

# Psoriasis and associated risk factors: a cross-sectional analysis of the Brazilian Longitudinal Study of Adult Health

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## SUMMARY

**OBJECTIVE:** This study investigated the association of psoriasis with cardiovascular risk factors and psychological aspects among participants of the Brazilian Longitudinal Study of Adult Health.

**METHODS:** This is a cross-sectional study from the baseline data of the Brazilian Longitudinal Study of Adult Health cohort, collected between 2008 and 2010 in six state capitals of Brazil (i.e., Belo Horizonte, Porto Alegre, Rio de Janeiro, Salvador, São Paulo, and Vitória). Participants were active and retired civil servants from college and research institutions, aged between 35 and 74 years. Exclusion criteria included the intention to quit working at the institution, pregnancy, severe cognitive impairment, and, if retired, residence outside of a study center's corresponding area. Psoriasis case identification was based on a previous medical diagnosis of psoriasis. Cardiovascular risk profile, psychological aspects, and sociodemographic variables were investigated.

**RESULTS:** Data from 15,105 participants were analyzed (mean age of 52.3 years, 51.3% women). The prevalence of psoriasis was 1.6% (n=236). Psoriasis was associated with higher education (OR 1.94 [CI 1.07–3.52]), health insurance plan (OR 1.56 [CI 1.08–2.25]), central obesity (OR 1.63 [CI 1.10–2.40]), smoking status (former OR 1.40 [CI 1.03–1.88]; current OR 1.61 [CI 1.08–2.40]), and very bad self-perception of health (OR 7.22 [CI 2.41–21.64]), remaining significant even after multivariate adjustment. Self-reported Black participants were less likely to have psoriasis (OR 0.45 [CI 0.26–0.75]).

**CONCLUSION:** In a sample of healthy workers, psoriasis was associated with central obesity, smoking, and a very bad self-perception of health, which may contribute to future cardiovascular disease.

**KEYWORDS:** Psoriasis. Cardiovascular risk factors. Central obesity. Smoking. Self-perception.

## INTRODUCTION

Psoriasis is one of the most common inflammatory skin disorders, with a prevalence between 0.7 and 3.0% and great variability based on the geographical region of the world<sup>1</sup>. Psoriasis has been associated with frequent comorbidities such as diabetes and obesity<sup>2</sup>.

There are conflicting data about the association of psoriasis and cardiovascular diseases, with some studies showing positive associations<sup>3</sup> and others reporting no association at all<sup>4</sup>. The presence of psoriasis considerably increased the risk of myocardial infarction and stroke<sup>3</sup>, and a less healthy profile of cardiovascular risk factors was seen in patients with psoriasis compared to the general population<sup>5</sup>. On the contrary, prospective data from the Rotterdam Study described a similar cardiovascular risk in a sample with a majority of mild cases of psoriasis compared with participants without the disease<sup>4</sup>.

Besides, psoriasis also involves a psychological burden, given the emotional and social impact on the patient's life<sup>6</sup>.

Depression is currently a risk factor for cardiovascular diseases to be considered in patients with psoriasis<sup>7</sup>. Other psychosocial risk factors such as quality of life and self-perception of health may be decreased in patients with psoriasis<sup>8,9</sup>.

Brazil is a middle-income country with great climate diversity, ethnicity, and socioeconomic status, with a higher psoriasis prevalence in the Southeast and South regions<sup>10</sup>, probably associated with better access to health care. The prevalence of psoriasis in Brazil's state capitals ranges from 1.1 to 1.5%<sup>10</sup>. However, few studies investigated the association of psoriasis with traditional cardiovascular risk factors and psychological aspects in low- and middle-income countries such as Brazil<sup>5,11</sup>, mostly with small samples.

This study aimed to investigate the association of psoriasis with cardiovascular risk factors and psychological aspects among participants of the Brazilian Longitudinal Study of Adult Health (ELSA-Brasil).

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Conflicts of interest: the authors declare there is no conflicts of interest. Funding: none.

Received on February 15, 2023. Accepted on March 16, 2023.

## METHODS

The Brazilian Longitudinal Study of Adult Health is a prospective cohort study of 15,105 civil servants (aged 35–74 years), active or retired employees of higher education and research institutions from six different Brazilian cities. The exclusion criteria included the intention to quit working at the institution, pregnancy, severe cognitive impairment, and, if retired, residence outside of a study center's corresponding area. The information about the ELSA-Brasil sampling recruitment protocol is found elsewhere<sup>12,13</sup>. This study was a cross-sectional analysis using baseline data (2008–2010) from the entire sample of the ELSA-Brasil study. The study protocol was standardized and approved by the Ethic Board of all six centers: Federal University of Bahia (process 027/06), University Hospital from University of São Paulo (process 669/06), Oswaldo Cruz Foundation (process 343/06), Federal University of Minas Gerais (process 186/06), Porto Alegre Clinical Hospital (process 194/06), and Federal University of Espírito Santo (041/06). All participants signed an informed consent form.

### Psoriasis

A previous medical diagnosis of psoriasis was informed by a specific question: "Have you been previously told by a physician that you had/have psoriasis?" If the participant responded yes to this question, the year of medical diagnosis was also recorded. This information was obtained during the 9-year follow-up visit, and based on the reported year of diagnosis, we identified prevalent cases at baseline. In addition, spontaneous report about the medical diagnosis of psoriasis at baseline data collection was also considered for case identification.

### Cardiovascular profile

The Brazilian Longitudinal Study of Adult Health participants were assessed by standard examinations and questionnaires<sup>13</sup>. Anthropometric measurements were obtained using international standard criteria<sup>12,14</sup>. Body mass index (BMI) was calculated (weight (kg)/height<sup>2</sup> (m<sup>2</sup>)) and classified as obesity if BMI<sup>3</sup>30.0 kg/m<sup>2</sup>. Central obesity was defined as a waist circumference (WC)<sup>3</sup>88 cm for women and WC<sup>3</sup>102 cm for men. Hypertension was defined as systolic BP<sup>3</sup>140 mmHg or diastolic BP<sup>3</sup>90 mmHg<sup>14</sup> or the current use of antihypertensive medication. Diabetes was defined as a fasting plasma glucose <sup>3</sup>126 mg/dL, a 2-h plasma glucose of <sup>3</sup>200 mg/dL (5.17 mmol/L) after an overload of 75 g of glucose, glycated hemoglobin (HbA1c)<sup>3</sup>6.5, or self-reported previous medical diagnosis or use of medication for diabetes. Dyslipidemia was identified as low-density lipoprotein (LDL) cholesterol <sup>3</sup>130 mg/dL or self-reported use of lipid-lowering medication.

### Covariates

Self-reported information about sex, age (years), race (white, brown, black, and other), education attainment (less than high school, high school, and some college or complete college or more), smoking status (never, former, or current), current alcohol consumption (yes or no), marital status (not single or single), health perception (very good, good, regular, bad, or very bad), and having a private health insurance plan (yes or no) were included as covariates. In addition, depression and anxiety were evaluated using the Revised Clinical Interview Schedule<sup>15</sup>, and physical activity was assessed by International Physical Activity Questionnaire, being classified as physically active those participants with <sup>3</sup>75 min/week of high intensity or <sup>3</sup>150 min/week of moderate intensity or a combination of both.

### Statistical analysis

Sample characteristics were presented in absolute and relative frequency (categorical) and in mean and standard deviation (continuous), being compared according to psoriasis diagnosis (i.e., chi-square test and independent-samples t-test, respectively). Logistic regression models were used to evaluate the association of psoriasis diagnosis with sociodemographic, cardiovascular risk, and psychological risk factors, presented as odds ratio (OR) and 95% confidence interval (95%CI). Multivariate adjusted models included age, sex, self-reported race, education attainment, marital status, having private health insurance, diagnosis of hypertension, diabetes, and dyslipidemia, BMI, central obesity, smoking, alcohol, physical activity, depression, anxiety, and the self-perception of health. The significance level adopted was 5% (p<0.05). IBM SPSS for Statistics v.26 was used for the statistical analysis.

## RESULTS

Of the 15,105 participants, 236 had a previous medical diagnosis of psoriasis at baseline. The sociodemographic and clinical characteristics are described in Table 1. Participants with psoriasis were mostly white with a lower frequency of self-reported black and mixed races (p<0.001), former and current smokers (p=0.019), had a higher education (p<0.001), private health insurance plan (p<0.001), and central obesity (p=0.005). The frequency of reporting "very bad" self-perception of health was higher in participants with psoriasis than those without the disease (p=0.03).

Table 2 describes the association between psoriasis, sociodemographic factors, cardiovascular risk factors, and psychological aspects. Participants who reported Black race were less likely to have psoriasis when compared to those who reported

**Table 1.** General and clinical characteristics according to the presence of psoriasis in Brazilian Longitudinal Study of Adult Health baseline sample (n=15,105).

	Psoriasis		p-value
	No n=14,869	Yes n=236	
Age (years), mean (SD)	52.1 (9.1)	52.3 (9.2)	0.78
Women, n (%)	8,097 (54.5)	121 (51.3)	0.33
Self-reported race, n (%)			
White	7,637 (52)	154 (65.8)	<0.001
Mixed	4,147 (28.2)	55 (23.5)	
Black	2,380 (16.2)	17 (7.3)	
Other	523 (3.6)	8 (3.4)	
Education, n (%)			
Less than high school	1,907 (12.8)	15 (6.4)	<0.001
High school and some college	5,173 (34.8)	60 (25.4)	
Complete college or more	7,789 (52.4)	161 (68.2)	
Marital status, n (%)			
Not single	9,826 (66.1)	158 (66.9)	0.78
Hypertension, n (%)	5,319 (35.8)	83 (35.3)	0.88
Diabetes, n (%)	2,562 (17.2)	43 (18.2)	0.69
Dyslipidemia, n (%)	8,636 (58.1)	140 (59.3)	0.70
BMI, n (%)			
Normal weight	5,483 (36.9)	82 (34.7)	0.46
Overweight	5,983 (40.3)	92 (39.0)	
Obesity	3,397 (22.8)	62 (26.3)	
Central obesity, n (%)	5,782 (38.9)	113 (47.9)	0.005
Smoking, n (%)			
Never	8,481 (57.1)	113 (47.9)	0.019
Former	4,448 (29.9)	85 (36.0)	
Current	1,939 (13.0)	38 (16.1)	
Current alcohol consumption, n (%)			
Yes	10,251 (69.1)	178 (75.4)	0.036
Physical activity, n (%)			
Physically active	3,530 (24.1)	61 (26.2)	0.26
Depression, n (%)	626 (4.2)	11 (4.7)	0.74
Anxiety, n (%)	1,937 (13.2)	30 (12.8)	0.86
Private health insurance plan, n (%)	10,110 (68)	190 (80.9)	<0.001
Self-perception of health, n (%)			
Very good	4,162 (28)	62 (26.4)	0.03
Good	7,741 (52.1)	126 (53.6)	
Regular	2,671 (18)	39 (16.6)	
Bad	236 (1.6)	4 (1.7)	
Very bad	55 (0.4)	4 (1.7)	

SD: standard deviation; BMI: body mass index.

**Table 2.** Association of psoriasis diagnosis with sociodemographic factors.

	Odds ratio (95% confidence interval)	
	Unadjusted	Adjusted*
Age (years)	1.0 (0.99-1.02)	0.99 (0.98-1.01)
Sex		
Men	1.0 (Reference)	1.0 (Reference)
Women	1.14 (0.88-1.47)	1.21 (0.90-1.62)
Self-reported race		
White	1.0 (Reference)	1.0 (Reference)
Mixed	0.66 (0.48-0.90)	0.77 (0.56-1.07)
Black	0.35 (0.21-0.59)	0.45 (0.26-0.75)
Others	0.32 (0.04-1.29)	0.93 (0.45-1.92)
Education attainment		
Less than high school	1.0 (Reference)	1.0 (Reference)
High school and some college	1.48 (0.84-2.60)	1.35 (0.75-2.44)
Complete college or more	2.62 (1.54-4.47)	1.94 (1.07-3.52)
Marital status		
Single	1.0 (Reference)	1.0 (Reference)
Not single	1.04 (0.79-1.37)	0.95 (0.71-1.28)
Private health insurance plan		
No	1.0 (Reference)	1.0 (Reference)
Yes	1.99 (1.43-2.76)	1.56 (1.08-2.25)
Hypertension		
No	1.0 (Reference)	1.0 (Reference)
Yes	0.98 (0.75-1.28)	0.98 (0.72-1.33)
Diabetes		
No	1.0 (Reference)	1.0 (Reference)
Yes	1.07 (0.77-1.49)	1.08 (0.75-1.57)
Dyslipidemia		
No	1.0 (Reference)	1.0 (Reference)
Yes	1.05 (0.81-1.37)	0.99 (0.75-1.30)
BMI, n (%)		
Normal weight	1.0 (Reference)	1.0 (Reference)
Overweight	1.03 (0.76-1.39)	0.90 (0.63-1.29)
Obesity	1.22 (0.88-1.70)	0.88 (0.54-1.45)
Central obesity		
No	1.0 (Reference)	1.0 (Reference)
Yes	1.44 (1.12-1.87)	1.63 (1.10-2.40)
Smoking		
Never	1.0 (Reference)	1.0 (Reference)
Former	1.43 (1.08-1.91)	1.40 (1.03-1.88)
Current	1.47 (1.02-2.13)	1.61 (1.08-2.40)
Current alcohol consumption		
No	1.0 (Reference)	1.0 (Reference)
Yes	1.38 (1.02-1.85)	1.10 (0.80-1.51)

Continue...

Table 2. Continuation.

	Odds ratio (95% confidence interval)	
	Unadjusted	Adjusted*
Physical activity		
Insufficiently active	1.0 (Reference)	1.0 (Reference)
Physically active	1.12 (0.83–1.50)	1.07 (0.78–1.45)
Depression		
No	1.0 (Reference)	1.0 (Reference)
Yes	1.11 (0.60–2.05)	0.91 (0.45–1.85)
Anxiety		
No	1.0 (Reference)	1.0 (Reference)
Yes	0.97 (0.66–1.42)	0.88 (0.58–1.35)
Self-perception of health		
Very good	1.0 (Reference)	1.0 (Reference)
Good	1.09 (0.80–1.48)	1.12 (0.81–1.54)
Regular	0.98 (0.66–1.47)	1.15 (0.74–1.80)
Bad	1.14 (0.41–3.15)	1.48 (0.52–4.22)
Very bad	4.88 (1.72–13.9)	7.22 (2.41–21.64)

\*Multivariable adjustment by age, sex, self-reported race, education attainment, marital status, having private health insurance, diagnosis of hypertension, diabetes and dyslipidemia, BMI, central obesity, smoking, alcohol, physical activity, depression, anxiety, and the self-perception of health.

White race (OR 0.45; CI 0.26–0.75), whereas those participants who have complete college or more (OR 1.94; CI 1.07–3.52) and those with private health insurance (OR 1.56; CI 1.08–2.25) had higher odds of having psoriasis. Participants with central obesity (OR 1.63; CI 1.10–2.40) and those who were former (OR 1.40; CI 1.03–1.88) and current smokers (OR 1.61; CI 1.08–2.40) had higher odds of having psoriasis diagnosis. Current alcohol consumption was associated with psoriasis diagnosis in crude analysis (OR 1.38; CI 1.02–1.85), but this association became non-significant in multiple adjusted model. Participants who reported very bad self-perception of health were seven times more likely to have a psoriasis diagnosis when compared to those who reported having very good health (OR 7.22; CI 2.41–21.64). No association was observed between psoriasis and hypertension, diabetes, dyslipidemia, BMI, physical activity, depression, and anxiety.

## DISCUSSION

Our results showed an association of psoriasis with higher education attainment, central obesity, smoking, having private health insurance, and very bad self-perception of health, even after multivariate adjustment. On the contrary, self-reported Black race was associated with lower odds of having psoriasis. Our results showed a worst profile of cardiovascular risk factors such as current smoking and central obesity

in participants with psoriasis compared to participants without the disease.

Brazilian Longitudinal Study of Adult Health participants who reported to be former or current smokers were more likely to have psoriasis when compared to those that never smoked. Similar results were reported by recent meta-analyses<sup>16</sup>. ELSA-Brasil is a cohort with a low prevalence of current smokers (13.1%) and most of the cases of psoriasis in the cohort are mild, but even under these circumstances, an association was found between smoking and psoriasis. On the contrary, it is questioned whether smoking increases the risk of developing psoriasis or if the habit is a repercussion of the undergoing stress the patients have. Therefore, it is impossible to “rule out” reverse causality to explain our results.

Psoriasis was associated with central obesity in this study. Central obesity is a risk factor for cardiometabolic diseases, mediating 52% of the risk of systolic blood pressure, total serum cholesterol, and fasting plasma glucose<sup>17</sup>. However, this study showed no association of psoriasis with obesity measured by BMI, which deserves further investigation into the role of different adiposity indicators in psoriasis.

Our study observed no association of psoriasis with hypertension, diabetes, and dyslipidemia, as a previous study with the Brazilian sample<sup>5</sup>. Comorbidities, particularly cardiometabolic disorders, were highly prevalent in patients with psoriasis compared to healthy controls<sup>18</sup>. A possible reason for the negative

results of the present study could be related to the mild severity of psoriasis in ELSA-Brasil. The ELSA-Brasil is a relatively young cohort, which will need a longer follow-up to present cardiovascular and metabolic complications. In addition, the nature of sample recruitment in ELSA-Brasil was substantially different compared to the case-control studies in psoriasis, which included samples from specialized health care facilities while ELSA-Brasil identified psoriasis cases within the sample.

Regarding sociodemographic factors, psoriasis was associated with higher education and private health insurance in this study. Convergingly, a previous Brazilian study<sup>19</sup> reported higher education, higher income, and higher rates of private insurance among people with psoriasis. DiBonaventura et al.<sup>19</sup> suggested that possibly these patients had better access to medical care and, therefore, were more likely to have an early diagnosis of psoriasis. It is worth mentioning that the participants of ELSA-Brasil have higher education and higher access to private health care compared to the general population, which can lead to a higher frequency of the diagnosis of psoriasis even in mild cases. On the contrary, the lower frequency of psoriasis in self-reported Black individuals is interesting. ELSA-Brasil has a highly admixed sample with higher frequencies of Mixed and Black self-reported races. Psoriasis is a more common disease in White race, with a lower prevalence in Black<sup>20</sup>. The under-reporting and selection bias may have affected this result in our study.

Regarding psychological aspects, psoriasis was associated with very bad self-perception of health in this study. Previous studies also reported worse results related to satisfaction with life<sup>21</sup> and quality of life<sup>8</sup> in patients with psoriasis. This was an alarming result as negative self-reported health is associated with overall health status and with higher mortality rates<sup>22</sup>. Psoriasis

was not associated with depression or anxiety in ELSA-Brasil, as reported in other studies<sup>6,23</sup>. This lack of association might be compromised by the mild severity of psoriasis in the cases of the ELSA-Brasil sample.

It is important to mention that even in a large sample, the psoriasis cases were small at baseline. ELSA-Brasil participants are civil servants with more education, higher income, and higher access to health care compared to the Brazilian general population, restricting the generalizability of the results. In addition, this is an occupational cohort, and the majority of psoriasis cases were mild, in which the cardiovascular risk factors may be likely healthier when compared to more severe cases. Moreover, even though the ELSA-Brasil study is prospective, this cross-sectional analysis cannot evaluate causality.

## CONCLUSION

Psoriasis was associated with sociodemographic, cardiovascular risk factors and very bad self-perception of health in ELSA-Brasil. The assessment of cardiovascular risk factors and psychological support in patients with psoriasis is a key for prevention and improvement of quality of life. We suggest future research to investigate the role of disease severity in the observed associations.

## AUTHORS' CONTRIBUTIONS

**MC:** Conceptualization, Investigation, Writing – review & editing. **WRT:** Investigation, Writing – review & editing. **VM:** Investigation, Writing – review & editing. **IMB:** Conceptualization, Formal Analysis, Investigation, Supervision, Writing – review & editing.

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