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The unweighed factor during assessment of systemic lupus erythematosus arthritis

Omneya Mohamed-Ayman Abdel-Moniem^{1*} and Sally S. Hassouna²

Abstract

Background Systemic lupus erythematosus (SLE) is a known multisystemic autoimmune disorder. Active disease causes diverse morbidities. Arthritis is one of disease features present in most of patients, so it is important to study risk factors for such a complaint. Obesity appeared in some studies to increase SLE activity, here in this study, and for the first time, the effect of body weight on arthritis associating the disease was assessed.

Methods SLE patients were asked about their joint manifestations and were asked to weigh up joint pain severity which was translated into values of patient self-report joint count (PTJT) present in Multidimensional Health Assessment Questionnaire (MDHAQ), which was then compared to joint examination in the form of 28 tender joint count (28 TJC) and 28 swollen joint count (28 SJC). All previous items were correlated to body mass index (BMI).

Results BMI has a significant positive correlation with PTJT $p = 0.013$, and when PTJT of upper limbs and lower limbs were assessed separately, BMI was also positively correlated with $p = 0.008$ and 0.049 , respectively.

Conclusions Increased BMI may be a risk factor for arthritis associated with SLE, regardless its effect on weight-bearing joints. Management of body weight may help in preventing progression of joint affection in SLE.

Keywords Systemic lupus erythematosus, Arthritis, Body mass index, PTJT, Multidimensional Health Assessment Questionnaire

Introduction

Systemic lupus erythematosus (SLE) is a disorder in which the immune system attacks healthy tissues due to autoimmune pathogenesis. [1]

Symptoms vary according to systems affected, and systems that are commonly involved are joints, kidneys, the skin, blood elements, the lungs, and the heart.

Symptoms also vary in severity and may relapse and remit. Most of the patients have joint pain, and some patients develop arthritis. Joints that are frequently affected are the fingers, wrists, and knees [2, 3]. Jaccoud's

deformity [4] is a chronic reversible nonerosive joint affection that may happen after repeated attacks of arthritis.

The etiology of SLE is still unclear [1] but thought to involve a genetic and environmental factors combination [2]. Female sex hormones, exposure to sunlight, vitamin D deficiency, smoking, and some types of infections are believed to increase the risk for the disease [2].

Regarding body weight as a contributing factor in disease risk, obesity among Black female teenagers showed to be associated with increased risk of SLE in adulthood. The Nurses' Health Study (NHSII) cohort observed a significant increase in the risk of SLE (85%) among obese women when compared to women with normal BMI [5, 6]; however, this finding was not shown in the earlier cohort of NHS [7].

Besides increased risk of disease that was shown with increased body weight, it was observed that a

*Correspondence:

Omneya Mohamed-Ayman Abdel-Moniem
omneyamohamedayman@gmail.com

¹ Rheumatology, Rehabilitation and Physical Medicine Department,
Faculty of Medicine, Alexandria University, Alexandria, Egypt

² Rheumatology and Immunology Unit, Internal Medicine Department,
Faculty of Medicine, Alexandria University, Alexandria, Egypt

low-caloric diet regulates SLE activity through modulation of inflammation and immune functions [8].

Obesity in inflammatory rheumatic diseases such as rheumatoid arthritis (RA) and psoriatic arthritis is a contributing factor to arthritis severity [9].

Adipokines, which are cytokines secreted by adipose tissue, appeared to play important roles in inflammation and are related to arthritis pathogenesis in RA and psoriatic arthritis. Synoviocytes, osteoclasts, osteoblasts, and chondrocytes in RA joints produce adipokines. Adipokines also appeared to have modulatory effects on different immune cells and cells in synovial tissue, bone, and cartilage [10–12].

Increased body weight is not only implicated in increasing SLE disease risk but also may increase the hazard of premature atherosclerosis that is associated with SLE and may add on its complications [13, 14]; this is why obesity, the point at issue, should be studied in relation to different phenotypes of SLE including arthritis, away from being a load on weight-bearing joints; this is important to know if avoiding increasing weight is a protective factor from arthritis or other disease manifestations.

Is obesity related to increased arthritis risk in SLE or is related to its pathogenesis in the disease? Is arthritis severity in SLE preventable through decreasing body weight? This is our question.

Methods

This study included 36 SLE patients diagnosed according to ACR criteria [15, 16] and/or SLICC criteria [17] after obtaining informed consent, and thorough clinical history and examination were done, and 28 tender joints (28 TJC) and 28 swollen joints (28 SJC) were counted (the 28 joints are as follows: both shoulders, both elbows, both wrists, both knees, metacarpophalangeal and proximal interphalangeal joints). Patients were assessed using the self-reported Multidimensional Health Assessment Questionnaire (MDHAQ), and the following was scored: RAPID3 and RAPID 4. RAPID3 includes pain (PN), physical function FN, and patient global assessment (PTGL), while RAPID4 involves patient self-report joint count (PTJT) as an extra element to RAPID3. PTJT was calculated, and also, PTJT scores of upper limbs in both shoulders, both elbows, both wrists, and metacarpophalangeal and proximal interphalangeal joints and lower limbs (both knees, both ankles, and metatarsophalangeal joints) were calculated separately, which was then transformed into numerical values [17–19]. Body mass index was classified into overweight = ≥ 25 and underweight = < 25 [20].

Statistical analysis of the data

Data were using version 20.0 of IBM SPSS software package (Armonk, NY: IBM Corp.). Numbers and percentages represented the categorical data. Association between categorical variables was investigated by chi-square test.

When the expected count is less than 5 in more than 20% of cells, Fisher exact correction test was applied. Shapiro-Wilk test was used to test for normality of continuous data. Range (minimum and maximum), median, mean, and standard deviation expressed the quantitative data for quantitative variables which were not normally distributed. In comparison between two groups by using Mann-Whitney test, correlations between quantitative variables were done using Person coefficient. At 5% level is the point at which judgement obtained results significance was done.

Results

This study involved 36 female SLE patients with demographic data shown in the following Table 1. Study results showed that BMI is positively correlated with RAPID 4 ($r = 0.337$, $p = 0.044$), while not correlated to RAPID 3 ($r = 0.303$, $p = 0.072$).

BMI correlation with total PTJT was ($r = 0.409$, $p = 0.013$) (Fig. 1), and when total PTJT was divided into upper PTJT and lower PTJT individually, BMI was positively correlated with both ($r = 0.432$, $p = 0.008$, and $r = 0.329$, $p = 0.049$, respectively) (Figs. 2 and 3).

When comparing patients of overweight to patients of underweight in their relation with total PTJT, there was a significant difference between its increased values in overweighted patient and its decreased ones in underweighted patients ($p = 0.035$) (Fig. 4). PTJT for upper limbs was significantly higher in overweight than in underweight ($p = 0.029$) (Fig. 5); however, PTJT of lower limbs did not show any significant difference between overweight and underweight ($p = 0.084$).

Mean \pm SD of tender joint count (28 TJC) in underweight group = 2.25 ± 3.28 with a median = 0.5 (0–9), while mean \pm SD of TJC28 in overweight group was =

Table 1 Distribution of the studied cases according to demographic data ($n = 36$)

	No.	Mean \pm SD	Median (min.–max.)
Age	36	40.22 \pm 9.71	40.5 (19–62)
BMI (kg/m ²)			
Total sample	36	27.99 \pm 4.90	28.3 (19.47–36.96)
Underweight (< 25)	12	22.47 \pm 1.71	23.23 (19.47–24.14)
Overweight (≥ 25)	24	30.74 \pm 3.38	29.38 (25.61–36.96)

SD standard deviation

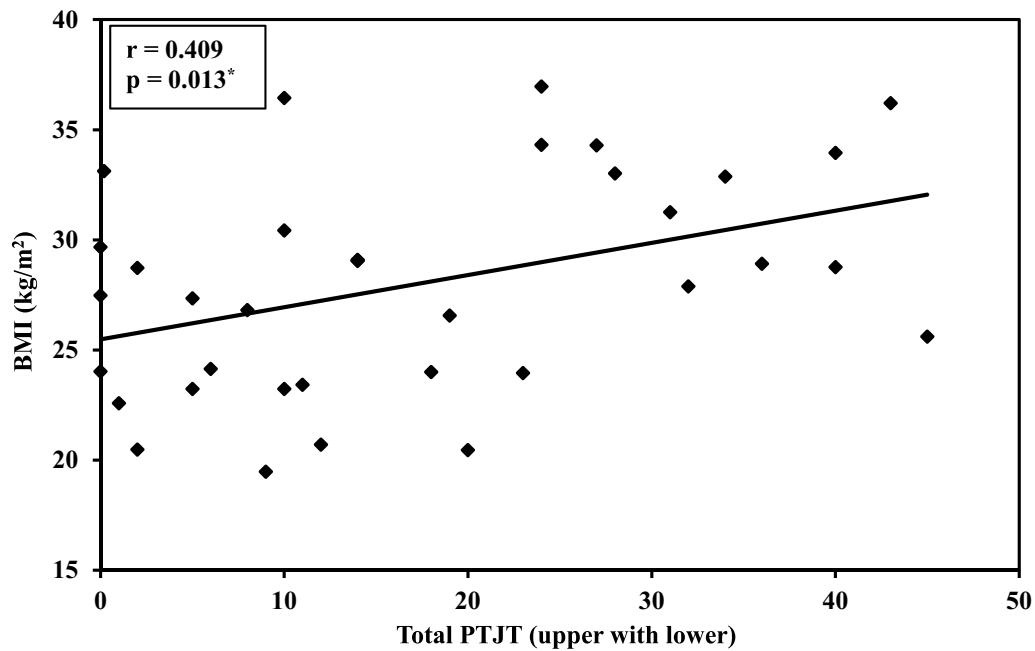


Fig. 1 Correlation between BMI with total PTJT

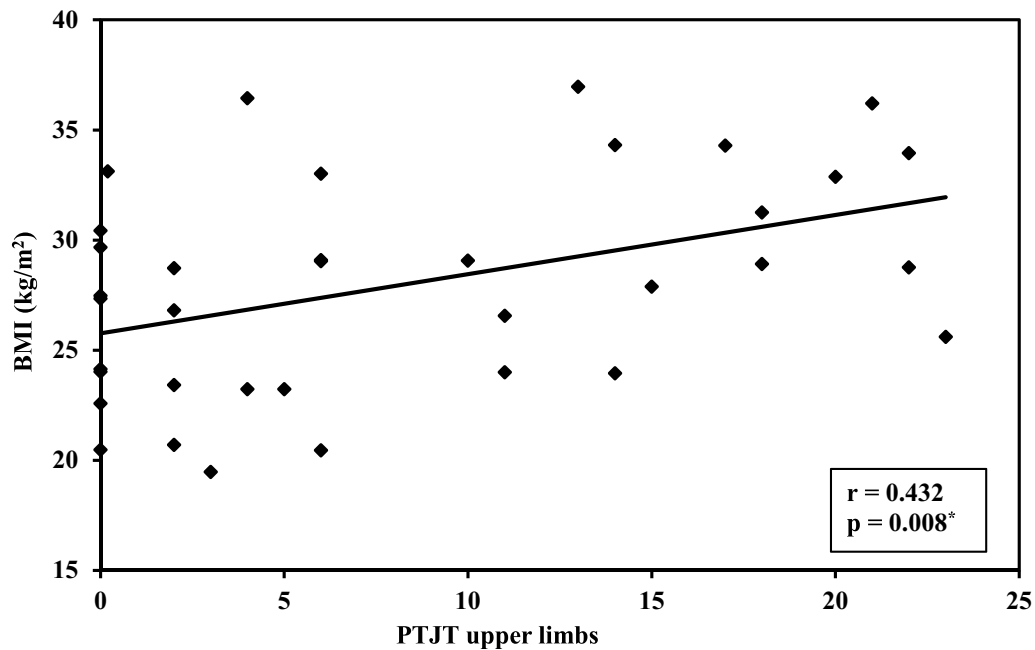


Fig. 2 Correlation between BMI with PTJT of upper limbs

7.25 ± 6.51 and median = 6 (0–25), and there was a significant difference between the two groups in TJC28 ($p = 0.008$). On the other hand, there was no significant difference in 28 swollen joint count (28 SJC) between the two groups ($p = 0.518$) (mean ± SD = 3.33 ± 3.42 and 2.75 ±

3.21, while median = 2.5 (0–12) and 1 (0–13) in underweight group and overweight group, respectively; also, there was no significant difference between overweight and underweight groups in the sum of both 28TJC and 28 SJC ($p = 0.120$).

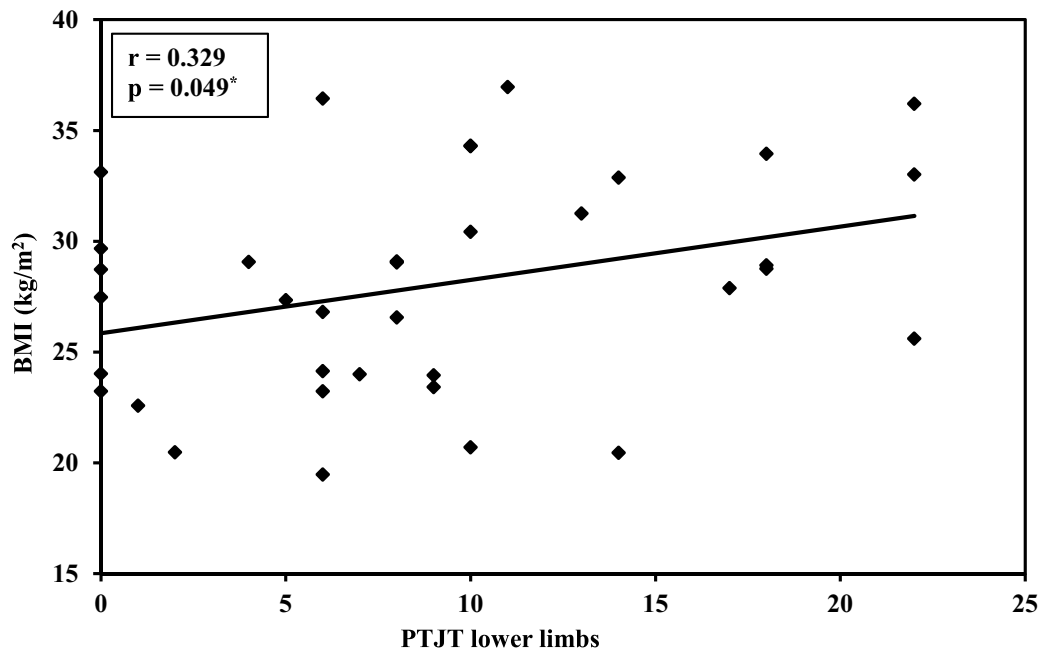


Fig. 3 Correlation between BMI with PTJT of lower limbs

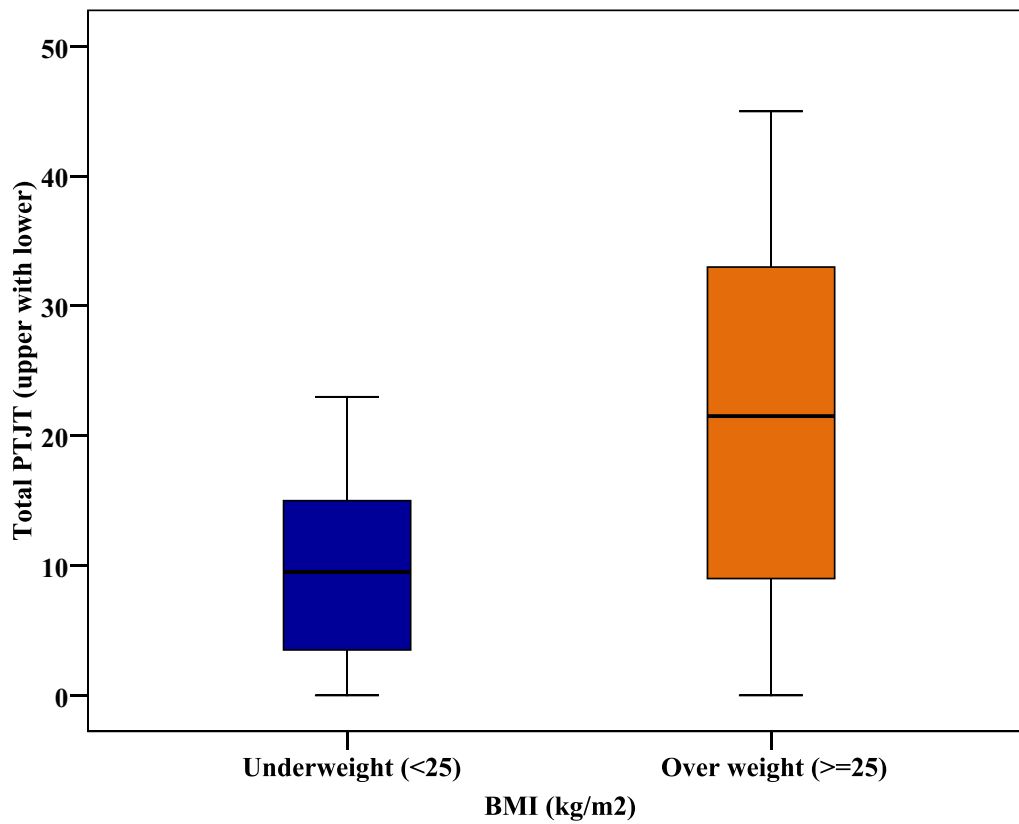


Fig. 4 Comparison between underweight (< 25) and overweight (≥ 25) according to total PTJT

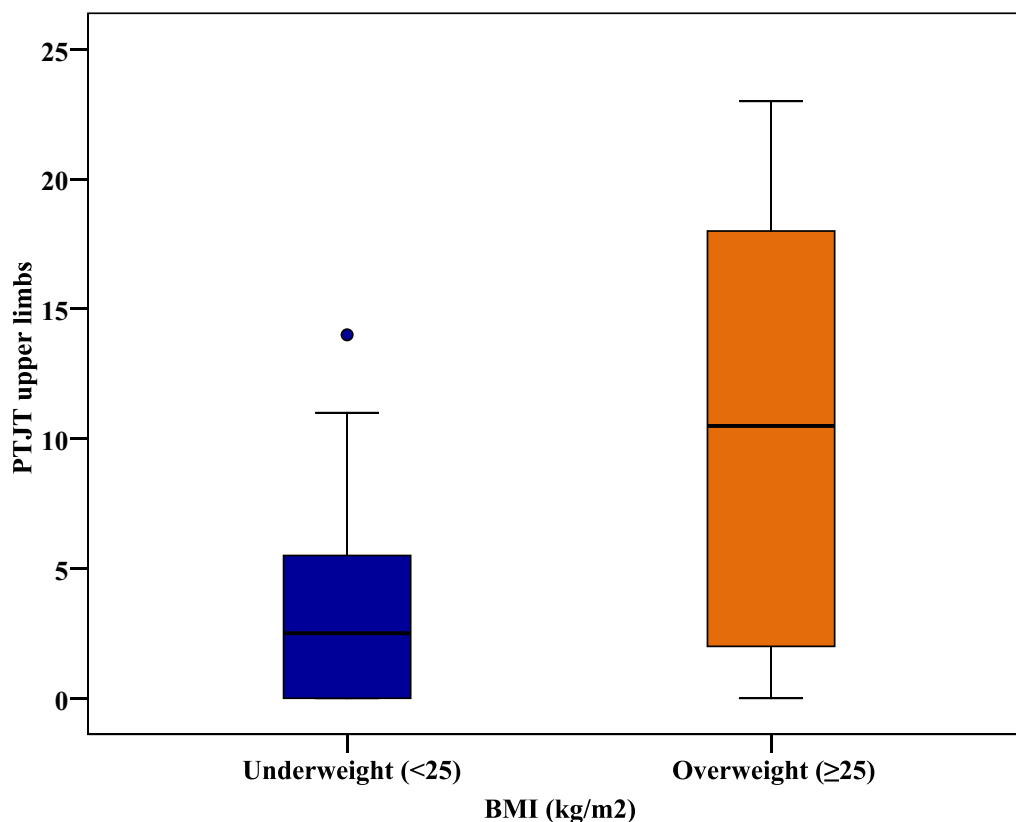


Fig. 5 Comparison between underweight (< 25) and overweight (≥ 25) according to PTJT of upper limbs

BMI was positively correlated to 28 TJC ($r = 0.494$, $p = 0.002$), but not correlated to 28 swollen joint count (28 SJC) ($r = 0.035$, $p = 0.838$). Eventually, BMI was also positively correlated to sum of 28 TJC and 28 SJC ($r = 0.398$, $p = 0.016$).

PTJT was positively correlated to 28 TJC ($r = 0.689$, $p < 0.001$) and sum of 28 TJC and 28 SJC ($r = 0.637$, $p < 0.001$), while not correlated to SJC alone ($r = 0.252$, $p = 0.145$).

Discussion

SLE is one of serious diseases that may lead to many morbidities and even death [1]; thus, it is of importance to study each element of the disorder, the etiology of each organ affection, the pathogenesis, the aggravating factors, and what can treat the insult or even prevent it, and since arthritis is a symptom causing disability and annoyance to the patient [2, 3] and may even lead to deformities, i.e., Jaccoud's deformity [4], this study was made to perceive the relation between BMI of the patients and inflammatory arthritis and if increased body weight poses a risk for developing or aggravating arthritis.

The study results showed a significantly positive correlation between SLE patients' BMI and the score RAPID

4 included in MDHAQ [17–19] but not correlated with RAPID 3 that is included in the same questionnaire; this means the strength of the relation between BMI and RAPID 4 in the study results is due to self-reported arthritis score. So was the relation of BMI with total PTJT score which agrees and confirms the previous elicitation, the positive correlation of BMI, and total PTJT when was analyzed with upper limb PTJT and lower PTJT individually revealed a positive correlation of BMI with upper limb PTJT and not only with lower limb PTJT, and comparison between overweight and underweight PTJT revealed a significant difference in total PTJT and that of upper limbs but not in lower limbs PTJT, and this point denies the idea of that this self-reported joint affection with increased body weight is only due to load on weight-bearing joints.

Positive correlation between total PTJT and 28 TJC ensures that patients' complaint is mostly due to real joint insult, although total PTJT was not correlated with 28 SJC.

All these findings highlight the possibility of BMI being a strong risk factor for development and severity of arthritis associating SLE agreeing with what appeared in some studies about BMI increasing the risk

of disease development and with the evidence found in inflammatory arthritis of RA and psoriatic arthritis that BMI increases joint inflammation through several mechanisms [10, 11].

Despite what appeared in the current study results that increased BMI increases arthritis frequency might be explained by the fact that patients with severe disease and arthritis may be receiving higher doses of corticosteroids as a treatment which in turn causes increased body weight [21], and here, we may not be able to know which happened first. But it should be put in mind also that long-standing corticosteroids intake may lead to muscle wasting and weight loss consequently [22].

Recommendations

The study should be conducted on a large base of patients and investigations necessary for follow-up, and confirmation of arthritis diagnosis should be held in further studies. Weight management may be of great importance in SLE management, and it must be considered and put in mind.

Abbreviations

SLE	Systemic lupus erythematosus
MDHAQ	Multi-Dimensional Health Assessment Questionnaire
RAPID 3	Routine Assessment of Patient Index Data 3
RAPID 4	Routine Assessment of Patient Index Data 4
PTJT	Patient self-reported joint count
TJC	Tender Joint Count
SJC	Swollen joint count

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Authors' contributions

First author: OMA, the idea, obtaining consent, history and examination, and the corresponding author. Second author: SSH, writing the manuscript.

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Availability of data and materials

Available on request.

Declarations

Ethics approval and consent to participate

Ethics Committee of Faculty of Medicine, Alexandria University, Egypt, accepted the study proposal with IRB No.: 00012098, FWA No.: 00018699, and serial number: 0306020, date: 16 February 2023.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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