Body composition and basal metabolic rate in systemic lupus erythematosus patients


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Aim of the work: Descriptions of the body composition parameters and metabolism in systemic lupus erythematosus (SLE) patients are limited. The aim of the present work was to assess the body composition factors and basal metabolic rate (BMR) in Iranian SLE patients and to study its relation to disease activity.

Patients and methods: Seventy-four female SLE patients and 76 matched controls were included in the present study. The body mass index (BMI), body fat (BF), visceral fat (VF), body muscle (BM) and basal metabolic rate (BMR) were measured using BIA (bioelectrical impedance analysis). The international physical activity questionnaire (IPAQ) was used to assess physical activity. SLE disease activity index (SLEDAI) was assessed for all the patients.

Results: The mean age of the patients was 38.5 ± 10.1 years with a median disease duration of 7.5 years. The median SLEDAI was 4. Body composition factors (BMI, BF, VF, and BM) were not significantly different between the SLE patients with high and low SLEDAI or between the patients and their controls. The BMR in SLE patients was significantly lower than controls. No significant differences were found in body composition parameters and BMR between the SLE patients with high SLEDAI or between the patients and their controls. The BMR in SLE patients was significantly lower than their controls. No significant differences were found in body composition parameters and BMR between the SLE patients with high and low SLEDAI or between the patients and their controls.

Conclusion: SLE women have a significantly lower BMR compared to their controls. No significant differences between the measured parameters except for a negative association with age (r = –0.3, p = 0.03).

1. Introduction

Systemic lupus erythematosus (SLE) is an autoimmune disease in which the body’s immune system mistakenly attacks healthy tissues [1]. Early coronary heart disease has appeared as a major cause of morbidity in SLE patients. In addition, cardiovascular induced mortality has been increased in these patients compared with the general population [2–6]. Increased cardiovascular events can be explained in part by an increased prevalence of cardiovascular disease (CVD) risk factors such as metabolic syndrome (MetS) and its components [6]. Improved control of SLE disease activity could help in minimizing the development of irreversible damage [7].

The amount and distribution of body fat and lean mass have an important impact on health [8]. In SLE, disproportionate adiposity in abdominal region as a key-feature of MetS together with proinflammatory and prothrombotic state contributes to atherosclerosis [1–3]. An association of BMI with dyslipidemia and decreased quality of life in SLE patients has been reported. Qol. Even though its role in disease activity is not clear, obesity was associated with SLE damage accrual [9]. Effective management of MetS would help control SLE activity, damage, and the future development of cardiovascular events [10].
Changes in body composition have been reported in SLE patients due to the systemic inflammatory nature of the disease and prolonged corticosteroid therapy. Abnormal body composition phenotypes may therefore represent an additional risk for CVD in SLE patients [11–15].

Basal metabolic rate (BMR) is the most important indicator of human metabolism and its abnormalities have been linked to undesirable health outcomes [16]. The BMR reflects a combination of cardiopulmonary function and lean body mass resulting from regular physical activity [17]. The BMR is referred to as the minimal rate of metabolism required to support basic body functions. It is well known that individual BMR varies greatly, even when correcting for body weight, fat content, and thyroid hormone levels, but the mechanistic determinants of this phenomenon remain unknown [18]. There was no difference in weight gain between adults with low and high BMR, implying that habitual differences in food intake or activity may counterbalance variations in BMR as a risk factor for weight gain [19]. The interindividual variation in BMR in humans could be primarily explained by differences in mitochondrial oxygen affinity [18].

The BMR is high in rheumatoid arthritis (RA) patients due to hypercatabolism caused by systemic inflammation and cigarette smoking has been associated with a further increase [16]. BMR is closely associated with bone mineral density (BMD) in elderly persons and may be a novel target for interventions aimed at preventing the age-related decline in BMD [17].

Few studies have assessed the relationship of body composition and disease activity in SLE patients [20–23]. Thus, the aim of the present work was to assess the body composition factors and basal metabolic rate (BMR) in Iranian SLE patients compared to healthy control and to study its relation to disease activity.

2. Patients and methods

2.1. Participants

Between August and November 2015, 74 adult females aged 20–65 years diagnosed according to Systemic Lupus International Collaborating Clinics classification criteria for SLE [24] were recruited from the rheumatology clinic at Hafez Hospital in Shiraz. Patients exclusion criteria were pregnancy, lactation, ischemic heart disease and reduced renal function (serum creatinine >2.5 mg/dl). The control group consisted of 76 healthy female who were matched in age, body mass index (BMI) and physical activity level. Interpreting the age-related decline in BMD [17].

In order to make a good match between the patients and controls, both premenopausal and postmenopausal subjects were included in the two groups of the study for omitting the confounding effect of menstrual cycle on BMR.

Because of the necessity of considering physical activity level in both groups of SLE patients and healthy controls, the participants were asked to report their daily physical activity by filling a questionnaire; the international physical activity questionnaire (IPAQ) [28]. There are three levels of physical activity according to IPAC questionnaire: inactive, minimally active and HEPA active (health enhancing physical activity; a high active category).

2.3. Statistics

Data were analyzed using SPSS 18 (SPSS Inc., Chicago, IL) statistical software package. All the data were assessed for normality of distribution, using the Kolmogorov–Smirnov test. Results were presented as mean ± standard deviation. To compare variables, independent sample t test and Mann–Whitney U test were used. The correlations were calculated by the Spearman correlation test and variables with significant coefficients were tested again in backward multivariate regression model. A p-value <0.05 was considered significant.

3. Results

Seventy-four SLE patients were enrolled in this study. Demographic characteristics, clinical and laboratory features and medications used by the SLE patients are presented Table 1. According to the IPAQ, all participants were categorized as inactive to minimally active and none were HEPA active. The comparison of age, BMI, body composition parameters and BMR in patients and control is shown in Table 2. The BMR was significantly lower in SLE

<table>
<thead>
<tr>
<th>Parameter n (%) or median (range)</th>
<th>SLE patients (n = 74)</th>
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<tbody>
<tr>
<td>Age (year)</td>
<td>37 (30–45)</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>26.3 (21.2–28.3)</td>
</tr>
<tr>
<td>Disease duration (year)</td>
<td>7.5 (3.87–15)</td>
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<tr>
<td>SLEDAI</td>
<td>4 (2–8)</td>
</tr>
<tr>
<td>Lupus nephritis</td>
<td>12 (16.2)</td>
</tr>
<tr>
<td>Arthritis</td>
<td>6 (8.1)</td>
</tr>
<tr>
<td>Vasculitis</td>
<td>1 (1.3)</td>
</tr>
<tr>
<td>Hypocomplementemia</td>
<td>22 (29.7)</td>
</tr>
<tr>
<td>Positive anti ds-DNA</td>
<td>19 (25.6)</td>
</tr>
<tr>
<td><strong>Medications</strong></td>
<td></td>
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<tr>
<td>Prednisone</td>
<td></td>
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<tr>
<td>&lt;7.5 mg/d</td>
<td>56 (75.6)</td>
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<tr>
<td>≥7.5 mg/d</td>
<td>9 (12.1)</td>
</tr>
<tr>
<td>Hydroxychloroquine</td>
<td>21 (28.3)</td>
</tr>
<tr>
<td>Other Immunosuppressant</td>
<td>27 (36)</td>
</tr>
<tr>
<td>ACE/ARB</td>
<td>17 (22.9)</td>
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</tbody>
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patients (1328.39 ± 154.6 kcal/day) compared to that in the control (1400.44 ± 200.35 kcal/day) (p = 0.01).

Differences in the body composition parameters, BMR and steroid dose in the patients based on disease activity are presented in Table 3. Differences based on daily corticosteroid dosage ≤7.5 and >7.5 mg/day are shown in Table 4. Nine patients (12.2%) did not receive corticosteroids. In addition no significant differences were seen in body composition parameters according to presence and absence of nephritis, arthritis, positive DS-DNA and hypocomplementemia.

The correlations between SLE disease activity with the age, body composition parameters, BMR and corticosteroid consumption are shown in Table 5. The relation of BMR with the studied parameters remained non-significant even after adjusting for age (p = 0.19), BMI (p = 0.12), physical activity (p = 0.36) and menopause status (p = 0.47) as confounding factors using linear regression.

4. Discussion

In the present work, the body composition factors and BMR were assessed in Iranian SLE patients and their relation to disease activity was studied. As fat mass (FM), FFM and distribution of fat vary among different ethnic groups; we aimed to assess this trend in Iranian patients. No difference was found in body composition parameters (BMI, BM and BF), BMR and daily corticosteroids dosage in the patients based on their disease activity. This result implies that the disease activity has a limited effect on the metabolism and body composition of SLE patients, while younger patients were more active. The main finding of this study is that the BMR in SLE patients was significantly lower than in the control. To the best of our knowledge, no similar finding has been previously reported. However, BMI, FM and FFM were not significantly different between the patients and control which argues against the observed lower BMR in the patients. Furthermore, neither physical activity nor low FM accounted for patients’ lower BMRRs. A possible explanation relates to the complicated disease characteristics including the inflammatory burden of lupus itself as well as therapy with corticosteroids. Most patients in this study were on low to medium steroid dose, however, prolonged treatment contributes to net protein catabolism and reduced muscle mass [22]. According to previous studies increased FM and reduced lean body mass is prevalent in SLE patients [22,23]. Thus the lower BMR could attribute to the compensatory effect of reduced FFM with the aim of preserving energy homeostasis. In terms of disease activity influence on body composition, based on the results of the study performed in pre-menopausal women with SLE, disease activity was correlated with changes in body composition, as higher disease activity was associated with higher FFM accounted for patients’ lower BMRRs. 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markers and adipocytokines (leptin, adiponectin, visfatin) which all could affect BMR have not been measured in our work. Assessment of endocrine status including thyroid hormones, sex hormones and insulin like growth factors would also be helpful in interpreting the altered metabolism seen in these patients. In addition correlation of parameters like anti-DNA titer and complement level with body composition would be interesting.

In conclusion, women with SLE have a significantly lower BMR; however, no significant differences have been observed in patients' BMI, BF, BM, VF compared with healthy individuals. Presumably, consuming immunomodulatory medications, inflammatory burden of the disease might contribute to the altered metabolism seen in these patients.

Conflict of interest

None.

Acknowledgements

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References