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THE EFFECT OF LUPUS AEROBIC EXERCISE ON THE QUALITY OF LIFE PATIENTS WITH SYSTEMIC LUPUS ERYTHEMATOSUS WITH MILD DISEASE ACTIVITY (MEXICAN SYSTEMIC LUPUS ERYTHEMATOSUS DISEASE ACTIVITY INDEX 0–5)

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ABSTRACT

Background: Systemic Lupus Erythematosus (SLE) is a chronic autoimmune disorder that often affects women of productive age and is associated with reduced physical capacity, persistent fatigue, and impaired health-related quality of life (HRQoL). Although exercise benefits patients with SLE, evidence on lupus-specific aerobic exercise (senam lupus) for improving HRQoL in Indonesian patients remains limited. **Objective:** To evaluate the effect of a 6-week senam lupus program on HRQoL in patients with mild SLE. **Methods:** A quasi-experimental pre–post study was conducted in November–December 2024 at the Physical Medicine and Rehabilitation Department of Dr. Kariadi General Hospital and affiliated studios. A total of 25 participants were female adults aged 30–50 years with mild disease activity (MEX-SLEDAI 0–5), able to perform moderate-intensity exercise, and without musculoskeletal, cardiopulmonary, or neurological comorbidities. All participants completed supervised senam lupus sessions three times weekly for 6 weeks. HRQoL was measured using the SF-36 questionnaire before and after the intervention. **Results:** The 6-week intervention improved SF-36 scores in all domains, notably physical functioning, role physical, bodily pain (p<0,001), general health, role emotional, mental health (p=0,001), vitality (p=0,002), and social functioning (p=0,042). No participant experienced worsening disease activity or exercise-related adverse events. **Conclusion:** Senam lupus effectively improved HRQoL in patients with mild SLE and was well tolerated. This program may serve as a safe and beneficial therapeutic exercise to support rehabilitation and enhance daily functioning in individuals with SLE.

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INTRODUCTION

Systemic lupus erythematosus (SLE) is a chronic autoimmune disease characterized by multi system involvement resulting from immune dysregulation and the production of autoantibodies that attack various organs and tissues.[1,2] The disease most commonly affects individuals between 15 and 45 years of age and occurs disproportionately in women, with female patients affected 10–15 times more frequently than men.[3] Globally, the incidence and prevalence of SLE vary widely, with incidence rates ranging from 1 to 10 per 100,000 person-years and prevalence rates from 20 to 70 per 100,000 population.[4]

Patients with SLE frequently experience symptoms such as fatigue, fever, and arthritis, which contribute to reduced physical capacity, decreased daily functioning, and poorer quality of life (QoL) compared with healthy individuals.[5,6] Despite significant advances in medical management that have improved survival rates, the chronic and often fluctuating nature of SLE continues to impose a considerable burden on long-term health outcomes.[7] As a result, quality of life and patient-reported outcomes (PROs) which reflect subjective perceptions of physical, emotional, and social well-being are significantly impaired among individuals with SLE.[8]

Quality of life in patients with SLE is influenced by multiple factors, including socioeconomic, cultural,

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and environmental conditions, which may differ across countries and regions. Nevertheless, existing literature consistently indicates that health-related quality of life (HRQOL) among SLE patients remains substantially lower than that of the general population, with the physical health component being the most affected.[8]

Recent controlled trials have shown that structured exercise programs can enhance muscle strength and aerobic capacity in patients with SLE without exacerbating disease activity or symptoms. Recommended exercise include walking, light aerobic activity, swimming, cycling, and resistance training. These interventions have been shown to improve aerobic fitness, reduce fatigue, optimize heart rate response, and enhance functional and physical performance. Importantly, therapeutic exercise does not increase disease activity as measured by the Systemic Lupus Erythematosus Disease Activity Index (SLEDAI).[9]

So far, no studies conducted in Indonesia have examined the effectiveness of lupus specific exercise programs in improving the quality of life of patients with SLE, particularly among those with mild disease activity. Therefore, the present study aims to evaluate the effectiveness of a lupus exercise intervention in improving health-related quality of life in patients with SLE.

METHODS

Study Design and Setting

This study employed a quasi-experimental pre–post design to evaluate the effect of lupus aerobic exercise on health related quality of life among patients with Systemic Lupus Erythematosus (SLE) with mild disease activity. The study was conducted at the Department of Physical Medicine and Rehabilitation, Dr. Kariadi General Hospital Semarang, and in exercise studios (Metro Sports Center Agus Salim) from November to December 2024.

Subject

Participants were included if they met the following criteria: age 30–50 years, able to understand and follow instructions, normal visual and auditory function, able to perform moderate intensity physical activity for 30 minutes without complaints, able to ambulate independently without assistive devices, mild disease activity defined by Mexican SLE Disease Activity Index (MEX-SLEDAI) score 0–5, and willing to participate and sign informed consent. Participants excluded if they had musculoskeletal, neuromuscular, or postural disorders affecting standing or walking balance, lower extremity pain (VAS $\geq$ 4) or restricted joint mobility, moderate to severe disease activity (MEX-SLEDAI $\geq$ 6), history of cardiac comorbidities (ischemic heart disease, valvular disease, heart failure, arrhythmias), pulmonary or neuromuscular diseases affecting chest expansion or respiratory function, other autoimmune diseases, or active smokers.

Participants were excluded from the final analysis if they missed $\geq$ 3 non consecutive sessions or 2 consecutive exercise sessions, did not attend pre or post assessment or withdrew voluntarily.

Intervention

Participants underwent a supervised lupus aerobic exercise program *(senam lupus)* three times per week for six consecutive weeks. Each session included warm up in low intensity stretching and mobility exercises (5–10 minutes), main aerobic session within 30 minutes with rhythmic, whole-body movements involving large muscle groups, performed at moderate intensity, guided using Borg Scale 5–6) or 40–60% heart rate reserve, and cool-down with breathing exercises and flexibility movements (5–10 minutes). All sessions were supervised by trained instructors under medical oversight. Participants were monitored for symptoms, fatigue level, and heart rate to ensure exercise safety.

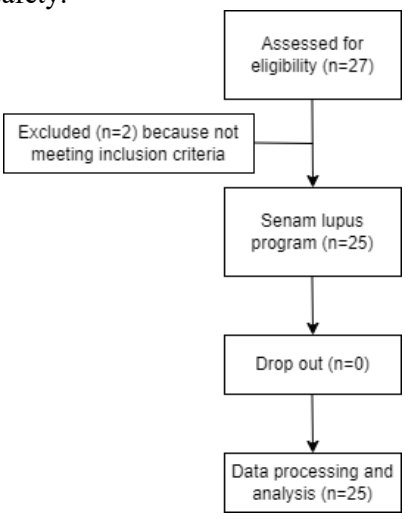


Figure 1. Study Flow Diagram

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Measurements

Health-related quality of life was assessed using the Short Form-36 (SF-36) questionnaire that consist of 36 questions, covering eight domains: physical functioning, role physical, bodily pain, general health, vitality, social functioning, role emotional, and mental health. SF-36 assessments were conducted before the intervention (pre-test) and after 6 weeks of exercise (post-test).

Statistical Methods

Data were analyzed using SPSS® software. Descriptive statistics were used to summarize demographic and baseline variables. Normality testing was conducted using the Shapiro–Wilk test. For normally distributed SF-36 scores, paired t-test was applied. For abnormal distribution, Wilcoxon signed-rank test was used. A p-value <0.05 was considered statistically significant.

RESULTS

Table 1 summarizes the baseline characteristics of the study participants. All 25 participants were female (100%), with a mean age of 41.08 ± 7.23 years. The mean body mass index (BMI) was 25.80 ± 5.84 kg/m², with 68% classified as overweight or obese. All participants had low physical activity levels based on IPAQ-SF, and all had mild disease activity based on MEX-SLEDAI.

Table 1. Baseline Characteristic

Variable	Frequency	%	Mean ± SD	Median (min – max)
Age (year)			41,08 ± 7,23	44 (30 – 50)
Gender				
Male	0	0		
Female	25	100		
BMI (kg/m²)				
Underweight	2	8		
Normal	6	24	25,80 ± 5,84	26,5 (15,9 – 41,4)
Overweight	12	48		
Obese	5	20		
IPAQ-SF				
Low	25	100		
MAX-SLEDAI pre				
Mild	25	100		

Descriptive analysis of SF-36 domain scores before and after the intervention is presented in Table 2. All eight domains showed improvement significantly after six weeks of lupus aerobic exercise (p<0,005). The most notable improvements were seen in role-physical (p<0,001), role-emotional (p=0,001), physical functioning, bodily pain (p<0,001), general health, and mental health (p=0,001).

Table 2. Comparison SF36 Pre and Post Test

Domain SF 36	Pre	Post	p
Physical Functioning	50 (25 – 95)	90 (50 – 100)	<0,001†*
Role physical	25 (0 – 100)	100 (0 – 100)	<0,001†*
Bodily pain	47,90 ± 19,63	71,80 ± 17,19	<0,001¶*
General health	52,16 ± 15,36	70,49 ± 17,59	0,001¶*
Vitality	52,60 ± 14,00	67,20 ± 14,58	0,002¶*
Social functioning	63,00 ± 21,49	75,50 ± 19,59	0,042¶*
Role emotional	0 (0 – 100)	100 (0 – 100)	0,001†*
Mental health	62,88 ± 12,08	78,88 ± 14,77	0,001¶*

Note: * Significant (p < 0,05); † Wilcoxon; ¶ Independent-t

DISCUSSION

The present study evaluated the effectiveness of a six-week lupus-specific aerobic exercise program in improving the quality of life (QoL) of patients with systemic lupus erythematosus (SLE) with mild disease activity. The results demonstrated meaningful improvements across several SF-36 domains, including physical functioning, role patients, bodily pain, and general health perceptions. These findings indicate that structured aerobic exercise can serve as a beneficial adjunctive therapy for patients with stable SLE. The improvements observed are consistent with previous research showing that SLE patients frequently experience reduced physical capacity, heightened fatigue, and diminished QoL compared with healthy individuals, making exercise-based interventions particularly relevant.[5,6]

The positive outcomes of this study align with existing literature demonstrating the effectiveness of aerobic and resistance exercise in enhancing functional capacity and QoL in SLE. Carvalho et al. reported that supervised cardiovascular training improves aerobic capacity, reduces fatigue, and enhances QoL without increasing disease activity.[10] Similarly, Bogdanovic et al. found that both aerobic and isotonic training significantly reduce fatigue, improve psychological well-being, and enhance QoL in SLE populations, again without provoking disease flares.[11] These findings support the notion that exercise is safe when performed during periods of low disease activity and that its benefits extend beyond physical functioning to psychological health as well.[12]

Improvement in QoL can be explained through several physiological mechanisms. Aerobic exercise is known to modulate inflammatory responses by reducing levels of pro-inflammatory cytokines such as

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IL-6 and TNF-α, while increasing anti-inflammatory cytokines like IL-10, which collectively help reduce fatigue and pain—two major contributors to reduced QoL in SLE.[13,14] Exercise also improves endothelial function, enhances autonomic nervous system balance, and increases cardiorespiratory fitness, mechanisms that have been described in rheumatic diseases and chronic inflammatory conditions.[15,16] These physiological adaptations are consistent with the improvements observed in the physical functioning and vitality domains of the SF-36 in the present study.

In addition to physiological benefits, psychological mechanisms also contribute substantially to QoL improvements. Exercise is well documented to improve mood, reduce anxiety and depressive symptoms, and enhance sleep quality effects mediated by increased endorphin release and improved hypothalamic–pituitary–adrenal (HPA) axis regulation.[17] This is particularly relevant in SLE, where psychological comorbidities such as depression and anxiety are common.[6] The improvements in vitality and general health perception in the current study may reflect these psychosocial benefits. Yuen and Bagley also highlighted the role of exercise in ameliorating psychosocial distress among individuals with chronic rheumatologic conditions.[18]

The absence of increased disease activity after the six-week intervention is an important finding. All patients had mild disease activity (MEX-SLEDAI 0–4), ensuring that the intervention adhered to guidelines recommending exercise during clinical stability.[12] Previous studies consistently demonstrate that moderate-intensity aerobic exercise does not increase the risk of SLE flares, further confirming the safety of exercise in this population.[9,19] Safety concerns are frequently cited as barriers to exercise participation among SLE patients, making these findings particularly clinically relevant.

This study also has relevance in the Indonesian context, as it represents one of the first evaluations of a lupus-specific exercise program in the country. Cultural, social, and economic factors have been shown to influence QoL outcomes in SLE.[20,21] Limited access to physiotherapy services, varying levels of health literacy, and socioeconomic barriers may influence adherence to lifestyle interventions. The use of a simple, low-cost, and culturally adaptable exercise modality such as "*senam lupus*" thus offers a feasible adjunct to standard care in resource-limited settings.

The improvements across SF-36 domains suggest enhanced functional capacity, reduced pain, and better overall health perception. Increases in vitality likely reflect reductions in fatigue, which has been identified as one of the most debilitating symptoms in SLE and is responsive to aerobic training.[5,22] Although not all domains improved equally, partial improvements remain clinically significant, as QoL in SLE is influenced by the complex interaction of physical, psychological, and social factors.[8]

This study has several strengths, including the use of a validated instrument (SF-36), direct supervision during all exercise sessions, and the inclusion of participants with only mild disease activity. Such methodological features reduce variation and improve internal validity, consistent with best practices in exercise-intervention research.

However, several limitations must be acknowledged. The pre–post design without a control group restricts causal inference, as improvements may partly reflect natural symptom fluctuation or expectancy effects. The relatively small sample size limits generalizability, and the intervention period of six weeks may not fully capture long-term or sustained benefits. Moreover, the lack of objective physiological measures (e.g., VO_2 max, muscular strength assessment, biomarkers) limits mechanistic interpretation of the observed improvements. Similar limitations have been noted in previous small-scale SLE exercise studies.[10,11]

Despite these limitations, the findings of this study support the integration of structured aerobic exercise programs into routine clinical management for patients with mild SLE. Regular exercise has demonstrated consistent benefits for physical and psychological health, does not increase disease activity, and is feasible for implementation even in low-resource settings. Future research should include randomized controlled trials with larger samples, objective physiological outcome measures, longer follow-up durations, and evaluation of adherence-related factors.

Overall, this study demonstrates that a six-week lupus aerobic exercise program can significantly improve QoL in patients with mild SLE without increasing disease activity. These results reinforce the

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growing evidence that structured exercise is a safe and effective non-pharmacological strategy for SLE management and highlight its potential value within the Indonesian healthcare context.

CONCLUSION

This study demonstrates that a six-week supervised lupus aerobic exercise program effectively improves health-related quality of life in patients with Systemic Lupus Erythematosus (SLE) with mild disease activity. Significant improvements were observed across key SF-36 domains, particularly physical functioning, role physical, bodily pain, general health, vitality, social functioning, role emotional, and mental health. Importantly, the intervention was safe and did not lead to increased disease activity or adverse events throughout the program. These findings support the incorporation of lupus aerobic exercise as a feasible, low-cost, and non-pharmacological adjunct to routine clinical management for individuals with mild SLE. Further studies with larger sample sizes and controlled designs are recommended to strengthen the evidence base and explore long-term outcomes.

ETHICAL APPROVAL

The Research Ethics Committee at the Health and Medical Research Ethics Commission of RSUP Dr. Kariadi Semarang, Indonesia granted ethical approval with the ethical clearance number No. 618/EC/KEPK/FK-UNDIP/XI/2024

CONFLICTS OF INTEREST

The authors declare no potential conflict of interest with respect to the research, authorship, and/or publication of this article.

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