Applied nutritional investigation

Nutritional status and food intake in patients with systemic lupus erythematosus

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Abstract

Objective: Systemic inflammation, therapy with corticosteroids, and reduced physical activity may increase the predisposition to accumulate body fat in patients with systemic lupus erythematosus (SLE). The aim of this study was to assess the nutritional status and food intake of patients with SLE.

Methods: One hundred seventy women with SLE were evaluated consecutively in a cross-sectional study. Nutritional status was assessed by subjective global assessment and body mass index. Food intake was assessed by a 24-h recall and a semiquantitative food frequency questionnaire. Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS), considering P < 0.05 as significant.

Results: The mean ± SD age of the patients was 39.14 ± 9.98 y, and the duration of the disease was 9.94 ± 6.18 y. Approximately 91.8% patients were classified as being well nourished; 6.5% were classified as suspected or moderately malnourished, and 1.8% were classified as severely malnourished. In terms of body mass index, malnutrition was found in 1.2% of the patients, normal weight in 35.9%, overweight in 35.3%, and obesity in 27.7%. Most patients reported food consumption below the estimated needs for energy. Calcium was the nutrient with the most inadequate intake. Low consumption of fruits, vegetables, and dairy products and a high consumption of oils and fats were reported.

Conclusion: The results showed that patients with SLE have inadequate nutritional status and food intake.

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Introduction

Systemic lupus erythematosus (SLE) is a chronic systemic disease of unknown etiology, which is characterized by immunologically mediated injury in multiple body systems. The disease affects women during their reproductive years and its pathogenesis is a combination of genetic, environmental, and hormonal factors that lead to loss of balance control of cellular immunoregulation [1].

The objectives of treatment of SLE are to control the signs and symptoms, disease remission, and the prevention of damage caused by drugs and disease activity as well as relief of symptoms, suppression of certain symptomatic changes, and long-term prevention. Among the drugs commonly used to treat SLE are non-steroidal antiinflammatory agents, steroids, and antimalarial drugs, in addition to the intravenous administration of cytotoxic drugs [1,2].

Systemic inflammation therapy with corticosteroids and reduced physical activity may increase the predisposition to body fat accumulation and development of coronary heart disease in patients with SLE [3–6]. Moreover, these patients are at a high risk of developing low bone mineral density, anemia, high plasma levels of homocysteine, and other risk factors for cardiovascular disease [7].
Obesity also leads to inflammation, and there is little information about its effect on the symptoms, functional capacity, and markers of inflammation in patients with chronic inflammatory diseases, such as SLE. The accumulation of body fat leads to increased levels of proinflammatory cytokines, which may lead to the exacerbation of the inflammation present in SLE and increase the risk of developing diabetes mellitus, hypertension, and coronary heart disease [8]. On the other hand, these patients may be malnourished due to the continuous use of immunosuppressive drugs, which increases susceptibility to infections and gastrointestinal symptoms, providing for a greater risk of disorders of appetite and dietary changes [1].

These aspects suggest that the nutritional status and food intake of patients with SLE may interfere in the disease course [9]. Thus, assessing the nutritional status of these patients is of the utmost importance because reducing levels of body fat may lead to the reduction of inflammation and associated comorbidities as well as because treating the malnourishment may have an impact on their overall outcome.

The aim of this study was to assess the nutritional status and food intake of patients with SLE.

Patients and methods

Patients

A cross-sectional study encompassing 170 women with SLE was conducted. Patients were selected from the Rheumatology Outpatient Clinic at Minas Gerais Federal University Medical School Hospital. The following inclusion criteria were used: female gender, age between 18 and 60 y, SLE according to the American College of Rheumatology revised classification [10,11], and having been diagnosed with the disease for over a year. Pregnant patients were excluded. The study was approved by the University’s ethical committee and written informed consent was obtained from all patients.

Methods

Nutritional status was assessed by subjective global assessment (SGA) and body mass index (BMI). Subjective global assessment consists of questions about recent body-weight changes, gastrointestinal symptoms, food-intake habits and changes, alterations in functional capacity, and metabolic demands [12]. The patients were diagnosed as being well nourished, suspected or moderately malnourished, or severely malnourished [12]. According to BMI, patients were diagnosed as being well nourished, suspected or moderately malnourished, or severely malnourished [12]. According to BMI, patients were classified as malnourished (BMI < 18.5 kg/m^2), normal weight (BMI = 18.6-24.9 kg/m^2), overweight (BMI = 25-29.9 kg/m^2), and obese (BMI ≥ 30 kg/m^2), based on the criteria of the World Health Organization [13]. Energy requirements were calculated according to the estimated energy requirement (EER) [14]:

\[
\text{EER} = 387 - 7.31 \times \text{age (y)} + \text{Physical activity} \times (10.9 \times \text{weight (kg)} + 660.7 \times \text{height (m)})
\]

where

- physical activity = 1.00—patient was classified as being inactive
- physical activity = 1.27—patient was classified as being active

Food intake was assessed by a 24-h recall and a semiquantitative food frequency questionnaire. Patients reported food and beverages that were eaten on the day before the medical appointment and their respective quantities to quantify the 24-h recall [15]. The semiquantitative food frequency questionnaire included nutrients divided into groups such as the following [15]:

- grains
- vegetables
- fruits
- meat
- milk and dairy products
- beans
- oils
- sugars

Patients reported the frequency of each food intake (daily, three or four times a week, once or twice a week, biweekly, monthly, rarely, and never) and the amount consumed in household measures, which was subsequently converted to daily serving. The portions of food eaten from each group were calculated and compared with the recommendation according to the adapted food guide pyramid [16].

The nutrients assessed were as follows: energy, protein, fat, carbohydrate, fiber, calcium, iron, and vitamin B12. These micronutrients were assessed because SLE patients present a high risk for the development of anemia and low bone mineral density. The software DietPro 5i version (Viçosa, Minas Gerais, Brasil) was used to quantify the intakes.

The relative distribution of macronutrients was assessed using the acceptable macronutrients distribution range: carbohydrate, 45% to 65%; protein, 10% to 35%; fat, 20% to 35% [14].

Calcium intake was assessed according to the adequate intake (AI) [17]. Iron and vitamin B12 according to the estimated average requirement (EAR) [18,19]. Fiber intake was calculated by g/1000 kcal and analyzed according to AI [14].

The Statistical Package for the Social Sciences (version 16.0; SPSS, Chicago, IL) software was used. Normal distribution of the study variables was tested using the Kolmogorov-Smirnov test. Categorical variables were presented as frequencies and percentages as well as continuous variables as the mean ± SD when the distribution was normal and as median ± interquartile range (IR) when the distribution was not normal.

Results

One hundred seventy women with SLE were assessed. Their mean ± SD age was 39.14 ± 9.98 y, and the duration of the disease was 9.94 ± 6.18 y. The nutritional status classification according to SGA is presented in Figure 1.

The mean ± SD BMI of the patients was 27.24 ± 5.42 kg/m^2. Sixty-two percent of the patients presented with excess weight.

The distribution of nutritional status according to BMI is shown in Figure 2 (the two patients considered malnourished according to this parameter were excluded from the study).

Only 1.80% (3) of patients reported having one or two meals a day; 75.9% (126) reported three or four meals a day, and 22.3% (37) reported five or six meals a day.

The median ± IR of the EER was 2086.43 kcal (1941.84-2288.00 kcal). A significant difference was found between the EER of patients with normal weight and those with excess weight (Table 1).

Table 2 presents the mean ± SD and the median ± IR of the nutrients assessed by the 24-h recall.

Patients reported eating only 72.8% of estimated energy needs; 73.5% of them had an intake of less than 90% of the requirements and only 9.6% reported eating more than 110%.

The majority (67.2%) of the normal-weight patients reported intakes less than 90.0% of needs and 9.8% more than 110%. In the excess-weight group, 74.7% of the patients reported intakes below 90% of needs, and 9.3% reported intakes of more than 110% (Table 3).

![Fig. 1. Distribution of the nutritional status of SLE patients, according to SGA.](image-url)
Calcium intakes of <1000 mg/d were reported by 92.9% of the patients in the group aged 19 to 50 y old, and calcium intakes of <1200 mg/d were observed in all patients aged between 50 and 59 y. Inadequate iron intake was present in 36.7% of patients between 19 and 50 y old and 12.5% of patients aged between 50 and 59 y. The intake of vitamin B12 was adequate in 52.3% of patients.

Both the normal-weight and the excess-weight group patients had intakes of calcium and fiber much lower than recommended and adequate intakes of iron and vitamin B12 (Table 3). There was no association between anemia and low intake of iron.

Table 4 shows the number of servings from each food group according to the food frequency questionnaire (FFQ).

The intake of vegetables was less than four servings per day in 98.8% (165) of patients, and intake of fruits and milk/dairy products was less than three servings per day in 85.6% (143) and 88.0% (146) of patients, respectively. Decreased intakes of grains, beans, and meat were observed in 32.3% (54), 21.6% (36), and 16.2% (27) of the patients, respectively. Considering oil intakes, 78.8% (126) of patients presented with higher intakes than recommended (Table 5).

The majority (82.8%) of normal-weight patients presented with consumptions of milk/dairy products below the recommendations and 100.0% and 86.4% reported intakes of vegetables and fruits, respectively, below the daily recommendation. In addition, in this group, 28.8% and 16.9% of patients had intakes of grains and meat lower than recommended, respectively. Sixty-nine percent of patients in this group showed consumption of oils and fats above the recommendation. Similarly, 90.7%, 98.1%, and 85.2% of excess-weight patients presented with intakes of milk/dairy products, vegetables, and fruit of less than three servings per day, respectively. In this group, the intakes of grains, beans, and meat were inadequate in 34.3%, 24.1%, and 15.7% of patients, respectively. The consumption of oils and fats above the recommendation was found in 83.8% of patients.

**Table 1**

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Normal weight</th>
<th>Excess weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>EER (kcal)</td>
<td>2001.4</td>
<td>2133.4</td>
</tr>
<tr>
<td>Median</td>
<td>1851.5-2157.9</td>
<td>1995.4-2315.8</td>
</tr>
</tbody>
</table>

EER, estimated energy requirement; IR, interquartile range

Mann-Whitney test

* P < 0.001.
the current study is probably due to the fact that patients who are ambulatory mostly have the disease controlled. On the other hand, patients with active disease tend to have rapid and severe weight loss, leading to undernutrition. This was seen in the Brazilian National Survey (IBRANUTRI) study, which reported 70.1% of undernutrition among patients with autoimmune diseases [23]. On the other hand, excess weight (BMI > 25 kg/m²) was found in 63.0% of patients. The high frequency of overweight individuals with SLE has been reported in other studies [8,24].

The identification of excess weight as a risk factor for the perpetuation of inflammation in patients with SLE and the consequent decline in quality of life is extremely important because this can potentially be modified [8]. Weight loss through dietary intervention and physical activity results in decreased circulating levels of inflammatory cytokines, which could promote improvement in the symptoms of SLE patients [25,26].

The relationship between nutrition and SLE is not well established, especially because SLE is a disease of multifactorial origin with genetic, environmental, and hormonal factors. However, the quality of the diet is extremely important in patients with SLE because they have a higher risk of developing cardiovascular diseases, low bone mineral density, and anemia [7]. Brown related the influence of nutrition in SLE and reported that some nutrients, such as vitamin E, vitamin A, selenium, ω-3 fatty acids, calcium, and vitamin D, may have beneficial impacts on the symptoms of SLE. In contrast, excess calories, proteins, fats, zinc, and iron can aggravate the symptoms [27].

The majority of the patients presented with inadequate intakes of calcium, iron, vitamin B12, and fiber. Shah et al. and Caetano et al. also found insufficient intakes of these nutrients in SLE patients with or without dietary intervention [7,28]. Furthermore, the data in the current study are similar to those presented in a series encompassing healthy individuals [29,30]. Inadequate calcium intake was observed in the majority of patients in the current study, according to the 24-h recall. The FFQ also confirmed the low consumption of dairy products. In NHANES III, calcium intake below the recommendation was also observed in the general population [29]. Adequate intake of calcium is especially important in patients with SLE because many of them have low bone mineral density associated with prolonged use of corticosteroids [31]. Therefore, supplementation of this mineral should be commonly recommended for these patients.

Inadequate intakes of iron were observed in this study and are observed frequently in the general population [29]. Similar to our study, Shah et al. also found low iron intakes in patients with SLE, although they found no association between anemia and low intakes of iron [7]. SLE is associated with an increased prevalence of anemia but this is due to multifactorial issues, including iron deficiency, hemolytic anemia, and other causes [32]. Therefore, the consumption of food sources rich in iron, such as meat, beans, and green vegetables, should be encouraged in this population.

The consumption of vitamin B12 was lower than recommended in 46.8% of the patients. Low intakes of vitamin B12 are generally associated with low intakes of foods of animal origin, the only dietary sources of this vitamin [33]. As meats are also major sources of iron, patients with low consumption of this food group may also have a deficiency of this mineral and vitamin B12. However, no association was found between inadequate intakes of vitamin B12 and anemia. Low serum vitamin B12 is associated with increased plasma homocysteine [34], which, in turn, increases the risk of cardiovascular disease [35]. Although no determination was made of plasma concentrations of vitamin B12, the low intake reported in this study may reflect low levels of this vitamin. The data on the intake of meat and beans in the FFQ confirm the low intake of these foods, which may reflect the intake of iron and vitamin B12.

Fiber intakes were below the recommended daily intake, as confirmed by the low consumption of fruits and vegetables observed in the FFQ. Shah et al. also observed a low fiber intake in patients with SLE [7]. Similarly, inadequate intakes of fiber were found in the general population [29,36].

### Table 4

Daily intake of food servings per food group of SLE patients according to the food frequency questionnaire

<table>
<thead>
<tr>
<th>Food Group</th>
<th>FFQ (servings/d)</th>
<th>Recommendations¹</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Grains</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>5.8</td>
<td>5 to 9 servings/d</td>
</tr>
<tr>
<td>Median</td>
<td>5.8</td>
<td></td>
</tr>
<tr>
<td>IR</td>
<td>4.5-6.8</td>
<td></td>
</tr>
<tr>
<td><strong>Vegetables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>1.4</td>
<td>4 to 5 servings/d</td>
</tr>
<tr>
<td>Median</td>
<td>1.2</td>
<td></td>
</tr>
<tr>
<td>IR</td>
<td>0.6-2.0</td>
<td></td>
</tr>
<tr>
<td><strong>Fruits</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>1.4</td>
<td>3 to 5 servings/d</td>
</tr>
<tr>
<td>Median</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>IR</td>
<td>0.5-2.0</td>
<td></td>
</tr>
<tr>
<td><strong>Meat</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>1.5</td>
<td>1 to 2 servings/d</td>
</tr>
<tr>
<td>Median</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>IR</td>
<td>1.0-2.0</td>
<td></td>
</tr>
<tr>
<td><strong>Milk and dairy products</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>1.3</td>
<td>3 servings/d</td>
</tr>
<tr>
<td>Median</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>IR</td>
<td>0.4-1.9</td>
<td></td>
</tr>
<tr>
<td><strong>Beans</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>1.3</td>
<td>1 servings/d</td>
</tr>
<tr>
<td>Median</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>IR</td>
<td>1.0-2.0</td>
<td></td>
</tr>
<tr>
<td><strong>Oils</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>3.8</td>
<td>1 to 2 servings/d</td>
</tr>
<tr>
<td>Median</td>
<td>3.4</td>
<td></td>
</tr>
<tr>
<td>IR</td>
<td>2.4-4.6</td>
<td></td>
</tr>
<tr>
<td><strong>Sugars²</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>3.4</td>
<td>1 to 2 servings/d</td>
</tr>
<tr>
<td>Median</td>
<td>2.0</td>
<td></td>
</tr>
<tr>
<td>IR</td>
<td>0.8-5.0</td>
<td></td>
</tr>
</tbody>
</table>

IR, interquartile range

² Servings calculated per week.

### Table 5

Daily intake of servings, according to the food frequency questionnaire

<table>
<thead>
<tr>
<th>Food Group</th>
<th>Normal weight</th>
<th>Excess weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grains²</td>
<td>Mean 5.9</td>
<td>Mean 5.8</td>
</tr>
<tr>
<td>Median 5.8</td>
<td>Median 5.5</td>
<td></td>
</tr>
<tr>
<td>IR 4.7-6.9</td>
<td>IR 4.4-6.8</td>
<td></td>
</tr>
<tr>
<td>Vegetables²</td>
<td>Mean 1.2</td>
<td>Mean 1.5</td>
</tr>
<tr>
<td>Median 1.2</td>
<td>Median 1.3</td>
<td></td>
</tr>
<tr>
<td>IR 0.5-1.7</td>
<td>IR 0.7-2.0</td>
<td></td>
</tr>
<tr>
<td>Fruits²</td>
<td>Mean 1.4</td>
<td>Mean 1.4</td>
</tr>
<tr>
<td>Median 1.2</td>
<td>Median 1.0</td>
<td></td>
</tr>
<tr>
<td>IR 0.5-2.0</td>
<td>IR 0.5-2.0</td>
<td></td>
</tr>
<tr>
<td>Meat group²</td>
<td>Mean 1.5</td>
<td>Mean 1.5</td>
</tr>
<tr>
<td>Median 1.5</td>
<td>Median 1.5</td>
<td></td>
</tr>
<tr>
<td>IR 1.0-2.0</td>
<td>IR 1.1-2.0</td>
<td></td>
</tr>
<tr>
<td>Milk/dairy products²</td>
<td>Mean 1.3</td>
<td>Mean 1.2</td>
</tr>
<tr>
<td>Median 0.9</td>
<td>Median 1.0</td>
<td></td>
</tr>
<tr>
<td>IR 0.4-2.1</td>
<td>IR 0.4-1.7</td>
<td></td>
</tr>
<tr>
<td>Beans²</td>
<td>Mean 1.2</td>
<td>Mean 1.3</td>
</tr>
<tr>
<td>Median 1.0</td>
<td>Median 1.0</td>
<td></td>
</tr>
<tr>
<td>IR 1.0-2.0</td>
<td>IR 1.0-2.0</td>
<td></td>
</tr>
<tr>
<td>Oils²</td>
<td>Mean 3.6</td>
<td>Mean 3.4</td>
</tr>
<tr>
<td>Median 3.2</td>
<td>Median 3.7</td>
<td></td>
</tr>
<tr>
<td>IR 2.1-4.1</td>
<td>IR 2.7-4.9</td>
<td></td>
</tr>
<tr>
<td>Sugars²</td>
<td>Mean 4.5</td>
<td>Mean 2.8</td>
</tr>
<tr>
<td>Median 3.0</td>
<td>Median 1.5</td>
<td></td>
</tr>
<tr>
<td>IR 1.5-6.5</td>
<td>IR 0.5-3.8</td>
<td></td>
</tr>
</tbody>
</table>

IR, interquartile range

¹ Student’s t test; 2, Mann-Whitney test

¹ Servings calculated per week.
A high consumption of fats and oils was seen. This can be very detrimental in patients with SLE because they are more prone to the development of dyslipidemia and cardiovascular disease [37,38].

The low frequency of sugar and sweet intake reported by patients points to the potential lack of data reliability because the frequency of overweight as well as high serum concentrations of glucose and diabetes were higher in this population group than are found in the general population [39,40].

Two different methods of assessing diet intake were used in this study, as there is no gold standard instrument. Our results showed no correlation between the two methods used, as well as its relationship with the patients’ nutritional status. The average energy intake obtained by the 24-h recall was below the estimated energy need. However, excess weight was found in 62.0% of this sample. This result may be explained by errors inherent to the individual and the methods per se [41]. The 24-h recall is subject to errors of memory and one single day of recall does not represent the routine intake of the individual [15,42]. On the other hand, the validity of the FFQ may have been compromised by an incomplete list of foods and/or errors in information of hand, the validity of the FFQ may have been compromised by this sample. This result may be explained by errors inherent to the energy intake obtained by the 24-h recall was below the estimated energy need. Furthermore, there was an incomplete list of foods and/or errors in information of hand, the validity of the FFQ may have been compromised by this sample. This result may be explained by errors inherent to the energy intake obtained by the 24-h recall was below the estimated energy need. Furthermore, there was no difference between the intake of any nutrient in the normal-weight patients compared with those with excess weight, which confirms the potential unreliability of the data. Nevertheless, our results were similar to the sparse data encompassing SLE patients [7].

In summary, this study has shown similarities between the dietary intake of patients with SLE and the eating habits of the Brazilian population reported by Levy-Costa et al., who found high intakes of sugars, sweets, oils, and fats, and a low consumption of fruits and vegetables [30]. Similarly, Caetano et al. assessed the dietary intake of patients with SLE and arthritis and identified excessive intakes of lipids and proteins and low intakes of micronutrients [28].

Conclusion

Patients with SLE have inadequate nutritional status and food intake. Thus, interventions aimed at promoting adequate nutritional status may contribute to reduction of comorbidities and improved quality of life in these patients. It would also be important to know the influence of overweight and dietary interventions on the inflammation already present in SLE.

Acknowledgments

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International Congress Hidden Hunger From Assessment to Solutions

March 6-9, 2013
University of Hohenheim
Stuttgart, Germany

OBJECTIVES
1) to create awareness of the global problem of Hidden Hunger,
2) to get scientific issues on the agenda of policymakers, academicians, politicians and industry, and
3) to discuss solutions to address worldwide micronutrient deficiencies.

Participants will include scientists, field workers, and representatives of NGOs, administration, management and policy. Attention will be given to Africa and Asia as well as North America and Europe. Hidden Hunger is an increasing problem even in developed countries. Its potential negative consequences on long-term health are often overlooked and underestimated.

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