Report

Association between obesity measured by different parameters and severity of psoriasis

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Abstract
Background Obesity has been associated with the severity of psoriasis, but this relation-ship is not completely understood.
Objectives This study aimed to evaluate associations between the severity of psoriasis and weight excess as determined using a variety of parameters.
Methods A cross-sectional study was performed in 296 psoriasis patients. Their body mass index (BMI), waist circumference (WC), and waist : hip ratio (WHR) values were compared with results on a psoriasis area severity index (PASI).
Results The frequency of severe psoriasis was higher in men ($P < 0.05$). Direct correlations were established between PASI scores and each of BMI ($R = 0.0154$, $P = 0.01$), WC ($R = 0.207$, $P = 0.001$), and WHR ($R = 0.164$, $P = 0.007$).
Conclusions This study extends previous reports of an association between psoriasis and obesity and shows a direct correlation between obesity as measured according to different parameters and psoriasis severity.

Introduction

Psoriasis is an immune-mediated disease with a worldwide prevalence of 2–3%.[1,2] Obesity, alcoholism, smoking, diabetes, and coronary artery disease have been considered risk factors for or are associated with the severity of psoriasis.[3–5] Initial studies documenting the association between psoriasis and obesity were performed in Europe.[6,7] In Utah, USA, Herron *et al.*[8] showed that although obesity was observed in 34% of patients with psoriasis, it occurred in only 18% of the general population. The association between obesity and psoriasis has been explained by the relationships among the immune system, adipokines, and metabolism. Fat tissue induces a low degree of proinflammatory status in subjects with obesity.[9,10] The

consequent increase in levels of tumor necrosis factor-α (TNF-α) enhances resistance to insulin and atherosclerosis.[10–12] Additionally, keratinocytes and inflammatory cells produce vascular endothelial growth factor (VEGF), which induces angiogenesis and endothelial activation. Adipocytes also produce VEGF induced by hyperinsulinemia. The inflammation and increased levels of VEGF may not only initiate psoriasis but may cause it to be more severe.[13] Obesity measured by body mass index (BMI) has been associated with severity of psoriasis.[5] This study used BMI and other parameters to evaluate visceral fat.

According to the World Health Organization (WHO),[14] obesity affects about 35% of the world population. In Brazil, where this study was conducted, overweight is observed in up to 40.6% and obesity in 5.0%

of the population.[15] In this cross-sectional study, the prevalence of obesity (BMI of ≥30) and weight excess (overweight or obesity, defined by a BMI of ≥25) were determined in a large sample of adult psoriasis patients. These variables and other morbidities were correlated with psoriasis severity.

Materials and methods

Patients

In order to determine the prevalence of obesity and to establish whether it influences the severity and clinical forms of psoriasis, 296 patients were enrolled in this study. The sample size calculation was based on the formula $n = z \times p \times q/d^2$, established by Lwanga and Lemeshow,[16] and took into account a prevalence of obesity in the state of Bahia, Brazil, of 5% according to data sourced from the Brazilian Ministry of Health,[1] given a variation of ±5%. All patients aged >18 years and diagnosed with psoriasis, independent of its clinical form, who consecutively attended the dermatology clinic at the University Hospital of Professor Edgard Santos from October 2008 to August 2010 were invited to participate in this study. All participants provided signed informed consent, and the study was approved by the Ethics Committee of the University Hospital of Professor Edgard Santos. All patients completed a questionnaire and underwent a complete physical examination. Body mass index was calculated by dividing the subject's weight (kg) by his or her height in meters squared (m^2). Diagnoses of obesity and overweight followed the criteria established by the National Institute of Health (NIH) in 1981. Weight excess was defined by a BMI ≥ 25 (overweight or obesity) and obesity by a BMI ≥ 30. Centripetal obesity was measured by waist circumference (WC) and waist : hip ratio (WHR). Obesity was classified as centripetal when the WC was >122 cm in men and >88 cm in women or when the WHR was >0.9 in men and >0.8 in women.[17,18] Dyslipidemia was diagnosed when the triglyceride level was >150 mg/dL, high-density lipoprotein (HDL) was <40 mg/dL in men and <50 mg/dL in women, or low-density lipoprotein (LDL) was >130 mg/dL.[19] Psoriasis was considered severe when the psoriasis area severity index (PASI) score was >10. The diagnosis of severe psoriasis was determined by the same three observers. Correlations between weight excess and PASI score were determined in patients with BMI values ≥25 (weight excess) and ≥30 (obesity), respectively.

Smoking was evaluated by a pack/years index, and degree of alcoholism was determined as the mean frequency of units consumed per week. Any previous history of alcoholism was not taken into account.

Statistical analysis

Descriptive statistical analysis was performed in SPSS Version 11.5 for Windows (SPSS, Inc., Chicago, IL, USA). Quantitative variables were analyzed using the normal Kolmogorov–Smirnov test. Comparisons between quantitative variables such as PASI, BMI, WC, and WHR values were performed using the Mann–Whitney test. Patients were classified into one of three groups according to whether their BMI values were <25, ≥25 and <30, or ≥30. These analyses were conducted using the Kruskal–Wallis test. The chi-squared test was used to determine the association between two categorical variables. Correlations were ascertained using the Spearman test. Results were considered statistically significant at a *P*-value of <0.05.

Results

Of the 296 patients examined, 164 (55.4%) were men and 132 (44.6%) were women. Clinical forms of psoriasis included vulgaris (90.8%), palmoplantar (3.0%), inverse (2.0%), guttate (1.3%), erythrodermic (1.0%), pustular (0.6%), and nail (0.3%) psoriasis. Patient demographic and some clinical data, according to gender, are shown in Table 1. The mean ± standard deviation (SD) age of the population was 48 ± 14 years. There were no differences between male and female patients in age, duration of illness, or age at diagnosis of psoriasis (*P* > 0.05). Obesity was more frequent in women (36.0%) than in men (22.0%) (*P* < 0.05). Mean BMI values were higher in women (29) than in men (27) (*P* < 0.01). The mean ± SD PASI score was 7.9 ± 7.7 (range: 0–48). Mean ± SD PASI scores were higher in men (9.2 ± 8.3) than in women (6.7 ± 6.9) (*P* = 0.03), and the frequency of severe psoriasis (PASI score ≥10) was higher in men (37.8%) than in women (26.5%) (χ^2 = 4.23, *P* = 0.04).

The following comorbidities were identified in this population: alcoholism (46.8%); smoking (42.9%); high blood pressure (29.7%); dyslipidemia (19.3%); and diabetes mellitus (9.5%). The majority of the population (198) were classified as exceeding their recommended weight range. The prevalence of overweight (BMI ≥25 and <30) was 39.0% and that of obesity was 28.5%. Weight was not recorded in two patients. There was no

Table 1 Demographic characteristics and clinical data for psoriasis patients by gender

Variables	Men *n* = 164 Mean ± SD	Women *n* = 132 Mean ± SD	*P*-value
Age, years	49 ± 14	46 ± 14	0.12
Duration of illness, months	135 ± 121	146 ± 110	0.14
Age at diagnosis, years	37 ± 15	34 ± 16	0.10
Psoriasis area severity index	9.2 ± 8.3	6.7 ± 6.9	<0.01
Body mass index	27 ± 4.7	29 ± 6.4	0.01

SD, standard deviation.

correlation between PASI scores and smoking or alcoholism. To evaluate the relationships between comorbidities and psoriasis, patients were classified into two groups according to age. Table 2 shows frequencies of comorbidities in patients aged <40 years and ≥40 years, respectively. Smoking, high blood pressure, diabetes, dyslipidemia, and excess weight were associated with psoriasis.

In addition to BMI scores, we used the WC and WHR to evaluate weight excess. When the WC was used, we found that 63.0% of women and 24.0% of men were classified as exceeding their recommended weight range. When the WHR was used, weight excess was found to occur at even higher frequencies of 89.0% in women and 81.0% in men. Figure 1(a–c) shows BMI, WC, and WHR

Table 2 Associated comorbidities in psoriasis patients by age

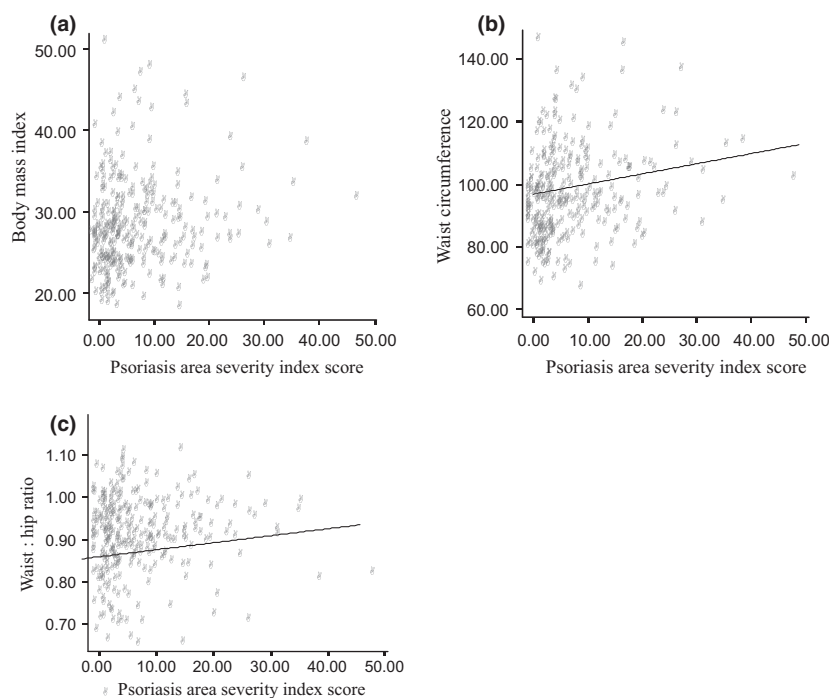| Comorbidities/aspect (*n/N*, %)	Age < 40 years (%)	Age ≥ 40 years (%)	*P*-value
Alcoholism (138/295, 46.8%)	53.4	42.4	0.06
Smoking (125/291, 42.9%)	23.1	55.0	<0.001
Hypertension (88/296, 29.7%)	16.1	39.9	<0.001
Diabetes (28/296, 9.5%)	3.4	14.0	0.003
Dyslipidemia (57/296, 19.3%)	10.2	25.8	0.001
Body mass index > 25 (199/295, 67.5%)	52.1	69.5	0.003
Body mass index ≥ 30 (84/295, 28.5%)	24.0	31.6	0.15

values plotted against PASI scores for each patient. There were direct correlations between BMI and PASI scores, WC and PASI scores, and WHR and PASI scores. The median WC in patients with PASI scores of ≥10 (96.9 cm) was higher (P = 0.013) than that in patients with PASI scores of <10 (92.8 cm). In patients with BMI scores of <25, ≥25 but <30, and ≥30, median PASI scores were 3.9, 6.0, and 7.0, respectively (P < 0.01). This supports the hypothesis that weight excess influences the severity of psoriasis.

Discussion

The number of overweight people in the world population has increased.[14] An association between psoriasis and obesity has long been recognized.[6,7] Moreover, smoking, dyslipidemia, alcoholism, and high blood pressure have been associated with psoriasis.[3,5] This study shows that the frequency of weight excess in patients with psoriasis is higher than that in the general population. We also found an association between the severity of psoriasis based on PASI scores and BMI scores of ≥25 and ≥30. Our findings of an association between PASI scores of ≥10 and WC and of correlations between all the anthropometric measurements used to evaluate weight excess in this study (WC, WHR, and BMI score) and PASI scores confirm the existence of a relationship between weight excess and psoriasis severity. This finding indicates that the overweight condition is highly associated with

Figure 1 Correlations between psoriasis area severity index (PASI) scores in psoriasis patients (*n* = 296) and (a) body mass index (R = 0.0154, P = 0.01), (b) waist circumference (R = 0.207, P = 0.001) and (c) waist : hip ratio (R = 0.164, P = 0.007)

psoriasis and that weight excess constitutes a risk factor for severity of disease.

Although no differences in age, duration of illness, and age at diagnosis emerged between male and female study subjects, the severity of psoriasis as measured by PASI score, as well as the frequency of severe disease, was higher in men than in women. The association between psoriasis severity and gender accords with the results of a previous study that identified a greater frequency of more severe psoriasis in men than in women.[20]

Several comorbidities have been associated with psoriasis.[3-7] In this study, comorbidities were found to be associated with psoriasis but only in patients aged ≥40 years. The importance of age in the association between comorbidities and psoriasis has been identified previously.[21] Several factors may explain the influence of age in the association of comorbidities with psoriasis. Genetic factors are associated with psoriasis, which is better documented in early-onset psoriasis.[2] It is also possible that the development of comorbidities in psoriasis depends on the duration of disease.[22] This study extends previous documentation of the association between obesity and psoriasis and emphasizes the relationship between overweight and severity of psoriasis. The study was performed in a city with a low frequency of obesity according to data released by the Brazilian Ministry of Health. Obesity was predominantly documented in women, although the different frequencies of centripetal obesity in men and women may reflect the multiethnic nature of the population. This association between weight excess and psoriasis has been observed in other studies. However, these studies used different criteria to determine weight excess, including BMI scores of >27, >25 or >30, the measurement of fat by bioelectrical impedance analysis, and the evaluation of WC.[3,5,20,21,23] The present study used several anthropometric measures (BMI, WC, and WHR) to evaluate weight excess. Initially, we showed that a large percentage of the population – predominantly women – demonstrated weight excess. Secondly, the use of the WC and WHR parameters increased the frequency of obesity two-fold. Moreover, we showed a strong association between weight excess as established in each of the three methods and PASI score. This makes weight excess an important risk factor for severe psoriasis. However, the association between psoriasis and obesity may represent a common pathogenesis rather than a simple and direct cause–consequence relationship.

Conclusions

Obesity is highly associated with psoriasis in Brazil, and the use of BMI scores does not identify a large percentage of patients with visceral fat. The severity of psoriasis was associated with weight excess as determined by each of the methods used in this study but predominantly with centripetal obesity.

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