

# Nutritional status and food intake of patients with systemic psoriasis and psoriatic arthritis associated

Estado nutricional e consumo alimentar de pacientes com psoríase dos tipos sistêmica e artropática sistêmica associada

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## ABSTRACT

**Objective:** To identify the nutritional status and food intake of individuals with systemic psoriasis and psoriatic arthritis associated.

**Methods:** This is an exploratory and cross-sectional study with 34 men aged between 19 and 60 years seen at a Psoriasis Center. Participants were divided into systemic psoriasis group and arthritic-systemic psoriasis associated group. For nutritional assessment we used anthropometry, bioelectrical impedance analysis and whole-body plethysmography. Clinical and nutritional information were assessed using the clinical and nutritional history-taking, and the 24-hour dietary recall. For statistics the general linear model test ( $p < 0.05$ ) was used. **Results:** According to the body mass index 29.4% patients ( $n = 10$ ) were eutrophic, 41.2% ( $n = 14$ ) overweight and 29% ( $n = 10$ ) obese. Almost all individuals (60%;  $n = 21$ ) had body fat percentage above normal levels ( $> 25\%$ ) and a high risk for metabolic complications according to the waist circumference and the obesity index, however, there were no statistically significant differences between groups. The mean food intake, total fat, calories and protein were above recommended levels, being 58.8% for lipids ( $319.17 \pm 241.02$  mg of cholesterol and  $17.42 \pm 11.4$  g saturated fatty acids); 29.4% for calories and 67.6% for proteins. Thus, regardless of the psoriasis type, an excessive consumption of calories, lipids, fatty acids, cholesterol and a higher incidence of overweight were found.

**Conclusion:** The sample showed an abnormal nutritional condition,

an increased risk for chronic diseases related to obesity, worsening of the psoriatic lesions, and poor quality of life.

**Keywords:** Psoriasis/complications; Obesity/complications; Feeding; Food consumption; Nutritional status; Risk factors

## RESUMO

**Objetivo:** Identificar o estado nutricional e o consumo alimentar de indivíduos com psoríase sistêmica e artropática associada.

**Métodos:** Pesquisa exploratória e transversal, na qual avaliaram-se 34 homens, de 19 a 60 anos, atendidos em um Centro de Psoríase, separando-os em Grupo PS (com psoríase sistêmica) e Grupo PAS (com sistêmica mais artropática). A avaliação nutricional deu-se pelo emprego da antropometria; bioimpedância e plestimografia de corpo inteiro. Aspectos clínicos e nutricionais foram investigados pela anamnese clínica, nutricional e recordatório de 24 horas. Empregou-se o teste *General Linear Model* ( $p < 0,05$ ) para avaliação estatística. **Resultados:** Segundo Índice de Massa Corporal, 29,4% ( $n = 10$ ) apresentaram-se eutróficos; 41,2% ( $n = 14$ ) com sobrepeso e 29% ( $n = 10$ ) com obesidade. A maioria dos avaliados (60%;  $n = 21$ ) apresentou valor da porcentagem de gordura (avaliada pela antropometria, bioimpedância e plestimografia de corpo inteiro) acima da normalidade ( $> 25\%$ ) e com risco alto para complicações

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metabólicas segundo CC e índice de obesidade, sem diferença estatística significativa entre os grupos. O consumo alimentar médio de lipídio, calorias e proteína apresentou-se acima do recomendado, sendo 58,8% para os lípidos ( $319,17 \pm 241,02$  mg de colesterol e  $17,42 \pm 11,4$  g de ácidos graxos saturados); 29,4% para as calorias e 67,6% para as proteínas. Assim, independentemente do tipo de psoríase, encontrou-se consumo excessivo de calorias, lípidos, colesterol e ácidos graxos, além de maior ocorrência de excesso de peso. **Conclusão:** A amostra apresentou estado nutricional comprometido, aumento do risco para doenças crônicas relacionadas à obesidade, agravamento das lesões e má qualidade de vida.

**Descritores:** Psoríase/complicações; Obesidade/complicações; Alimentação; Consumo alimentar; Estado nutricional; Fatores de risco

## INTRODUCTION

Psoriasis is a demartosis that affects about 2 to 3% of the world population and occurs in both sexes. Although it can happen at any age, studies indicate a high prevalence between 20 and 30 years, and also between 50 and 60 years of age. The incidence of psoriasis is higher in countries such as Finland, Iceland, Norway and Germany, and less common in dark-skinned persons of East Africa, Indians and Eskimo people. In the United States it is estimated that 8 million of persons have psoriasis, in Brazil approximately 2% of population has this disease<sup>(1)</sup>.

This disorder can affect the whole skin surface, but it is most common on the extensor surface of the limbs, scalp, nails, sacral and palmo-plantar regions. Psoriasis is classified according to the site of the lesion. When it appears as a chronic disease in plaque forms it is known as psoriasis vulgaris, if presented as drops on the skin it is called psoriasis guttata, which is usually found in young people. In addition, there is the inverse psoriasis found in the folds of the skin; the palmo-plantar psoriasis found in palms and sole of feet; and there is also the erythrodermic psoriasis that affects most of the body<sup>(2,3)</sup>.

Psoriasis can also be considered an autoimmune disease mediated by defense cells known as T lymphocytes (CD4 and CD8) that provoke a high proliferation of proinflammatory cytokines, such as interferon- $\gamma$ , interleukins (IL) 1 and 6 and tumor necrosis factor-alpha (TNF- $\alpha$ ), which increase skin lesions and causing also a chronic inflammatory status<sup>(4)</sup>.

In 1818 a study by Alibert verified that psoriasis patients with skin lesions could also develop joint problems, which he named as psoriatic arthritis (PsA)<sup>(5)</sup>. An epidemiologic study done in 2002 by Zachariae et al.<sup>(6)</sup> with 5,000 patients from Denmark, Finland, Norway and Sweden who had different types of

psoriasis, observed that 30% of them also presented joint problems. The PsA is characterized by T and B cell infiltration leading to increased concentrations of IL-1, IL-6, IL-12, IL-15, IL-17, IL-18, interferon- $\gamma$  and TNF- $\alpha$  in tissues that line the inner part of the joints and are known as synovial tissue.

Because of the chronic inflammation provoked by the skin and joint disease, it is believed that individuals with psoriasis are subjected to systemic changes in the organism, such as insulin resistance, changes in the lipid profile, obesity and increased cardiovascular risk<sup>(7)</sup>. Many studies point out a wide relationship between psoriasis and the development of associated chronic disease as dyslipidemia, hypertension, non-alcoholic fatty liver disease and type 2 diabetes mellitus, besides that, a high risk for heart diseases and metabolic syndromes. The prevalence of metabolic syndrome in people with PsA or other psoriasis type was high when compared with those without psoriasis as suggested by Raychaudhuri et al.<sup>(8)</sup> and Cohen et al.<sup>(9)</sup>.

The literature reports that nutritional treatment applied to psoriasis patients (associated to the control of anthropometric and biochemical variables) gives more clinical stability, preventing related non-transmissible chronic diseases (NTCD), and provides long-term quality of life. In other words, the weight control improves the prognosis of psoriasis<sup>(2)</sup>. On the other side, other studies indicate that dietary pattern established associated to life style may contribute to the development of psoriasis. Therefore, nutrition can influence psoriasis in two different ways, as the cause of the metabolic disorder or as the treatment and prevention.

However, despite the fact that nutrition is considered a tool for the treatment of psoriasis there are no national or international guidelines that recommend an adequate diet for such patients. Some authors suggest that several active compounds in the human diet perform an important role in the physiopathology of psoriasis, having the same impact as the monitorization of the diet energy supply and the total fat and saturated fat intake on the control of NTCDs.

Among these nutrients some vitamins and minerals (vitamins A, E, C and D and folic acid), omega 3 polyunsaturated fatty acids besides low-energy diets<sup>(10)</sup> are mentioned. It is believed that some vitamins (A, E and C), carotenoids and minerals (iron, copper, manganese, zinc and selenium) have antioxidants ability, which decrease oxidative stress and the production of reactive oxygen species, mainly in systemic inflammation like psoriasis<sup>(10)</sup>.

In addition, food fibers also play an important role in systemic inflammation, decreasing oxidative stress produced by large amounts of sugar, also improving glycemic, insulin and lipidemic control.

## OBJECTIVE

To define, identify and associate the nutritional status and food intake of patients with systemic psoriasis and associated psoriatic arthritis seen at a Psoriasis Center.

## METHODS

### Design and Setting

This is cross-sectional, quantitative, analytical study of exploratory approach performed during 1 year and 5 months that started on December 2009. Data collection was done at the Brazilian Psoriasis Study Center in São Paulo city.

### Population, sample, inclusion and exclusion criteria

The center where the research was carried out receives about 30 to 60 new cases of psoriasis each month of both sexes aged between 20 and 65 years.

The sample included men with systemic psoriasis associated with psoriatic arthritis and who fit the following inclusion criteria: aged between 19 and 60 years, male gender (to evaluate the natural cycle of psoriasis without the changes of the aging process, of gestation hormones or of menstrual cycle), be diagnosed with psoriasis for at least three years because at this time the clinical features will be well defined, using laser therapies, topical medication, oral medicines like methotrexate, cyclosporine and biological medicines, being diagnosed with systemic psoriasis associated with psoriatic arthritis.

We excluded women, those patients aged less than 19 years and more than 60 years, who had mild psoriasis forms, and did not fit psoriasis classification as defined in the study.

### Ethical issues

The study was approved by the Research Ethics Committee of the Centro Universitário São Camilo, registered under the number 193/09, which addresses the resolution 196 of October 10, 1996 stated by the Brazilian National Health Council that supervises researches using human beings.

All participants were informed of the study purpose, as well as the procedures to be done, the lack

of health risk, assurance of anonymity and privacy of personal information; the possibility of leaving the study whenever they decided to do so without any kind of uneasiness or punishment; they were informed that their participation did not imply in expenses or payment; if leaving the study at any time as desired would have no influence in the treatment or loss of any of the acquired benefits. All individuals who decided to join the study signed the Informed Consent Form (ICF), which included a statement authorizing the authors to report results in congresses or scientific journals if applicable.

### Procedures

The psoriasis area severity index (PASI) was used by the responsible physician to classify and describe the disease. The total score of the PASI was measured based on the evaluation of four body surface areas (head, chest, upper and lower limbs) using the method described by Harari et al<sup>(11)</sup>. The selected sample had only individuals who presented PASI  $\geq$  18, which is classified as a high severity. After selecting the patients, all participants were interviewed to gather clinical and nutritional history containing the following issues:

- cultural and socioeconomic background, such as name, age, city of birth, place of birth, address, occupation, marital status, use of medicines and practice of physical activity;
- family background: parents, grandparents and uncles health status;
- clinical background: (prior and current disease): prior health problems, allergies, medicine currently used, test results, clinical or surgical treatment performed;
- nutritional background (food or dietary): weight gain or loss, anthropometric measures as weight, height, circumference and skinfolds;
- 24-hour dietary recall: it enabled to define and measure food and drink intake in the 24 hours before the interview. To do so, we provided booklets with examples of utensils and portions to help volunteers.

We also evaluated the lack or the use of medicines regarding dosage and administration hours before the appointment at the center.

To evaluate body composition three different methods of nutritional assessment were applied, and made available in distinct moments to the subjects, mainly those that did not show an uncontrolled risk or danger to the participants.

- Anthropometry: the volunteers' weight was checked using a digital balance (Plenna<sup>®</sup>) with 150 kg weighting capacity and division of 100 g placed on the floor level. For height (m) we used a metric stadiometer (Sanny<sup>®</sup>) of 150 cm placed on the wall. These measures used to calculate the body mass index (BMI) given by  $\text{weigh}/\text{height}^2$ , and the result was classified according to the World Health Organization (WHO)<sup>(12)</sup>. Using the techniques described in the literature we measured the patients' right hemi body, the arm circumference, waist and hip circumference with an inelastic tape from Sanny<sup>®</sup>(13). After gathering these measures the relations hip waist/hip circumference was calculated and the results classified as stated by WHO<sup>(14)</sup>. To evaluate the regional body fat or topographic evaluation the method proposed by Lohmann et al. was used<sup>(15)</sup>. Finally, the skinfold measures were taken by a fat caliper from Lange<sup>®</sup> of 1.0 mm of precision and maximum amplitude of 65 mm. The body areas measured followed the standards proposed in the literature, and were taken by a skilled evaluator. Each fold was measured in three different times and the final results determined by the mean values. We assessed skinfolds at biceps, triceps, subscapular and suprailiac. From the obtained results we calculated the fat percentage based on the equation of Durnin et al.<sup>(16)</sup>.

The conicity index (C index) was calculated to determine obesity, body fat distribution and risk to diseases associated to excessive weight by the equation of Valdez et al.<sup>(17)</sup>:

$$C \text{ index} = \frac{\text{waist circumference (m)}}{0109 \times \sqrt{\text{body weight (kg)} \div \text{height (m)}}$$

The index of central obesity (ICO), a new parameter for obesity, was also calculated. Some studies have considered the waist circumference is not sufficient to measure the total body fat, mainly because height differs in each race and sex. Therefore, the ICO is considered the best parameter to determine central obesity, which is calculated by dividing the waist circumference (m) by the height (cm).

This study cutoff point took the weight mean as used in many countries and the waist circumference as suggested by the International Diabetes Federation (IDF) for metabolic syndrome<sup>(18)</sup>, being 1.18 for women and 1.25 for men.

- Bioelectrical impedance (BIA): this methods enabled to obtain body water composition and fat mass of the participants. To do so a Biodynamics 310

model<sup>®</sup> was used. In the analysis the participants were positioned on the stretcher in dorsal decubitus without watches or any metallic objects. Before placing skin-electrodes, we cleaned points of contact with alcohol 70%. Patients rested for 3 minutes before the measurement was performed. The equipment report provided: (1) fat mass (fat percentage and body fat (Kg)); (2) thin mass (muscles, bones and viscera); (3) whole body water (liters and water percentage in thin mass);

- Whole body plethysmography (Air Displacement Plethysmography, BOD POD<sup>®</sup>, body composition system; Life Measurement Instruments, Concord, CA). The evaluation was done using the criteria described in the manual of Fields et al.<sup>(19)</sup>. After the equipment calibration, participants were evaluated in a seated position, wearing minimal clothes, a swimming cap, and without any metallic objects like earrings, rings, necklace, etc. Variations between pressure and volume were measured to define body density of each subject using the equation of Siri<sup>(20)</sup>. When the data obtained were insufficient, the software itself performed a new evaluation until it got the adequate screening.

### Statistical analysis

Statistical analysis was performed using the General Linear Model test (GLM) for multivariate and unbalanced analysis comparing PS group (systemic psoriasis) with SPA group (systemic psoriatic arthritis associated). A significance level of  $p < 0.05$  was used. In addition, Shapiro-Wilk test was adopted to verify the normal sample distribution.

### RESULTS

The sample had 34 patients divided into two groups. The PS group had 25 individuals (73.5%) and the SAP group had 9 (26.5%) patients. The participants mean age was  $40.94 \pm 11.19$  years. The PS group mean age was  $38.84 \pm 10.57$  years and in the SAP group it was  $46.78 \pm 10.77$  years. No statistical significance was observed between groups as related to age ( $p > 0.05$ ). In both groups, a total of 25 individuals (73.5%) were sedentary and 9 (26.5%) did some physical activity. Both groups had sedentary individuals, which comprised 76% of PS group and 66.7% of SAP group. Therefore, in our study sedentarism was a characteristic of the psoriasis patients, which constituted 73.5% of all patients of the sample.

A total of 12 patients (32.4%) used biological medicines (Stelara<sup>®</sup>, Humir<sup>®</sup>a, Enbrel<sup>®</sup>), being 8 (26.5%)



immunosuppressive agents (methotrexate). Fourteen patients (41.2%) did not use oral medicines.

Among the individuals from the PS group 7 participants (28%) used biological medicines, 8 (32%) immunosuppressive agents and 10 (40%) did not take medicines. In the SAP group 4 individuals (44.4%) used biological medicines, 1 (11.1%) immunosuppressive agents and 4 (44.4%) did not take medicines.

A total of 13 patients (38.2%) presented associated diseases like hypertension, diabetes mellitus, dyslipidemia, heart disease and cancer. From this total, 9 individuals (36%) were in PS group and 4 (44.4%) in SAP group (Table 1).

The mean length of time of psoriasis was  $15.41 \pm 7.93$  years. Those in PS and SAP group had mean length of disease time of  $14.96 \pm 7.24$  years and  $16.75 \pm 9.59$  years, respectively. There was no statistical significance on length of time of the disease between the groups ( $p > 0.05$ ).

We stratified the sample into two other categories considering the length of the disease for individuals with up to 20 years of psoriasis and those with more than 20 years with the disease. We observed among the participants that 24 had psoriasis for up to 20 and 10 had the disease for more than 20 years, and 5 of these (50%) had one or more associated disease (Figure 1). Hence, there were more comorbidities associated to psoriasis in the group affected longer by the disease.

The mean BMI was  $28.01 \pm 4.42$  kg/m<sup>2</sup>. In the PS group it was  $27.86 \pm 4.55$  kg/m<sup>2</sup> and in the PAS group it was  $28.42 \pm 3.99$  kg/m<sup>2</sup> without significant differences regarding BMI in both groups ( $p > 0.05$ ).

Based on the WHO20 classification, 10 patients (29.4%) showed eutrophy using the BMI as a parameter, 14 (41.2%) were overweight, 7 (20.6%) were obese class I, 2 (5.9%) obese class II, and 1 (2.9%) obese class III. These results showed that 24 patients (70.6% of the sample) had excessive weight. In the PS group 7 individuals (28%) had eutrophy, 12 (48) were overweight, 4 (16%) were obese class I, 1 (4%) obese class II, and 1 (4%) obese class III. The SAP group had 3 individuals (33.3%) with eutrophy, 2 (22.2%) were overweight, 3 were (33.3%) were obese class and 1 (11.1%) obese class II (Table 2).

Besides BMI we considered other central measures to verify the possible risks. For example, the waist circumference mean was  $95 \pm 13.45$  cm ( $94.6 \pm 14.45$  cm in PS group and  $95.9 \pm 10.27$  cm in SAP group).

As a result based on the metabolic syndrome council classification<sup>(18)</sup>, 23.5% of all participants presented extremely high risk to develop metabolic complications,

32.4% high risk and 41.2% no risk, no significant differences between groups was found ( $p > 0.05$ ).

The waist-hip ratio for all participants, PS group, SAP group was  $0.91 \pm 0.07$ ;  $0.90 \pm 0.08$  and  $0.92 \pm 0.06$ , respectively. Among all individuals evaluated, 24 (70.6%) did not present risk for cardiovascular disease and 10 (29.4%) had risk based on WHO classification<sup>(14)</sup>. The same risk proportion was found in the PS and SAP groups, however, in the SAP group, using the same parameters, no patient had risk for heart disease.

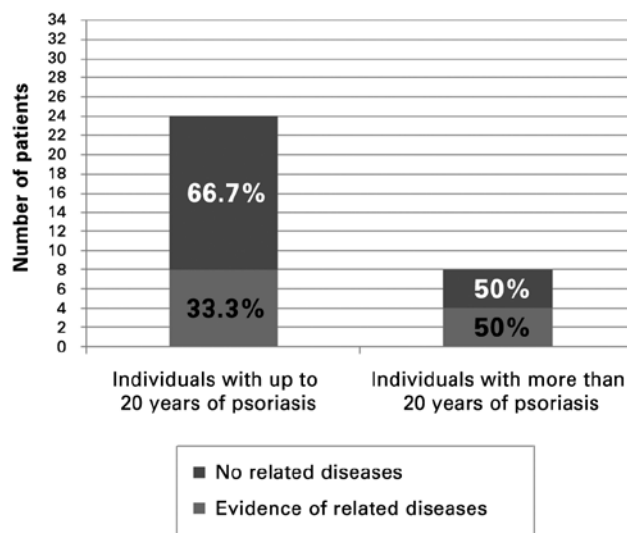
According to ICO the total mean of the sample was  $0.55 \pm 0.08$  ( $0.54 \pm 0.08$  in PS group and  $0.57 \pm 0.07$  in SAP group). Considering this mean based on the ICO value proposed by IDF, both groups had no risk to metabolic syndrome. We did not find statistical differences between the groups ( $p > 0.05$ ). For C index, the total mean for the sample was  $25 \pm 0.08$ , PS group and SAP group had  $1.24 \pm 0.09$  and  $1.28 \pm 0.07$ , respectively, without statistical differences ( $p > 0.05$ ).

We found by the anthropometric technique after summing the measurement values of the biceps, triceps, subscapular and suprailiac skinfolds that body fat was  $32.07 \pm 6.52\%$ , although more than 2/3 (n=25) of the

**Table 1.** Relationship between length of time of psoriasis and related diseases

Group	Length of time of psoriasis (years)	Evidence of related diseases (%)
PS group	$14.96 \pm 7.24$	36 yes 64 no
SAP group	$16.75 \pm 9.59$	44.4 yes 55.6 no
Total	$15.41 \pm 7.93$	38.2 yes 61.8 no

PS: systemic psoriasis; PAS: systemic arthropathy associated.



**Figure 1.** Patients' distribution by length of time of psoriasis and related

sample had fat percentage above the normal range with risk to acquire associated disease. The fat percentage in the PS group and SAP group was  $30.85 \pm 5.96\%$  and  $35.44 \pm 6.81\%$ , respectively.

A total of 17 patients (68%) from the PS group and 9 from the SAP group had fat percentage risk of associated diseases to obesity. We did not find statistical differences between groups regarding fat percentage ( $p > 0.05$ ).

The mean of body fat using the BIA technique was  $24.14 \pm 5.91\%$  ( $23.68 \pm 6.2\%$  in PS group and  $25.32 \pm 4.86\%$  in SAP group). Among the 34 patients, 67% were above normal range with associated risk for disease, in which 16 were from PS group and 7 from SAP group. In the comparison using this technique no statistical significant differences was found between groups ( $p > 0.05$ ).

**Table 2.** Classification of body composition, according to BMI related to psoriasis

Diagnosis for BMI	PS group		SAP group		Total	
	n	%	n	%	n	%
Eutrophy	7	28	3	33.3	10	29.4
Overweight	12	48	2	22.2	14	41.2
Class I obesity	4	16	3	33.3	7	20.6
Class II obesity	1	4	1	11.1	2	5.9
Class III obesity	1	4	0	0	1	2.9

BMI: body mass index; PS: systemic psoriasis; PAS: systemic arthropathy associated.

Finally, when fat percentage was measured using plethysmography (BOD POD®) the mean values were  $27.43 \pm 8.99\%$  in the sample ( $27.02 \pm 9.49\%$  in the PS group and  $28.49 \pm 7.48\%$  in the SAP group). In addition, 24 participants had fat percentage above normal ranges, being 17 in the PS group. In statistical analysis no significant differences were found ( $p > 0.05$ ) for this parameters between groups.

Generally, we verified that fat percentage was above normal ranges using the anthropometric methods in the PS (72%) and SAP (88%) groups. According to BIA and BOD POD®, the PS group had 64% and the SAP group 78%, without significant differences. In addition, we could observe that both groups had fat percentage above normal ranges, and it was present in more than 64% of the participants ( $n=21$ ) (Table 3).

Patients' food intake was distributed in calories and macronutrients. The mean caloric consumption was  $2,031.87 \pm 728.96$  Kcal ( $2,196.62 \pm 565.28$  Kcal in PS group and  $1,578.81 \pm 913.27$  Kcal in SAP group). In the SAP group 4 (44.4%) individuals had caloric consumption lower than recommended. We verified significant statistical differences between groups related to caloric consumption ( $p < 0.05$ ).

The sample presented consumption of  $43.3 \pm 12.24\%$  of carbohydrates;  $19.4 \pm 5.43\%$  of proteins and  $35.8 \pm 10.02\%$  of lipids. The mean consumption in the PS group was  $42.8 \pm 12.53\%$  of carbohydrates,  $20.1 \pm 5.78\%$  of proteins,  $35.4 \pm 9.6\%$  of lipids. The PAS group presented

**Table 3.** Comparison of body composition of psoriasis patients using different methods

Methods	Diagnosis (%)	PS group		SAP group		Total	
		n	%	n	%	n	%
Anthropometry	Morbid obesity (> 40)	2	8	3	33.3	5	14.7
	High obesity (35-40)	4	16	1	11.1	5	14.7
	Moderate obesity (30-35)	7	28	1	11.1	8	23.5
	Mild obesity (25-30)	5	20	3	33.3	8	23.5
	Above mean (16-24)	4	16	0	0	4	11.8
	Mean (15)	0	0	0	0	0	0
Bioelectrical impedance	Risk (> 30)	4	16	2	22.2	6	17.6
	Excessive adiposity (20-30)	12	48	5	55.6	17	50
	Moderate thin mass (12-20)	7	28	2	22.2	9	26.5
	Adequate (8-12)	0	0	0	0	0	0
	Too thin (5-8)	0	0	0	0	0	0
Whole body plethysmography	Risk (> 30)	10	40	4	44.4	14	41.2
	Excessive adiposity (20-30)	7	28	3	33.3	10	29.4
	Moderate thin mass (12-20)	4	16	2	22.2	6	17.6
	Adequate (8-12)	2	8	0	0	2	5.9
	Too thin (5-8)	0	0	0	0	0	0

PS: systemic psoriasis; PAS: systemic arthropathy associated.

consumption of  $44.8 \pm 11.28\%$  of carbohydrates;  $17.8 \pm 3.83\%$  of proteins; and  $36.8 \pm 11.02\%$  of lipids. There were no statistical differences regarding carbohydrates and lipids consumption between groups ( $p > 0.05$ ), but the PS group had a significantly higher consumption of proteins ( $p = 0.006$ ).

We found after the analysis the lipid intake quality that 40% of the sample ( $n=14$ ) had an inappropriate consumption of cholesterol ( $39.17 \pm 241.02$  mg), saturated fat ( $17.42 \pm 11.4$  g) mono ( $22.12 \pm 15.11$  g) and polysaturated ( $14.71 \pm 10.71$  g). Besides that, the analyzed subjects had low intake of fibers ( $13.47 \pm 8.91$  g), low consumption of fruits and vegetables, which helped to reduce in both groups the amounts of vitamins (A, B, C, D and B-complex), minerals (manganese and selenium) in almost 50% for all micronutrients.

## DISCUSSION

The number of patients with joint problems resembled the total observed in an epidemiological study done by Zachariae et al.<sup>(6)</sup> with individuals from Denmark, Finland, Norway and Sweden.

Obesity cases observed followed by hypertension and type 2 diabetes mellitus were almost the same as those described in the study by Cohen et al.<sup>(9)</sup>, which evaluated 340 Israeli patients with psoriasis vulgaris. Another study by Altobelli<sup>(21)</sup> also determined the occurrence of NTCD in more than 1,300 individuals with psoriasis from 21 dermatology departments in Italy. These studies stated that the risk for NTCD increases according to age, more specifically between 35 and 50 years, which seems to be due to exposition to chemical pollution and bad life habits as to food intake and by the lack of physical activity.

A cohort study done in 1996 by Naldi et al.<sup>(22)</sup>, evolving around 78,000 nurses from the Nurse's Health Study II between 1991 and 2005 assessed the relationship among BMI, waist and hip circumference and waist-hip ratio, and revealed that high BMI represent high relative risk (RR) to develop psoriasis. Therefore, patients with BMI between 23.0 e 24.9 kg/m<sup>2</sup> have a RR of 1.19, those with 25.0 to 29.9 kg/m<sup>2</sup> have a RR of 1.40, patients with 30.0 to 34.9 kg/m<sup>2</sup> have RR of 1.48, and those with  $\geq 35.0$  kg/m<sup>2</sup> a RR of 2.69. They also found a tendency in the relationship between the increase of waist and hip circumference and the appearance of psoriasis. Hence, these results corroborate the findings of the present study as regarding to enlarged waist circumference and elevated BMI, that almost all participants evaluated showed as well as having excessive weight, indicating any degree of overweight and obesity. Besides that, the

occurrence of obesity was two times higher than the expected for the general population.

The three methods of body composition used pointed to excessive adiposity, without significant statistical difference between groups, indicating the efficacy of these methods to evaluate fat percentage of psoriasis patients.

The excessive weight was the most common nutritional diagnosis in both studied groups, being obesity more frequent in SAP group. It could be explained by the fact that the individuals in the SAP group had a systemic inflammation and joint inflammation. However, such hypothesis could not be supported by the literature and more studies should be conducted to confirm this finding.

Evidences in the literature and the findings of this study confirm the positive relationship between psoriasis and obesity. It is important to note that first one is also considered an inflammatory disease and obesity presents high production of pre-inflammatory cytokines like TNF- $\alpha$ , IL-1, IL-6 e IL-8 by the adipose tissue. So, psoriasis and obesity can induce hyperglycemia, decreased sensibility to insulin and hypertension, which enables the occurrence of the metabolic syndrome when the individual had central adiposity<sup>(1,7)</sup>, that we also found in this study.

A chronic inflammatory status, common in psoriasis, inappropriate food intake and the lack of physical activity may trigger the development of psoriasis and related NTCD, as well as increase the inflammatory process<sup>(23)</sup>. However, it should be remembered interestingly, that nutrition can influence psoriasis in two different ways: as cause of metabolic disorders or as treatment and prevention. The literature reports that nutritional treatment of psoriasis patients, associated to the control of biochemical variables and anthropometrical control, assures more clinical stability for individuals with psoriasis, preventing commonly related NTCD and providing long-term quality of life<sup>(24)</sup>.

Results of food intake showed a heterogeneous consumption between groups, however without statistical differences. Also, there is the possibility of under report in this population. According to Scagliusi et al.<sup>(25)</sup>, an overweight and obese population have higher under reporting when describing its nutrition.

The WHO<sup>(26)</sup> suggests, as values of percentile distribution of macronutrients, proteins (10 to 15%) and lipids (15 to 30%), although, in this study the mean of protein and fat intake were higher among the participants. On the other hand, carbohydrates were lower than the recommended intake, between 50% and 60%. This study results corroborate the findings

of Willet<sup>(27)</sup>, which verified a direct relation between hyperlipidemic diet and the worsening of chronic disease, like obesity and dyslipidemia.

We think the high intake of lipids, cholesterol and saturated fat was due to the high consumption of animal proteins as reported by the participants. Besides, these individuals had low intake of fibers, low consumption of fruits and vegetables, which also contributed to reduced amount of vitamins (A, C, D and B-complex), minerals (manganese, zinc and selenium) in both groups. In a study with 316 psoriasis patients done by Naldi et al.<sup>(22)</sup> that assessed food intake using a semi-quantitative questionnaire, it was found a low consumption of vitamins and minerals in all participants. The same authors suggested that consuming food with carotenoids, flavonoids, selenium, vitamins A, C and E is extremely relevant to psoriasis patients because it can reduce the production of reactive oxygen species and tissue inflammation, providing stability of cell membrane and recovery of skin lesions. Food inadequacies according to Mobbs et al.<sup>(28)</sup> might be explained by the increase of industrial and urbanization process in Brazil and around the world, increasing the consumption of fat/sugar rich diets, sugar drinks and refined food, besides reducing the consumption of complex carbohydrates and fibers.

This study results enabled to create a nutritional profile of the participants, to identify the occurrence of excessive weight no matter the psoriasis type. Therefore, these findings seem to be consistent with other results reported in the literature regarding the relationship between psoriasis and obesity, and the risk to develop other comorbidities, like hypertension, diabetes mellitus, dyslipidemia and heart diseases.

In addition, when the psoriasis types were analyzed trying to understand possible metabolic differences between them, we verified that both had the same behavior as to metabolic changes and increased risk to develop related diseases.

This study also indicated different methods and tools that could be used in clinical practice to evaluate and follow-up psoriasis patients.

These results indicate that nutritionists should closely follow the amount and quality of food intake of these patients. Particularly regarding the intake of calories, lipids, vitamins (A, C, E a B-complex) and minerals (manganese, zinc and selenium) making nutritional interventions to maintain an ideal weight, decrease the production of free radicals and tissue inflammation, providing cell membrane stability and skin lesions repair. In addition, the consumption of food rich in antioxidants such as vegetables and fruits

must be stimulated, following the recommendations proposed by Brazilian Dietary Guidelines of daily intake of such foods<sup>(29)</sup>.

## CONCLUSION

The psoriasis patients showed an abnormal nutritional condition, an increased risk for chronic diseases related to obesity, worsening of the psoriatic lesions, and poor quality of life. There were no significant differences between PS and SAP groups as related to dietary intake.

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