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Sunburn in Brazilian college students and associated factors

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Abstract

Excessive exposure to solar radiation is an essential determinant of skin cancer. The cross-sectional and census study aimed to determine the prevalence of sunburn in a recall for the last year and associated factors among university students. Participants were 2,295 health students aged 18 years or older from a University in the Brazilian Midwestern region in 2018. A pre-tested, standardized, and self-administered questionnaire was applied, using Poisson regression with robust variance. Sunburn was reported by 43.9% (95%CI 41.9-46.0) of the sample, with a higher prevalence among men. White people from a high economic class, higher skin sensitivity, and most frequently wearing a hat/cap showed a higher occurrence of sunburn. Analysis by sex indicated that sunburn was associated with increased skin sensitivity among men. The prevalence of sunburn among university students is high, which highlights the need for educational and skin cancer prevention strategies in this population.

Keywords: Sunburn, Health Occupations Students, Sunscreens.

Queimadura solar em universitários brasileiros e fatores associados

Resumo

A exposição excessiva à radiação solar é um importante determinante do câncer de pele. O estudo, de caráter transversal e censitário, objetivou determinar a prevalência de queimadura solar no recordatório de último ano e fatores associados entre universitários. Participaram 2.295 estudantes da área da saúde com 18 anos ou mais de uma Universidade do Centro Oeste brasileiro no ano de 2018. Foi empregado questionário pré-testado, padronizado e autoaplicado, usando-se regressão de Poisson com variância robusta. Queimadura solar foi relatada por 43,9% (IC95% 41,9-46,0) da amostra, com prevalência maior entre homens. Cor da pele branca, classe econômica alta, maior sensibilidade da pele e uso de chapéu/boné associaram-se a maior ocorrência de queimadura solar. Análises por sexo indicaram que, entre os homens, a queimadura solar se associou com sensibilidade aumentada da pele. A prevalência de queimadura solar entre universitários é alta, o que salienta a necessidade de estratégias educativas e de prevenção do câncer de pele nessa população.

Palavras-chaves: Queimadura Solar, Estudantes de Ciências da Saúde, Protetores solares.

Introduction

The incidence of skin cancer is more common in populations that receive intense solar radiation and has been showing a growing trend worldwide (Coit et al., 2016). In Brazil, the number of new cases of this neoplasm was estimated at 185,380 for the year 2020, with 176,930 new cases of non-melanoma skin cancer, the most frequent type,

and 8,450 new cases of melanoma (Instituto Nacional de Câncer - INCA, 2020). The Midwest region of Brazil has the second highest national estimated risk of non-melanoma skin cancer, with just over 89 cases per 100,000 inhabitants (INCA, 2020).

Sunburn is an inflammatory reaction resulting from acute skin exposure to intense sunlight and is considered a risk marker for skin cancer (Mancini, 2004; Ramirez & Schneider, 2003). Review studies and meta-analyses indicate that intermittent exposure to the sun and a history of sunburn are important risk factors for melanoma (Davey, Miller, & McInerney, 2021; Dennis et al., 2008). In general, higher prevalences of sunburn are found among men with higher education, younger people with more prone skin, employed and with higher family income, and physically active, demonstrating that those who have more leisure opportunities would be more likely to suffer unintentional sunburn (Holman, Berkowitz, Guy, Hartman, & Perna, 2014; Holman, Ragan, Julian, & Perna, 2021; Pinault & Fioletov, 2017).

Research with university students showed a similar picture, although the frequency of sunburn is less frequent because they favor protective behaviors (Bowers, Hamilton, Lobel, Kanetsky, & Hay, 2021; Dallazem et al., 2019; Haack, Horta, & Cesar, 2008). In the USA, a study compared the results of surveys carried out in 1990 and 2007 with students, finding that risk perception was negatively associated with the frequency of exposure to the sun and those with higher perceived risk had more positive attitudes towards protective behaviors (Felts, Burke, Vail-Smith, & Whetstone, 2010).

In Brazil, most studies with university students used convenience samples, often presenting only descriptive analyses and focusing on photoexposure or photoprotection behaviors (Castilho, Sousa, & Leite, 2010; Costa & Weber, 2004; Dallazem et al., 2019; Didier, Brum, & Aerts, 2014; Lara, Rodrigues, Lima, & Nassif, 2013; Rocha et al., 2018; Urasaki, Muradi, Silva, Maekawa, & Zonta, 2016). These studies, carried out in the Northeast, South, and Federal District regions, found high levels of exposure to the sun at inappropriate times, non-regular use of sunscreen photoprotectors, and non-routine use of other types of sun protection such as hats, clothes, or staying in the shade (Castilho et al., 2010; Costa & Weber, 2004; Dallazem et al., 2019; Didier et al., 2014; Lara et al., 2013; Rocha et al., 2018; Urasaki et al., 2016). The wide variation in sunburn prevalence (20 to 92%) may be due to the ethnic and climatic diversity of university students (Castilho et al., 2010; Dallazem et al., 2019; Rocha et al., 2018).

Since sunburn is a modifiable risk factor, reducing its prevalence, especially among younger people, is an important primary prevention strategy for skin cancer. In this context, this research aimed to assess the prevalence of sunburn and factors associated with its occurrence among university students in the Brazilian Midwest.

Methodology

This is a university-based cross-sectional study with a census-type sample, whose target population consisted of all university students enrolled in nursing, dentistry, medicine, physiotherapy, pharmacy and physical education courses on campuses in the cities of Rio Verde, Aparecida de Goiânia, and Goianésia. For logistical reasons, students from the physical education course on the Caiapônia campus, the only health course on that campus, were excluded.

The Midwest region of the country, where the study was carried out, has a high incidence of sunlight. In 2018, the municipalities of Rio Verde, Aparecida de Goiânia, and Goianésia had 229,651, 565,957, and 69,072 inhabitants, respectively (IBGE, 2018). The human development index (HDI) was 0.70 in Goianésia, 0.82 in Aparecida de Goiânia and 0.86 in Rio Verde (IBGE, 2018).

All students aged 18 or older, regularly enrolled at the institution during the research period, were included in the sample. The sample calculation was based on estimates based on the study by Haack et al. (2008). The calculation considered a margin of error of 3 percentage points, an adjustment for a design effect of 2.0, an addition of 10% for possible losses and 15% to control for potential confounding factors. The sample obtained (n= 2,295) had 80% power to estimate a prevalence ratio 1.13 with a 95% confidence interval.

The data collection instrument used was a standardized, pre-tested, and self-administered questionnaire including demographic, socioeconomic, and behavioral variables. The pilot study was carried out with the class of an ineligible course, aiming at testing the logistics of the fieldwork, the quality and comprehensibility of the instrument, and estimating the duration of the application. Data collection took place in November 2018, and was conducted by a previously qualified field team. Students who were absent on the day of data collection were later contacted and invited to participate in the survey in up to three attempts.

For this study, the outcome was measured by the following question: “In the last year, have you had any skin burns or burning sensation after exposure to the sun?” The

answer options were “Yes” or “No”, and the recall considered was the last year in relation to the moment of data collection (November 2018). Exposures included sociodemographic, phenotypic, and behavioral aspects. The sociodemographic variables were age, sex (male and female) and economic class. Age was analyzed in the age groups of 18 to 20 years old, 21 to 22 years old, 23 to 24 years old and 25 years old or older. The economic class was evaluated according to the classification of the Brazilian Association of Surveillance Companies (Associação Brasileira de Empresas de Pesquisa - ABEP), which considers the possession of specific goods and the level of education of the head of the family (ABEP, 2018). The class was organized into three categories: A, B, and C/D/E. Phenotypic variables included reported skin color (black/brown, white, and yellow/indigenous), skin sensitivity, and family history of skin cancer among 1st-degree relatives -parents, siblings, grandparents, uncles (yes/no). Skin sensitivity was evaluated according to Fitzpatrick’s classification (1988), classifying the responses as “tanning” and “burning”. Behavioral variables were evaluated by the frequency of photoprotection habits (use of photoprotection, hat/cap, long-sleeved shirt, shade) in face of sun exposure for more than one hour (never/almost never, sometimes, often/always) and frequency of sun exposure (never/almost never, once a week, two or more times a week), according to the classification used by the Behavioral Risk Factor Surveillance System of the USA (Center for Disease Control and Prevention, 2018).

The double-entry of the data was performed in the EpiData 3.1 software, and for the analysis, the Stata 13.0 program was used. Initially, sunburn prevalences with 95% confidence intervals (95%CI) were described according to independent variables and tested using Pearson’s chi-square test and linear trend. Then, crude and adjusted prevalence rates were calculated using Poisson regression models with robust variance. The adjustment included the three blocks of variables in the following sequence: sociodemographic, phenotypic, and behavioral. Thus, according to the hierarchical model of determination (Victora, Huttly, Fuchs, & Olinto, 1997), the variables of each block were adjusted among themselves and by the previous blocks. In the adjusted analyses, only the variables with a significance level lower than 20% ($p \leq 0.20$) were kept in each block. All analyses were stratified by sex, and a significance level of less than 5% ($p < 0.05$) was adopted to detect associations between exposures and outcomes. The double-entry of the data was performed in the EpiData 3.1 software; for the analysis, we used the Stata 13.0 program.

The study was previously approved by the Research Ethics Committees of the University Vale dos Sinos (Opinion n. 2.892.764) and of the University of Rio Verde (Opinion n. 2.905.704), following the recommendations of Resolution n. 466/12 of the National Council of Health (Conselho Nacional de Saúde). All students who agreed to participate in the study signed a Free and Informed Consent Form before answering the questionnaires and could withdraw from participating at any time. Data are confidential.

Results

Of the total number of health area students (2,658) present on the campuses of Aparecida de Goiânia, Goianésia, and Rio Verde enrolled at UniRV in 2018, 2,295 (86.4%) answered the questionnaire, and 363 (13.6%) were classified as losses and refusals.

Most university students were female, with white skin color, aged less than 25 years and from higher economic classes. About 2/3 of the students reported high skin sensitivity when exposed to the sun, and about 1/4 declared having a family history of skin cancer. Over half reported exposing themselves to the sun at least once a week. Regarding photoprotection habits, when exposed to the sun for more than one hour, frequent or constant use of sunscreen with a factor above 15 was reported by less than 1/3 of the sample (Table 1).

The prevalence of at least one episode of sunburn in the last year was mentioned by 43.9% (95%CI 41.9 - 46.0) of the general sample, 47.7% (95%CI 44.0 - 51.4) among men and 42.3% (95%CI 40.0 - 44.8) among women. A higher prevalence of sunburn was found in university students with white skin color, who reported greater skin sensitivity, from economic class A and with a family history of skin cancer in the general sample (Table 1). The analyses by sex showed similar results when associated with sociodemographic and phenotypic variables, although, for men, the prevalences were generally higher than for women. An exception was age, which, among women, showed an inverse association with a linear trend: the younger the women, the greater the prevalence of sunburn in the last year (Table 1).

As for photoprotection and sun exposure habits, there was a higher prevalence of sunburn among those who reported greater use of hats and a lower prevalence among those who reported never or almost never seeking shade. However, in the stratified analysis, the more frequent hat use was associated with a higher prevalence of sunburn among women (Table 1).

Table 1
Prevalence of sunburn (SQ), according to sociodemographic, genetic and behavioral variables in university students (N= 2,295) *

	Total			Men			Women		
	N	% QS	CI 95%	N	% QS	CI 95%	N	% QS	CI 95%
Sex									
Male	699	47.7	44.0 - 51.4	—	—	—	—	—	—
Female	1596	42.3	40.0 - 44.8	—	—	—	—	—	—
Age (years)									
18-20	582	44.2	40.7 - 49.0	174	41.4	34.8 - 50.2	408	45.5	40.8 - 50.7 ^δ
21-22	788	45.4	42.4 - 49.5	217	47.4	41.5 - 55.5	571	44.6	40.8 - 49.2 ^δ
23-24	508	47.4	44.2 - 52.2	160	59.5	52.7 - 68.4	348	42.0	37.8 - 48.6 ^δ
≥ 25	417	36.5	32.3 - 42.1	148	42.8	35.3 - 52.8	269	33.1	27.8 - 39.6 ^δ
Race/skin color									
Black/Mixed race	869	32.8	30.1 - 36.6	273	37.5	33.0 - 45.1	596	30.7	27.1 - 34.7
White	1318	51.9	49.9 - 55.5	393	55.1	50.9 - 61.1	925	50.5	48.1 - 54.7
Yellow/Indigenous	108	35.1	26.4 - 47.4	33	42.3	21.1 - 68.9	75	32.4	22.4 - 46.3
Skin sensitivity									
Tans	681	22.6	20.0 - 26.6	200	26.6	21.7 - 35.0	481	21.0	17.5 - 25.0
Burns	1598	53.0	51.2 - 56.2	488	56.4	52.5 - 61.6	1110	51.6	49.2 - 55.2
Economic class									
A	977	51.3	48.4 - 54.8	350	53.0	48.1 - 58.7	627	50.3	46.7 - 54.6
B	962	39.2	36.1 - 42.3	241	43.6	37.0 - 49.8	721	37.7	34.2 - 41.4
C/D/E	251	38.6	33.1 - 45.4	66	45.5	33.7 - 58.6	185	36.2	29.7 - 43.9
Family history CP									
No	1741	42.3	40.5 - 45.3	554	45.9	42.9 - 51.5	1187	40.6	38.1 - 43.9
Yes	536	49.7	46.3 - 55.1	136	55.6	47.6 - 65.5	400	47.8	43.8 - 53.9
Use of suncre photoprotector									
Never or almost never	1133	44.5	42.8 - 48.8	478	48.6	45.1 - 54.4	655	41.5	39.0 - 46.8
Sometimes	422	44.1	39.6 - 49.4	112	45.5	37.4 - 56.9	310	43.5	37.9 - 49.3
Often/always	724	43.0	39.5 - 47.0	97	46.4	36.4 - 57.8	627	42.5	38.7 - 46.7
Use of hat/cap									
Never or almost never	1911	42.8	41.1 - 45.7	468	46.5	42.9 - 52.3	1443	41.6	39.5 - 44.7
Sometimes	239	48.1	43.4 - 56.6	136	49.3	42.7 - 60.4	103	46.6	37.7 - 58.1
Often/always	128	53.1	46.5 - 65.1	83	51.8	41.1 - 64.3	45	55.6	45.6 - 77.5
Long sleeve shirt									
Never or almost never	1760	42.9	42.2 - 47.0	513	46.9	43.9 - 52.8	1247	42.7	40.2 - 45.9
Sometimes	364	45.1	41.4 - 52.1	118	44.1	36.8 - 56.4	246	45.5	40.4 - 53.2
Often/always	153	41.8	33.2 - 50.0	56	62.5	46.1 - 74.8	97	29.9	21.6 - 41.3
Stays in a shaded environment									

Never or almost never	797	39.6	37.2 - 44.2	236	42.4	37.1 - 50.4	561	38.5	35.3 - 43.5
Sometimes	612	47.5	44.5 - 52.7	197	52.8	48.2 - 62.9	415	44.9	40.6 - 50.4
Often/always	869	45.4	42.4 - 49.2	256	48.2	42.4 - 55.1	613	44.2	40.5 - 48.6
Frequency sun exposure									
Never or almost never	1063	42.3	40.0 - 46.1	245	50.4	44.4 - 57.4	818	39.9	37.3 - 44.2
Once a week	654	47.6	44.3 - 52.3	234	47.9	42.3 - 55.8	420	47.5	43.0 - 52.8
≥2 times a week	563	42.8	39.6 - 48.0	209	44.5	39.6 - 53.7	354	41.8	36.9 - 47.5

Results in bold refer to those with p<0.05; * Pearson's Chi-Square Test; δ Linear trend.

In Table 2, it is possible to identify the crude and adjusted sunburn prevalence ratios for the entire sample. Adjusted analyses showed that men and people with white skin color had higher prevalence ratios for sunburn in the last year than women and people with black/brown skin color, respectively. Regarding economic status, people from classes B and C had a 20% lower prevalence when compared to class A. As for the most sensitive skin phototype (if it burns), this had a 2.12 times higher prevalence of sunburns compared to those with the least sensitive skin type. Regarding sun care photoprotection and photoexposure habits, there was a higher prevalence of the outcome for those who always or frequently used a hat/cap and were exposed to the sun once or more a week when compared to those who never or almost never wore a hat or were exposed in the sun (Table 2).

Table 3 shows the crude and adjusted prevalence stratified for females. Younger university students with white skin color, from a high economic class, increased skin sensitivity, and who wore a hat/cap always or frequently had a higher sunburn prevalence.

Crude and adjusted prevalences stratified for males are shown in Table 4. Among men, after adjustment, only the association between sunburn and increased skin sensitivity remained, with slight attenuation. Unlike what was seen among women, economic class, family history of cancer and sun care photoprotection behaviors were not associated with the outcome among men.

Table 2
Crude and adjusted sunburn prevalence according to sociodemographic, genetic, and behavioral variables in university students (N= 2,295).

	Crude Analysis		Adjusted Analysis	
	PR (CI95%)	p	PR (CI95%)	p
Sex		0.016		0.032^a
Female	1		1	
Male	1.13 (1.02 - 1.24)		1.04 (0.93 - 1.15)	

Age (years)		0.064		
18-20	1			
21-22	1.03 (0.91 - 1.15)			
23-24	1.07 (0.94 - 1.22)			
≥ 25	0.82 (0.70 - 0.96)			
Economic class		<0.001		<0.001^a
A	1		1	
B	0.76 (0.69 - 0.84)		0.80 (0.73 - 0.89)	
C/D/E	0.75 (0.63 - 0.89)		0.80 (0.68 to 0.94)	
Race/skin color		<0.001		<0.001^b
Black/Mixed race	1			
White	1.58 (1.41 - 1.76)		1.25 (1.12 - 1.40)	
Yellow/Indigenous	1.07 (0.80 - 1.42)		1.1 (0.84 - 1.46)	
Skin sensitivity		<0.001		<0.001^b
Tans	1		1	
Burns	2.34 (2.02 - 2.71)		2.12 (1.81 to 2.47)	
Family history of skin cancer		0.002		
No	1			
Yes	1.17 (1.06 - 1.30)			
Use of sun care photoprotector		0.530		0.052 ^c
Never or almost never	1		1	
Sometimes	0.99 (0.87 - 1.12)		0.96 (0.85 to 1.09)	
Often/always	0.97 (0.86 - 1.07)		0.90 (0.81 to 1.01)	
Use of hat/cap		0.005		0.025^c
Never or almost never	1		1	
Sometimes	1.12 (0.97 - 1.16)		1.07 (0.93 to 1.23)	
Often/always	1.24 (1.04 - 1.47)		1.21 (1.02 to 1.44)	
Long sleeve shirt		0.857		
Never or almost never	1			
Sometimes	1.03 (0.90 - 1.16)			
Often/always	0.95 (0.78 - 1.15)			
Stays in a shaded environment		0.021		
Never or almost never	1			
Sometimes	1.20 (1.06 - 1.34)			

Often/always	1.14 (1.02 - 1.28)		
Frequency of sun exposure		0.558	0.110 ^c
Never or almost never	1		1
Once a week	1.13 (1.01 - 1.25)		1.12 (1.01 to 1.24)
≥2 times a week	1.02 (0.89 - 1.13)		1.08 (0.96 to 1.21)

^a Adjustment between sex and economic class; ^b Adjustment between sex, economic class, skin color and skin sensitivity;

^c Adjustment between sex, economic class, skin color, skin sensitivity, use of suncare photoprotector, use of hat/cap and frequency of exposure to the sun.

Table 3
Crude and adjusted sunburn prevalence, according to sociodemographic, genetic, and behavioral variables in university students in the Brazilian Midwest, 2018 (N= 1,596).

	Crude Analysis		Adjusted Analysis	
	PR (CI95%)	p	PR (CI95%)	p
Age (years)		0.002		0.012^a
18-20	1		1	
21-22	0.98 (0.85 - 1.12)		0.94 (0.82 - 1.08)	
23-24	0.92 (0.78 - 1.08)		0.92 (0.79 - 1.08)	
≥ 25	0.73 (0.59 - 0.88)		0.73 (0.61 to 0.89)	
Economic class		<0.001		<0.001^a
A	1		1	
B	1.75 (0.66 - 0.84)		0.80 (0.72 - 0.90)	
C/D/E	0.72 (0.58 - 0.88)		0.79 (0.64 to 0.96)	
Race/skin color		<0.001		0.004^b
Black/mixed race	1		1	
White	1.65 (1.43 - 1.88)		1.28 (1.11 - 1.47)	
Yellow/Indigenous	1.06 (0.73 - 1.50)		1.15 (0.83 - 1.61)	
Skin sensitivity		<0.001		<0.001^b
Tans	1		1	
Burns	1.46 (2.04 - 2.94)		2.26 (1.85 to 2.75)	
Family history of skin cancer		0,011		
No	1			
Yes	1.17 (1.03 - 1.32)			
Use of suncare photoprotector		0.723		0.111 ^c
Never or almost never	1		1	
Sometimes	1.05 (0.89 - 1.22)		0.98 (0.84 - 1.14)	
Often/always	1.02 (0.89 - 1.16)		0.91 (0.80 - 1.03)	

Use of hat/cap		0.026		0.010^c
Never or almost never	1		1	
Sometimes	1.12 (0.90 - 1.38)		1.12 (0.92 - 1.37)	
Often/always	1.34 (1.02 - 1.74)		1.38 (1.07 - 1.75)	
Use of long-sleeve shirt		0.149		
Never or almost never	1			
Sometimes	1.07 (0.91 - 1.24)			
Often/always	0.70 (0.51 - 0.95)			
Stays in a shaded environment		0.051		0.199^c
Never or almost never	1		1	
Sometimes	1.17 (1.00 - 1.35)		1.10 (0.95 - 1.27)	
Often/always	1.15 (1.00 - 1.31)		1.10 (0.96 - 1.25)	
Frequency of sun exposure		0.245		0.078^c
Never or almost never	1		1	
Once a week	1.19 (1.45 - 1.35)		1.17 (1.03 - 1.33)	
≥2 times a week	1.05 (0.90 - 1.21)		1.10 (0.95 - 1.27)	

^aAdjustment between age and economic class; ^bAdjustment between age, economic class, skin color and skin sensitivity; ^cAdjustment between age, economic class, skin color, skin sensitivity, use of sun care photoprotector, hat/cap, shade, and frequency of exposure to the sun.

Table 4

Crude and adjusted prevalence and intervals of sunburn, according to sociodemographic, genetic, and behavioral variables in male university students, in Midwest Brazil, 2018 (N= 699).

	Crude Analysis		Adjusted Analysis	
	PR (CI95%)	p	PR (CI95%)	p
Age (years)		0,276		0.155 ^a
18-20	1		1	
21-22	1.15 (0.91 - 1.43)		1.11 (0.89 - 1.39)	
23-24	1.44 (1.15 - 1.78)		1.35 (1.09 - 1.68)	
≥ 25	1.03 (0.79 - 1.33)		1.08 (0.84 - 1.38)	
Economic class		0.056		0.053 ^a
A	1		1	
B	0.82 (0.69 - 0.97)		0.80 (0.72 - 0.90)	
C/D/E	0.86 (0.64 - 1.13)		0.79 (0.64 to 0.96)	
Race/skin color		<0.001		
Black/mixed race	1			
White	1.45 (1.23 - 1.75)			

Yellow/Indigenous	1.13 (0.70 - 1.81)		
Skin sensitivity		<0.001	<0.001^b
Tans	1		1
Burns	2.12 (1.65 - 2.69)		2.00 (1.57 to 2.55)
Family history of skin cancer		0.034	0.054 ^b
No	1		1
Yes	1.21 (1.01 - 1.44)		1.18 (0.99 - 1.40)
Use of suncare photoprotector		0.583	
Never or almost never	1		
Sometimes	0.94 (0.74 - 1.16)		
Often/always	0.95 (0.75 - 1.20)		
Use of hat/cap		0.312	
Never or almost never	1		
Sometimes	1.06 (0.87 - 1.29)		
Often/always	1.11 (0.88 - 1.40)		
Use of long-sleeve shirt		0.108	
Never or almost never	1		
Sometimes	0.94 (0.75 - 1.17)		
Often/always	1.33 (1.06 - 1.66)		
Stays in a shaded environment		0.207	
Never or almost never	1		
Sometimes	1.25 (1.02 - 1.52)		
Often/always	1.14 (0.93 - 1.38)		
Frequency of sun exposure		0.212	
Never or almost never	1		
Once a week	0.95 (0.79 - 1.13)		
≥2 times a week	0.88 (0.72 - 1.07)		

^a Adjustment between age and economic class; ^b Adjustment between age, economic class, skin sensitivity, and family history of cancer.

Discussion

Based on a census sample of health university students in a Brazilian region with a high incidence of sunlight, the study found a high sunburn prevalence in the last year, especially among young men and people with increased skin sensitivity. High prevalences among young people with increased sensitivity or white skin color were also verified in population-based studies with North American and Canadian adults

(Holman et al., 2014, 2018; Pinault & Fioletov, 2017) and in the population-based study conducted with individuals aged 10 to 29 years in southern Brazil (Haack et al., 2008). On the other hand, the difference found between men and women, which international studies corroborated (Bowers et al., 2021; Pettigrew et al., 2016; Pinault & Fioletov, 2017), was not found in the Brazilian study with young people (Haack et al., 2008).

As for the phenotype, the predisposition to episodes of sunburn is directly related to the amount of melanin deposited in their skin, and students who reported greater skin sensitivity had a higher prevalence of burns when exposed to solar radiation, similar to what was reported in other studies (Bowers et al., 2021; Haack et al., 2008; Holman et al., 2018). Correspondingly, among the women in this study, white skin color was associated with a higher frequency of reports of sunburn. Such findings indicate that, even among university students with more sensitive skin, a low-risk perception related to sun exposure may be predominant (Bowers et al., 2021; Felts et al., 2010). Corroborating this hypothesis, among women, the results showed a positive association between the outcome and family history of skin cancer. In this sense, a Swedish study with 4,114 people found no differences in the occurrence of burns between people with and without a family history of cancer (Karlsson, Hagberg, Nielsen, Paoli, & Ingvar, 2021). Thus, even though this is a population with presumably greater access to information in the health area, it is possible to think of the influence of beliefs that relate health to tanned skin, especially among younger female university students (Buller et al., 2011; Falk & Anderson, 2013) who may experience greater pressure to appear attractive.

Thus, further studies should investigate mediating aspects of sun exposure and skin protection behaviors, such as beliefs and perceptions of severity and susceptibility to health outcomes such as sunburn and skin cancer among young people. Still, one might think that the more episodic nature of sunburns may contribute to the lack of planning or preventive concerns, especially among young people, which leads us to point out the need to understand the contexts in which preventive behaviors occur (Holman et al., 2021) and how they can influence people's daily lives, becoming part of the routine of these individuals, especially in Brazil, a country with a tropical climate, with a high incidence of sunlight.

Considering the differences between men and women in the present study, the most relevant findings were revealed when considering stratification, indicating that different determination processes may be involved. Although with a lower overall

prevalence of sunburn compared to men, several aspects were associated with the outcome among women, while for them, only increased skin sensitivity remained related. In this regard, it is plausible to think that women's sun exposure behavior would be more susceptible to particular social circumstances, since younger university students and those from a higher economic class had the highest prevalence of sunburn. These findings are in line with other studies with both the general population and young people, although most of them do not highlight results for men and women (Buller et al., 2011; Costa & Weber, 2004; Falk & Anderson, 2013; Haack et al., 2008; Holman et al., 2014). In these studies, younger and wealthier people reported more burns. Thus, one might think that if, on the one hand, among poorer people, difficulties in accessing the use of sunscreen in everyday life may be an essential factor, it seems that among young people predominantly from higher economic classes, having more leisure opportunities would determine greater exposure and occurrence of burns (Holman et al., 2021). The decrease in the prevalence of burns among women with increasing age may be related to greater concerns with self-care and aging. Among men, the difficulty in adopting this and other health care in any context (whether leisure, work or daily life) would be related to social expectations related to the hegemonic pattern of masculinity (Gomes, 2011). In this direction, a study with North American university students found that men had fewer sun protection behaviors, and lower levels of concern about sun exposure compared to women (Yockey, Nabors, Oluwoye, Welker, & Hardee, 2017). Such male behaviour patterns would explain the lack of association between social class and the occurrence of burns, at least in this sample of male university students, predominantly from classes A and B.

Another aspect related to a higher prevalence of sunburn among university students was the report of wearing a hat/cap, which would not be expected. This result can be explained by the fact that, when using this type of suncare photoprotection, women would avoid burns on the face and neck. However, they would not be adequately protected in other parts of the body, such as the upper limbs, chest, abdomen and lower limbs, especially those with lighter skin color and greater sensitivity to solar radiation. Another explanation for the association could be that the students may have started wearing a hat/cap after an episode of sunburn, which could be due to reverse causality.

Also, considering that other protective measures (use of sunscreen, use of long-sleeved shirts, use of shade) did not show a statistically significant association with

the outcome among men or women, it is possible to think that these are not being used correctly. For example, the protection factor used may not be the minimum necessary or not being reapplied as recommended. At the same time, when using these measures, people can feel more protected and, consequently, expose themselves to the sun for longer or at inappropriate times, increasing the risk of burns. In this sense, some studies and reviews discuss the positive association between the frequent use of sunscreen and the appearance of skin changes (Autier, Boniol, & Doré, 2007; Silva, Tavares, Paulitsch, & Zhang, 2018).

The main limitations of the study are related to its cross-sectional nature, where exposures and outcomes are evaluated in the same period. In this sense, longitudinal studies are needed to better elucidate the risk factors for sunburn episodes. In addition, the results could be limited by considering a relatively long recall period (last year) for the outcome, by not assessing the severity of the lesions, and by the possibility of different definitions of sunburn by each individual.

Despite the limitations, the study was based in a rigorous methodology on a relevant outcome and still little investigated in Brazil, especially in the Brazilian Midwest region, which has a high incidence of sunlight. The results highlight the high prevalence of sunburn among college students in the health area, also demonstrating differences between men and women in factors associated with the outcome. The findings can support the development of specific preventive strategies for this population, also expanding knowledge about the behavior of young adults regarding sun exposure.

Conclusions

Prevention campaigns on skin lesions related to exposure to sunlight emphasize the risk of developing skin cancer. However, it should be remembered that a history of sunburn episodes can be considered a risk marker for developing skin tumors. Thus, the results of this study suggest that preventive interventions should focus on the specificities of a predominantly young public with high access to information and socioeconomic possibilities to dialogue with their contexts of life and leisure. The recommendation emphasis on a single sun care photoprotective measure is not enough, and specific educational strategies should also contemplate the articulation between gender, behavior, and health. The university public in the health area must be engaged in informative actions that make them aware of the dangers of spontaneous or

intentional exposure to solar radiation and the adequate use of sun care protective measures so that they become propagating agents of this type of information to the general population. Finally, it is recommended that future studies investigate the role of psychosocial aspects, such as beliefs and body self-image, as well as the social contexts in which sun exposure and sun care photoprotection behaviors occur.

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