muscle strength does.[20] Our study result also further supports this conclusion; we could see that muscle strength does not only impact the total score of SarQoL but also most of its different domains (physical and mental health, locomotion, body composition, functionality, activities of daily living and fears). Conversely, muscle mass does not impact the total score of SarQoL nor the specific domains it contains (table 2).

Table 3 Analysis of relevant factors associated with the SarQoL total score

Variables	Grouping (n)	SarQoL total score*†		
		Mean (SD)	Mean difference (95% CI)	P value
Age (years)	**<40 (107)** **≥40 (38)**	**72.80 (12.22)** **65.99 (13.62)**	**6.80 (2.09 to 11.50)**	0.005
Body mass index (BMI) (kg/m^2)‡	Normal (68) Abnormal (77)	71.48 (13.55) 70.61 (12.39)	0.867 (–3.39 to 5.12)	0.688
Muscle strength (kg)	**Good (94)** **Low (51)**	**74.36 (10.57)** **64.85 (14.56)**	**9.50 (5.33 to 13.66)**	**<0.001**
Walking speed (m/s)	Normal (17) Low (128)	75.39 (10.02) 70.43 (13.17)	4.95 (–1.6 to 11.51)	0.175
Appendicular muscle mass index	Good (118) Low (27)	71.07 (12.86) 70.79 (13.34)	0.28 (–5.18 to 5.74)	0.919
Sarcopenia status	Non-sarcopenic (119) Sarcopenic (26)	70.97 (12.85) 71.21 (13.42)	0.23 (–5.77 to 5.30)	0.933
Vitamin D25OH level (ng/mL)	Normal (44) Deficiency (101)	71.03 (11.85) 71.01 (13.40)	0.01 (–4.60 to 4.64)	0.994
Daily protein intake (g/kg BW)	Sufficient (92) Insufficient (53)	72.38 (12.30) 68.64 (13.69)	3.74 (–0.63 to 8.11)	0.093
Daily PUFA intake (mg)	Sufficient (79) Insufficient (66)	71.56 (12.70) 70.36 (13.21)	1.20 (–3.06 to 5.47)	0.577
Weekly IPAQ score (min)	Moderate-high (95) Low (49)	71.95 (12.62) 69.62 (13.21)	2.33 (–2.12 to 6.79)	0.303
Weekly moderate-heavy physical activity (min)	Sufficient (46) Insufficient (98)	72.43 (10.94) 70.56 (13.64)	1.86 (–2.67 to 6.40)	0.417
Barthel's Activity of Daily Living	Independent (69) Dependent (76)	72.42 (11.34) 69.74 (14.14)	2.68 (–1.50 to 6.87)	0.207
Time diagnosed with lupus (years)	≤5 years (74) ≥5 years (70)	70.28 (12.62) 71.89 (13.31)	1.60 (–5.8 to 2.66)	0.459
30 days Mex-SLEDAI score (points)	<2 (28) ≥2 (117)	74.74 (10.43) 70.12 (13.31)	4.62 (–0.71 to 9.95)	0.089
Lupus arthritis	**No (93)** **Yes (52)**	**73.07 (11.97)** **67.34 (13.80)**	**5.72 (1.39 to 10.05)**	**0.01**
Pain score (VAS)	**≤4 (94)** **>4 (51)**	**74.73 (10.65)** **64.16 (13.96)**	**10.57 (6.11 to 15.03)**	**<0.001**
Serum CRP level (mg/dL)	**Normal (59)** **Increased (17)**	**73.66 (12.12)** **66.52 (12.30)**	**7.14 (0.47 to 13.81)**	0.036
Corticosteroid usage in the previous month	No (22) Yes (123)	70.83 (13.63) 71.05 (12.83)	0.221 (–6.14 to 5.70)	0.941
Corticosteroid mean dose (mg prednisone equivalent)	Low (107) High (38)	71.20 (12.72) 70.49 (13.57)	0.704 (–4.13 to 5.53)	0.774

*Bold values denote statistically significant results.
†SarQoL range 0–100; the higher, the better.
‡Normal BMI includes those with normal or overweight; abnormal includes those with underweight or obese.
BW, body weight; CRP, C reactive protein; IPAQ, International Physical Activity Questionnaire; Mex-SLEDAI, Mexican SLE Disease Activity; PUFA, polyunsaturated fatty acid; SarQoL, Sarcopenia-related Quality of Life; VAS, Visual Analogue Score.

This is an important finding, as this further proves that, different from rheumatoid arthritis and the elderly,[4 21] the SarQoL in patients with lupus is mainly influenced by muscle function rather than mass. Our study also showed that the proportion of our volunteers with sarcopenia (17.9%) is significantly lower than in patients with rheumatoid arthritis.[4] This was probably influenced by our younger cohort, that a disturbance in muscle strength resulted in lower function in activities of daily living (ADL 18.00 vs 19.30; mean difference 1.29; p<0.001 and IADL 7.18 vs 7.66; mean difference 0.48; p=0.004) and increased need for daily living assistance (33.3% vs 8.5%; p<0.001). Thus, whether or not low muscle mass is present as a criterion for sarcopenia, a disturbance in muscle strength is an important clinical indicator that warrants further evaluation in patients with lupus.

Evaluation of relevant factors associated with the SarQoL total score revealed significantly lower points in

Table 4 Age-adjusted analysis of variables correlated with the SarQoL total score

Coefficients*						
		Unstandardised coefficients		Standardised coefficients		
Model		B	SE	Beta	t	Sig
1	(Constant)	77.481	3.658		21.183	0.000
	Age	0.196	0.106	0.153	1.848	0.067
2	(Constant)	80.704	3.326		24.263	0.000
	Age	0.137	0.097	0.107	1.408	0.161
	Lupus arthritis	1.536	2.511	0.057	0.612	0.542
	Pain scores (VAS)	9.280	2.544	0.344	3.648	0.000
	Muscle strength	6.979	2.081	0.259	3.355	0.001

*Dependent variable: SarQoL total score.
SarQoL, Sarcopenia-related Quality of Life; VAS, Visual Analogue Score.

individuals with older age, lower muscle strength, lupus arthritis, higher pain scores and elevated CRP levels. This result is not surprising, as we could see that individuals with joint pain will likely have reduced physical activity, higher disease activity scores, elevated CRP, and, in turn, need a higher dose of corticosteroids that will influence muscle strength and HRQoL in one way or another.[22–24] Interestingly, different than studies conducted in patients with rheumatoid arthritis and the elderly, nutritional status, such as vitamin D25OH level, daily protein and PUFA intake, does not seem to be associated with total SarQoL score, nor do physical activity measures, such as weekly IPAQ score and moderate-heavy physical activity. This further emphasises the difference in approach needed to improve the quality of life of patients with lupus according to age, especially in the functional domains such as muscle strength and function.[4 25–28]

Results from our study suggested that SarQoL was independently associated with joint pain and low muscle strength (table 4, online supplemental file 1). Thus, evaluation and management of joint pain and muscle strength should be integral to comprehensive management in patients with lupus, especially in improving the quality of life in the younger patients with lupus. Besides improving the control of arthritis with better immunosuppressants and/or biological agents, adequate pain control with a VAS lower than 4 as the target with a multimodal approach should also be implemented. We have already shown that the impact of low muscle strength on quality of life is multidimensional (table 2); thus, analysis with SarQoL for patients with lupus with low muscle strength will be needed to formulate the best strategies. Specific interventions will be needed to improve physical and mental health, locomotion, body image, functionality, daily living activities and specific patients' fears. Therefore, a multipronged intervention, both by the consultant and with physical rehabilitation, nutritionist, psychologist and social support, will improve the SarQoL in patients with lupus with low muscle strength according to the domains affected.

This is a cross-sectional study; thus, we could not infer causality between low SarQoL total score, high pain scores and low muscle strength. Nonetheless, as Andrews *et al*[19 20] have pointed out, the reduction of muscle strength will result in lower physical function and quality of life in the future; it will be interesting to follow up our cohort with the necessary multimodal interventions to halt the decline. Further studies will also be needed to confirm whether joint pain and low muscle strength will lead to disuse atrophy and sarcopenia later in the life of patients with lupus, as indicated by other studies conducted in the elderly and patients with rheumatoid arthritis.[4 25–27 29]

CONCLUSION

We found low muscle strength and moderate, severe joint pain independently associated with low SarQoL in Indonesian women with lupus. The impact of low muscle strength on SarQoL was multidimensional, as it affected not only the physical and mental health but also locomotion, body composition, functionality, activities of daily living and fears of patients with lupus.

Twitter Stevent Sumantri @dokterimun_id

Contributors SS, ES and IR contributed equally to planning, conducting, drafting and finalising the manuscript. All authors agreed to be held accountable for all aspects of the work, ensuring that questions related to the accuracy and integrity of the work are appropriately investigated and resolved. SS acts as the guarantor of this article.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Obtained.

Ethics approval This study involves human participants. The observational study has been approved by the Medical Research Ethics Committee of the Faculty of Medicine, Universitas Indonesia (KET-76/UN2.F1/ETIK/PPM.00.02/2020). Furthermore, all the study volunteers were adequately explained, agreed to participate and gave written informed consent.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement No data are available.

ORCID iD

Stevent Sumantri http://orcid.org/0000-0002-5866-6484

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