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Behaviors, Attitudes, and Knowledge Related to Sun Exposure Among Medical Students at the Universidad de Las Palmas de Gran Canaria[☆]



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Sunburn;
University student

Abstract

Introduction: The incidence of skin cancer, for which the main risk factor is exposure to ultraviolet radiation, has risen worldwide. Sunburn is one of the simplest ways to assess sun exposure habits. To date, few studies have evaluated sun exposure in university students.

Objectives: To determine behaviors, attitudes, and knowledge related to sun exposure and sun protection measures among medical students at the Universidad de Las Palmas de Gran Canaria; and to assess their relation to sunburn frequency.

Material and Methods: The voluntary participants in this cross-sectional survey were first-, third- and sixth-year university students enrolled during the 2016–2017 academic year. The students responded to a validated questionnaire about their habits, attitudes, and knowledge in relation to sun exposure. Respondents were grouped according to the number of sunburns they had experienced during the previous summer.

Results: A total of 286 students responded. The students demonstrated a high level of knowledge, but the percentage who experienced a sunburn was high. Multivariate analysis showed independent correlations between experiencing a sunburn and age, male sex, academic year of enrollment at the time of the survey, phototype, and negative attitudes toward the use of sun protection measures.

Conclusions: Our medical students' level of knowledge about sun exposure and sun protection is high and scarcely varies with time spent at the university. However, their knowledge is not reflected in their behavior and attitudes or in the frequency of sunburns.

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PALABRAS CLAVE

Fotoexposición;
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Cuestionario;
Quemadura solar;
Universitario

Comportamientos, actitudes y conocimientos relacionados con la exposición solar en estudiantes de medicina de la Universidad de Las Palmas de Gran Canaria

Resumen

Introducción: En las últimas décadas se ha producido un aumento en la incidencia de cáncer de piel a nivel mundial, siendo la exposición a la radiación ultravioleta el principal factor de riesgo. La quemadura solar es uno de los parámetros más sencillos para valorar los hábitos de exposición solar. Actualmente existen pocos trabajos que evalúen la fotoexposición en la población universitaria.

Objetivos: Determinar los comportamientos, actitudes y conocimientos sobre fotoexposición y fotoprotección en estudiantes de medicina de la Universidad de Las Palmas de Gran Canaria y su relación con la quemadura solar.

Material y métodos: Se realizó un estudio trasversal mediante participación voluntaria de alumnos de 1.º, 3.º y 6.º matriculados en el curso 2016-2017. Se utilizó un cuestionario validado sobre hábitos, actitudes y conocimientos en exposición solar. Se agruparon según el número de quemaduras solares en el último verano.

Resultados: Participaron 286 alumnos. Si bien los estudiantes mostraron un elevado nivel de conocimiento, se observó un alto porcentaje de quemaduras (70,6%). Tras el análisis multivariante las variables que mostraron una asociación independiente con las quemaduras fueron la edad, el sexo masculino, el curso matriculado, el fototipo y las actitudes negativas con respecto al empleo de fotoprotectores.

Conclusiones: En nuestro ámbito el nivel de conocimientos que presentan los estudiantes de medicina sobre fotoexposición y fotoprotección apenas varía durante la carrera y, a pesar de ser alto, no se refleja en su comportamiento, actitudes ni en la frecuencia de quemaduras solares. © 2018 Elsevier España, S.L.U. y AEDV. Publicado por Elsevier España, S.L.U. Todos los derechos reservados.

Background

Skin cancer refers to a group of tumors with different characteristics and origins, which can be categorized into 2 major groups: melanoma and nonmelanoma skin cancer. In recent decades, the incidence of skin cancer has risen in Spain, Europe, and worldwide.¹⁻⁶ While there are several risk factors, the main cause is still exposure to ultraviolet radiation, especially when there is a history of high accumulated sun exposure and episodes of sunburn during childhood and adolescence.^{1,5,7} Consequently, a history of sunburn is one of the parameters most often used in epidemiological studies to assess sun exposure behaviors, especially in patients with melanoma.⁸

In Spain, knowledge and attitudes related to sun exposure habits and sun protection behaviors have been studied mainly in adolescents and in populations living near beaches along the eastern and southern seaboard of the Iberian peninsula.⁸⁻¹³ There is little data on this topic from the university population,¹² and no validated data is available on the sun exposure habits of people living in the Canary Islands. Questionnaires are the instruments usually used to investigate health-related behaviors; they can be used in population studies and to assess the impact of interventions that have been implemented in the general population.⁹ Medical students are a group in which we can assess attitudes, knowledge, and behaviors in a population with a high level of knowledge about carcinogenesis, making them an ideal study population when our aim is to determine whether having such knowledge influences the individual's

sun exposure habits and photoprotection behavior or has an impact on the frequency of sunburn.

Methodology**Study Design and Population**

We conducted a cross-sectional descriptive study in a group of first-, third-, and sixth-year students enrolled in the 2016-2017 academic year in the medical degree program at the University of Las Palmas de Gran Canaria.

Questionnaire

The questionnaire used was the *Cuestionario a pie de playa (The Beach Questionnaire)*,⁹ validated by De Troya-Martín et al., which comprised sections on personal information (4 items), skin color (1 item), skin phototype (1 item), sunbathing behaviors at the beach (3 items), sunburn from beach exposure, sun protection behaviors at the beach (7 items), attitudes toward sun exposure (14 items), and knowledge related to sun exposure (7 items) (see additional material).

Sunburn was defined as the presence of pain and redness in the skin for more than 12 hours following exposure to the sun.⁹ Attitude was defined as a consistently positive or negative general feeling.⁹ We explored attitudes in 3 dimensions: health, appearance, and pleasure/leisure concerns.

The students completed the questionnaire voluntarily on the Moodle platform of the virtual campus at the University of Las Palmas de Gran Canaria. The data were then exported in an Excel format and anonymized for the rest of the study. All the data were used and stored in accordance with Spanish legislation on data protection (Ley 41/2002 of 14 November and Ley 15/1999 of 15 December) and the study was approved by the ethics committee of the Complejo Hospitalario Universitario Insular-Materno Infantil (Las Palmas de Gran Canaria, Spain).

Statistical Analysis

Age was summarized as means and standard deviations. Categorical variables were expressed in terms of frequencies and percentages. Means were compared using the independent t test, and percentages with the Chi-squared test, the linear-by-linear association test, or Fisher's exact test, as appropriate. To compare the group with no sunburn episodes with those reporting 1 to 2 episodes and those reporting 3 or more episodes, we performed 2 multivariate logistic regression analyses using the variables that were significant in the univariate analysis according to the complete selection algorithm and the Bayesian information criterion. Both models were summarized using P values (and odds ratios (OR) with 95% confidence intervals. The significance threshold was set .05. The data were analyzed using the R package, version 3.1.1 (R Development Core Team, 2016).^{14,15}

Results

In total, 286 of the 411 students in the course completed the questionnaire: 74 (59.2%) were first-year students, 129 (81.1%) were in their third year, and 83 (65.4%) were in the sixth year of their medical studies. Two participants failed to complete the questionnaire and the unanswered questions were treated as lost values.

Descriptive Analysis

Table 1 shows the demographic characteristics of the respondents and the responses grouped by sex.

In total, 70.5% of the participants reported at least 1 sunburn in the previous summer, more men than women ($P = .023$); 69.1% of students said that they always used a sunscreen with a sun protection factor (SPF) of 15 or more. Of note was the more frequent use among women of sunscreens with an SPF of 50 or higher ($P = .045$).

Over half of the respondents expressed favorable attitudes towards sun exposure in most of the statements, with the exception of the statements related to the use of sun protection. Women expressed more agreement with the statement "When I have a tan, clothes look better on me" ($P < .001$). The answers in the section on attitudes changed very little by academic year.

The percentage of correct answers in the knowledge section was over 80% for all the statements except "Avoiding sun exposure when you are young (before 18 years of age) reduces the risk of skin cancer by 80%" (69.7%). Women were more knowledgeable than men about the use of sunscreens;

they had a significantly higher number of correct answers than men in the following statements: "Sunscreens prevent skin aging caused by the ultraviolet radiation in sunlight" ($P = .038$) and "If I use a total protection sunscreen I can stay in the sun all day without risk" ($P = .015$). The responses in the knowledge section did not vary by academic year.

Univariate Analysis

Table 2 summarizes the study variables for all students by sunburn frequency.

Older students and students with more years of study had significantly fewer burns ($P < .001$ for age and academic year). Even so, 50.6% of the students in sixth year reported at least 1 sunburn episode in the previous year. Altogether, 80.9% of men reported at least 1 sunburn as compared to 66% of women ($P = .003$).

The skin color most associated with sunburn was fair (41.6%), although this difference was not statistically significant. Students with low skin phototypes reported fewer sunburns in the previous summer ($P < 0.001$).

The attitudes that correlated most closely with sunburn frequency were "It is worthwhile using sunscreen even though it stops me from tanning", ($P < .001$), "Sunbathing is healthy for my body", ($P = .029$), and "I dislike high protection factor sunscreens because they look unattractive", ($P = .010$). Sunburn frequency was not associated with the percentage of correct answers in the knowledge section, except in the case of the statement "Sunscreens prevent skin aging caused by the ultraviolet radiation in sunlight", ($P = .031$).

Multivariate Analysis

The variables that were statistically significant in the univariate analysis were included in both the logistic analyses (Table 3).

The variables that showed an independent, statistically significant association with a low sunburn frequency (1-2 episodes) were age (OR per year = 0.85) and male sex (OR = 2.24). The variables that showed an independent, statistically significant association with a high frequency of sunburn (≥ 3 episodes) were male sex (OR = 6.83), academic year (sixth year students had a lower risk of sunburn compared to those in their first year [OR = 0.09]), skin phototype (respondents with skin phototype I reported fewer sunburn episodes than those with skin phototype III [OR = 0.14] or IV [OR = 0.07]), "It is worthwhile using sunscreen, even though it stops me from tanning" (for each level of disagreement [OR = 3.37]), and "I dislike high protection factor sunscreens because they look unattractive" (for each level of disagreement [OR = 0.50]).

Discussion

The most significant finding in this study was the very high frequency of sunburn in this population, when one would expect that sunburn frequency would, at least, be lower in medical students than in the general population. Despite the lower sunburn frequency among students with more years of

Table 1 Characteristics of the Participants and Questionnaire Responses.^a

	Total N = 286	Men N = 89	Women N = 197	P
Age, y (SD)	21.3 (3.4)	21.7 (4.4)	21.1 (2.9)	.184
Country of origin				.693
Spain	278 (97.2)	86 (96.6)	192 (97.5)	
Other	8 (2.8)	3 (3.4)	5 (2.5)	
Time resident in the Canary Islands				.339
From birth	273 (95.5)	83 (93.3)	190 (96.4)	
Arrived aged 10 years or older	8 (2.8)	3 (3.4)	5 (2.5)	
Temporary (2-12 months)	5 (1.7)	3 (3.4)	2 (1.0)	
1. Skin color				.065
Very fair	43 (15.0)	6 (6.7)	37 (18.8)	
Fair	119 (41.6)	40 (44.9)	79 (40.1)	
Olive	67 (23.4)	22 (24.7)	45 (22.8)	
2. Skin phototype				.197
Phototype I	41 (14.3)	12 (13.5)	29 (14.7)	
Phototype II	58 (20.3)	17 (19.1)	41 (20.8)	
Phototype III	117 (40.9)	44 (49.4)	73 (37.1)	
Phototype IV	70 (24.5)	16 (18.0)	54 (27.4)	
3. No of sunny days spent at the beach				.182
None	6 (2.1)	1 (1.1)	5 (2.5)	
1-5 days	34 (11.9)	15 (16.9)	19 (9.6)	
6-15 days	63 (22.0)	22 (24.7)	41 (20.8)	
16-30 days	79 (27.6)	26 (29.2)	53 (26.9)	
Over 30 days	104 (36.4)	25 (28.1)	79 (40.1)	
4. Time exposed to sun on beach				.552
Less than 30 minutes	23 (8.0)	5 (5.6)	18 (9.1)	
30 min-1 hour	51 (17.8)	18 (20.2)	33 (16.8)	
1-3 hours	116 (40.6)	39 (43.8)	77 (39.1)	
Over 3 hours	96 (33.6)	27 (30.3)	69 (35.0)	
5. Time spent in sun during midday hours				.372
None	24 (8.4)	8 (9.0)	16 (8.1)	
Less than 1 hour	101 (35.3)	35 (39.3)	66 (33.5)	
1-2 hours	95 (33.2)	30 (33.7)	65 (33.0)	
2-4 hours	59 (20.6)	16 (18.0)	43 (21.8)	
4-6 hours	7 (2.4)	0 (0.0)	7 (3.6)	
6. Sunburn episodes				.023
None	84 (29.4)	17 (19.1)	67 (34.0)	
1-2	150 (52.4)	49 (55.1)	101 (51.3)	
3-5	45 (15.7)	19 (21.3)	26 (13.2)	
6-10	6 (2.1)	4 (4.5)	2 (1.0)	
> 10	1 (0.3)	0 (0.0)	1 (0.5)	
7. I use a beach umbrella				.238
Never	45 (15.7)	16 (18.0)	29 (14.7)	
Rarely	58 (20.3)	24 (27.0)	34 (17.3)	
Sometimes	72 (25.2)	21 (23.6)	51 (25.9)	
Usually	74 (25.9)	20 (22.5)	54 (27.4)	
Always	37 (12.9)	8 (9.0)	29 (14.7)	
8. I wear sunglasses				.207
Never	32 (11.2)	9 (10.1)	23 (11.7)	
Rarely	36 (12.6)	16 (18.0)	20 (10.2)	
Sometimes	53 (18.6)	18 (20.2)	35 (17.9)	
Usually	89 (31.2)	29 (32.6)	60 (30.6)	
Always	75 (26.3)	17 (19.1)	58 (29.6)	
9. I wear a a sun hat or a cap				.011
Never	88 (30.9)	33 (37.1)	55 (28.1)	
Rarely	88 (30.9)	32 (36.0)	56 (28.6)	
Sometimes	57 (20.0)	17 (19.1)	40 (20.4)	
Usually	34 (11.9)	2 (2.2)	32 (16.3)	
Always	18 (6.3)	5 (5.6)	13 (6.6)	

Table 1 (Continued)

	Total N = 286	Men N = 89	Women N = 197	P
<i>10. I wear long sleeves or long pants</i>				.118
Never	136 (47.7)	40 (44.9)	96 (49.0)	
Rarely	56 (19.6)	22 (24.7)	34 (17.3)	
Sometimes	60 (21.1)	14 (15.7)	46 (23.5)	
Usually	29 (10.2)	10 (11.2)	19 (9.7)	
Always	4 (1.4)	3 (3.4)	1 (0.5)	
<i>11. I avoid the sun between midday and 16.00 h</i>				.598
Never	16 (5.6)	3 (3.4)	13 (6.6)	
Rarely	68 (23.9)	24 (27.0)	44 (22.4)	
Sometimes	106 (37.2)	36 (40.4)	70 (35.7)	
Usually	79 (27.7)	22 (24.7)	57 (29.1)	
Always	16 (5.6)	4 (4.5)	12 (6.1)	
<i>12. I use a sunscreen with a protection factor ≥ 15</i>				.165
Never	10 (3.5)	5 (5.6)	5 (2.6)	
Rarely	7 (2.5)	3 (3.4)	4 (2.0)	
Sometimes	30 (10.5)	14 (15.7)	16 (8.2)	
Usually	41 (14.4)	11 (12.4)	30 (15.3)	
Always	197 (69.1)	56 (62.9)	141 (71.9)	
<i>13. I use a sunscreen with a protection factor ≥ 50</i>				.045
Never	28 (9.8)	13 (14.6)	15 (7.7)	
Rarely	38 (13.3)	13 (14.6)	25 (12.8)	
Sometimes	49 (17.2)	18 (20.2)	31 (15.8)	
Usually	79 (27.7)	27 (30.3)	52 (26.5)	
Always	91 (31.9)	18 (20.2)	73 (37.2)	
<i>14. When I have a tan, clothes look better on me</i>				< .001
Strongly agree	73 (25.6)	10 (11.2)	63 (32.1)	
Agree	110 (38.6)	35 (39.3)	75 (38.3)	
Neutral	92 (32.3)	40 (44.9)	52 (26.5)	
Disagree	5 (1.8)	3 (3.4)	2 (1.0)	
Strongly disagree	5 (1.8)	1 (1.1)	4 (2.0)	
<i>15. Sunbathing helps prevent health problems</i>				.245
Strongly agree	18 (6.3)	6 (6.7)	12 (6.1)	
Agree	152 (53.3)	40 (44.9)	112 (57.1)	
Neutral	52 (18.2)	21 (23.6)	31 (15.8)	
Disagree	48 (16.8)	15 (16.9)	33 (16.8)	
Strongly disagree	15 (5.3)	7 (7.9)	8 (4.1)	
<i>16. I like how the sun feels on my skin when I'm lying on the beach</i>				.589
Strongly agree	66 (23.2)	17 (19.1)	49 (25.0)	
Agree	126 (44.2)	40 (44.9)	86 (43.9)	
Neutral	51 (17.9)	15 (16.9)	36 (18.4)	
Disagree	26 (9.1)	10 (11.2)	16 (8.2)	
Strongly disagree	16 (5.6)	7 (7.9)	9 (4.6)	
<i>17. It is worth using sunscreens to prevent future problems</i>				.148
Strongly agree	266 (93.3)	80 (89.9)	186 (94.9)	
Agree	17 (6.0)	7 (7.9)	10 (5.1)	
Neutral	1 (0.4)	1 (1.1)	0 (0.0)	
Strongly disagree	1 (0.4)	1 (1.1)	0 (0.0)	

Table 1 (Continued)

	Total N = 286	Men N = 89	Women N = 197	P
<i>18. I find sunscreen creams disagreeable</i>				.117
Strongly agree	14 (4.9)	8 (9.0)	6 (3.1)	
Agree	42 (14.7)	16 (18.0)	26 (13.3)	
Neutral	55 (19.3)	16 (18.0)	39 (19.9)	
Disagree	90 (31.6)	22 (24.7)	68 (34.7)	
Strongly disagree	84 (29.5)	27 (30.3)	57 (29.1)	
<i>19. It is worth taking the trouble to use sunscreen even if it stops me from tanning</i>				.366
Strongly agree	192 (67.4)	58 (65.2)	134 (68.4)	
Agree	75 (26.3)	22 (24.7)	53 (27.0)	
Neutral	14 (4.9)	7 (7.9)	7 (3.6)	
Disagree	4 (1.4)	2 (2.2)	2 (1.0)	
<i>20. People with tans are more attractive</i>				.502
Strongly agree	28 (9.8)	10 (11.2)	18 (9.2)	
Agree	87 (30.5)	32 (36.0)	55 (28.1)	
Neutral	134 (47.0)	39 (43.8)	95 (48.5)	
Disagree	25 (8.8)	5 (5.6)	20 (10.2)	
<i>21. Sunbathing is healthy for my body</i>				.410
Strongly agree	21 (7.4)	8 (9.0)	13 (6.6)	
Agree	161 (56.5)	43 (48.3)	118 (60.2)	
Neutral	64 (22.5)	24 (27.0)	40 (20.4)	
Disagree	35 (12.3)	12 (13.5)	23 (11.7)	
Strongly disagree	4 (1.4)	2 (2.2)	2 (1.0)	
<i>22. Sunbathing relaxes me</i>				.750
Strongly agree	75 (26.4)	19 (21.6)	56 (28.6)	
Agree	129 (45.4)	42 (47.7)	87 (44.4)	
Neutral	47 (16.5)	17 (19.3)	30 (15.3)	
Disagree	24 (8.5)	7 (8.0)	17 (8.7)	
Strongly disagree	9 (3.2)	3 (3.4)	6 (3.1)	
<i>23. A tan makes me look younger and more relaxed</i>				.953
Strongly agree	29 (10.2)	8 (9.1)	21 (10.7)	
Agree	75 (26.4)	25 (28.4)	50 (25.5)	
Neutral	107 (37.7)	34 (38.6)	73 (37.2)	
Disagree	51 (18.0)	14 (15.9)	37 (18.9)	
Strongly disagree	22 (7.7)	7 (8.0)	15 (7.7)	
<i>24. Sunbathing makes me feel better</i>				.760
Strongly agree	59 (20.8)	18 (20.5)	41 (20.9)	
Agree	123 (43.3)	35 (39.8)	88 (44.9)	
Neutral	76 (26.8)	28 (31.8)	48 (24.5)	
Disagree	16 (5.6)	4 (4.5)	12 (6.1)	
Strongly disagree	10 (3.5)	3 (3.4)	7 (3.6)	
<i>25. I like sunbathing</i>				.069
Strongly agree	85 (29.9)	20 (22.7)	65 (33.2)	
Agree	118 (41.5)	34 (38.6)	84 (42.9)	
Neutral	51 (18.0)	24 (27.3)	27 (13.8)	
Disagree	21 (7.4)	7 (8.0)	14 (7.1)	
Strongly disagree	9 (3.2)	3 (3.4)	6 (3.1)	
<i>26. When I am on the beach I prefer to be in the shade</i>				.707
Strongly agree	36 (12.7)	8 (9.1)	28 (14.3)	
Agree	75 (26.4)	26 (29.5)	49 (25.0)	
Neutral	86 (30.3)	28 (31.8)	58 (29.6)	
Disagree	82 (28.9)	25 (28.4)	57 (29.1)	
Strongly disagree	5 (1.8)	1 (1.1)	4 (2.0)	

Table 1 (Continued)

	Total N = 286	Men N = 89	Women N = 197	P
27. I dislike high protection factor sunscreens because they look unattractive				.656
Strongly agree	2 (0.7)	1 (1.1)	1 (0.5)	
Agree	17 (6.0)	5 (5.7)	12 (6.1)	
Neutral	53 (18.7)	20 (22.7)	33 (16.8)	
Disagree	90 (31.7)	29 (33.0)	61 (31.1)	
Strongly disagree	122 (43.0)	33 (37.5)	89 (45.4)	
28. Sunscreens prevent skin aging caused by exposure to the ultraviolet radiation in sunlight				.038
False	51 (18.0)	22 (25.0)	29 (14.8)	
True	233 (82.0)	66 (75.0)	167 (85.2)	
29. Sun exposure is the leading cause of skin cancer				.660
False	5 (1.8)	2 (2.3)	3 (1.5)	
True	279 (98.2)	86 (97.7)	193 (98.5)	
30. The sun can cause spots on the skin				.342
False	2 (0.7)	0 (0.0)	2 (1.0)	
True	282 (99.3)	88 (100.0)	194 (99.0)	
31. If I use a total-protection sunscreen (sunblock) I can stay in the sun all day without any risk				.015
False	271 (95.4)	80 (90.9)	191 (97.4)	
True	13 (4.6)	8 (9.1)	5 (2.6)	
32. Avoiding the sun during the middle of the day (between 12 and 4 pm) is the most effective way to protect the skin				.336
False	40 (14.1)	15 (17.0)	25 (12.8)	
True	244 (85.9)	73 (83.0)	171 (87.2)	
33. Avoiding sun exposure when you are young (before 18 years of age) reduces the risk of skin cancer by 80%				.645
False	86 (30.3)	25 (28.4)	61 (31.1)	
True	198 (69.7)	63 (71.6)	135 (68.9)	
34. Once my skin is tanned, I do not need to use sunscreen				.342
False	282 (99.3)	88 (100.0)	194 (99.0)	
True	2 (0.7)	0 (0.0)	2 (1.0)	

^a The data are expressed as means (SD) and frequencies (%).

study, half of the final year students continue to report at least 1 sunburn every summer. Moreover, students' attitudes and knowledge remain almost unchanged throughout their studies.

Using the same questionnaire in an adolescent population living in the Costa del Sol area, Fernández-Morano et al. observed a sunburn frequency of 74.4%.¹⁰ During the validation of this questionnaire in a population aged under 14 years living in southern Spain, this percentage was 43.3%,⁹ and a similar frequency (46.9%) was reported in a study carried out on the beach in the Costa del Sol area.⁸ Another study carried out on the beach in Valencia reported a history of sunburn in 70% of respondents, with a higher frequency among adolescents and young adults.¹³ This was the first validated study on sun exposure habits carried out in the

Canary Islands. The possibility of practically year-round sunbathing in our area would explain a greater sunburn frequency than in the population of the Iberian peninsula. In other studies in university students, Lopez-Ravello et al. observed a sunburn frequency of 88.2% in students of the University of Granada.¹² Yurtseven et al. studied students attending the University of Istanbul, 39.6% of whom reported having a sunburn episode at least once in their lives.¹⁶ The authors of another study observed a lack of knowledge and incorrect sun exposure habits among students attending the Faculty of Physical Education and Sports Sciences at the University of Granada but did not investigate history of sunburn episodes.¹⁷

Both age and academic year showed an independent association in the multivariate analysis. The risk of sunburn

Table 2 Characteristics of the Students by Number of Sunburn Episodes.^a

	Total n = 286	None n = 84	1-2 n = 150	≥ 3 n = 52	P
Age, y (SD)	21.3 (3.4)	22.5 (3.9)	20.9 (3.1)	20.3 (2.9)	< .001
Academic year					< .001 ^b
1st	74 (25.9)	14 (16.7)	38 (25.3)	22 (42.3)	
3rd	129 (45.1)	29 (34.5)	77 (51.3)	23 (44.2)	
6th	83 (29.0)	41 (48.8)	35 (23.3)	7 (13.5)	
Sex					.003 ^b
Man	89 (31.1)	17 (20.2)	49 (32.7)	23 (44.2)	
Woman	197 (68.9)	67 (79.8)	101 (67.3)	29 (55.8)	
Country of origin					.259
Spain	278 (97.2)	80 (95.2)	146 (97.3)	52 (100.0)	
Other	8 (2.8)	4 (4.8)	4 (2.7)	0 (0.0)	
Time resident in the Canary Islands					.706
From birth	273 (95.5)	80 (95.2)	142 (94.7)	51 (98.1)	
After age 10	8 (2.8)	3 (3.6)	4 (2.7)	1 (1.9)	
Temporary (2-12 months)	5 (1.7)	1 (1.2)	4 (2.7)	0 (0.0)	
1. Skin color					.125
Very fair	43 (15.0)	12 (14.3)	24 (16.0)	7 (13.5)	
Fair	119 (41.6)	29 (34.5)	59 (39.3)	31 (59.6)	
Olive	67 (23.4)	23 (27.4)	36 (24.0)	8 (15.4)	
Dark	57 (19.9)	20 (23.8)	31 (20.7)	6 (11.5)	
2. Skin phototype					< .001
Phototype I	41 (14.3)	9 (10.7)	19 (12.7)	13 (25.0)	
Phototype II	58 (20.3)	13 (15.5)	28 (18.7)	17 (32.7)	
Phototype III	117 (40.9)	31 (36.9)	67 (44.7)	19 (36.5)	
Phototype IV	70 (24.5)	31 (36.9)	36 (24.0)	3 (5.8)	
3. No of sunny days at beach					.148
None	6 (2.1)	2 (2.4)	1 (0.7)	3 (5.8)	
1-5 days	34 (11.9)	11 (13.1)	19 (12.7)	4 (7.7)	
6-15 days	63 (22.0)	18 (21.4)	32 (21.3)	13 (25.0)	
16-30 days	79 (27.6)	17 (20.2)	43 (28.7)	19 (36.5)	
More than 30 days	104 (36.4)	36 (42.9)	55 (36.7)	13 (25.0)	
4. Time spent in the sun on beach					0.515
Less than 30 minutes	23 (8.0)	6 (7.1)	11 (7.3)	6 (11.5)	
30 min-1 hour	51 (17.8)	18 (21.4)	27 (18.0)	6 (11.5)	
1-3 hours	116 (40.6)	30 (35.7)	60 (40.0)	26 (50.0)	
Over 3 hours	96 (33.6)	30 (35.7)	52 (34.7)	14 (26.9)	
5. Time spent sunbathing during the middle of the day					.268
None	24 (8.4)	11 (13.1)	11 (7.3)	2 (3.8)	
Less than 1 hour	101 (35.3)	35 (41.7)	50 (33.3)	16 (30.8)	
1-2 hours	95 (33.2)	20 (23.8)	53 (35.3)	22 (42.3)	
2-4 hours	59 (20.6)	17 (20.2)	31 (20.7)	11 (21.2)	
4-6 hours	7 (2.4)	1 (1.2)	5 (3.3)	1 (1.9)	
7. I use a beach umbrella					.378
Never	45 (15.7)	13 (15.5)	24 (16.0)	8 (15.4)	
Rarely	58 (20.3)	18 (21.4)	28 (18.7)	12 (23.1)	
Sometimes	72 (25.2)	16 (19.0)	40 (26.7)	16 (30.8)	
Usually	74 (25.9)	20 (23.8)	41 (27.3)	13 (25.0)	
Always	37 (12.9)	17 (20.2)	17 (11.3)	3 (5.8)	
8. I wear sunglasses					.606
Never	32 (11.2)	7 (8.3)	17 (11.4)	8 (15.4)	
Rarely	36 (12.6)	10 (11.9)	18 (12.1)	8 (15.4)	
Sometimes	53 (18.6)	16 (19.0)	26 (17.4)	11 (21.2)	
Usually	89 (31.2)	26 (31.0)	45 (30.2)	18 (34.6)	
Always	75 (26.3)	25 (29.8)	43 (28.9)	7 (13.5)	

Table 2 (Continued)

	Total n = 286	None n = 84	1-2 n = 150	≥ 3 n = 52	P
<i>9. I wear a sun hat or cap</i>					.626
Never	88 (30.9)	24 (28.6)	46 (30.9)	18 (34.6)	
Rarely	88 (30.9)	22 (26.2)	47 (31.5)	19 (36.5)	
Sometimes	57 (20.0)	17 (20.2)	31 (20.8)	9 (17.3)	
Usually	34 (11.9)	14 (16.7)	15 (10.1)	5 (9.6)	
Always	18 (6.3)	7 (8.3)	10 (6.7)	1 (1.9)	
<i>10. I wear long sleeves or long trousers</i>					.064
Never	136 (47.7)	35 (41.7)	79 (53.0)	22 (42.3)	
Rarely	56 (19.6)	12 (14.3)	29 (19.5)	15 (28.8)	
Sometimes	60 (21.1)	25 (29.8)	27 (18.1)	8 (15.4)	
Usually	29 (10.2)	9 (10.7)	13 (8.7)	7 (13.5)	
Always	4 (1.4)	3 (3.6)	1 (0.7)	0 (0.0)	
<i>11. I avoid the sun between 12 and 4 pm</i>					.458
Never	16 (5.6)	4 (4.8)	9 (6.0)	3 (5.8)	
Rarely	68 (23.9)	18 (21.4)	36 (24.2)	14 (26.9)	
Sometimes	106 (37.2)	28 (33.3)	53 (35.6)	25 (48.1)	
Usually	79 (27.7)	27 (32.1)	43 (28.9)	9 (17.3)	
Always	16 (5.6)	7 (8.3)	8 (5.4)	1 (1.9)	
<i>12. I use a sunscreen with a protection factor ≥ 15</i>					.275
Never	10 (3.5)	2 (2.4)	7 (4.7)	1 (1.9)	
Rarely	7 (2.5)	2 (2.4)	5 (3.4)	0 (0.0)	
Sometimes	30 (10.5)	12 (14.3)	12 (8.1)	6 (11.5)	
Usually	41 (14.4)	6 (7.1)	26 (17.4)	9 (17.3)	
<i>13. I use a sunscreen with a protection factor ≥ 50</i>					.149
Never	28 (9.8)	5 (6.0)	18 (12.1)	5 (9.6)	
Rarely	38 (13.3)	16 (19.0)	19 (12.8)	3 (5.8)	
Sometimes	49 (17.2)	15 (17.9)	24 (16.1)	10 (19.2)	
Usually	79 (27.7)	18 (21.4)	40 (26.8)	21 (40.4)	
Always	91 (31.9)	30 (35.7)	48 (32.2)	13 (25.0)	
<i>14. Clothes look better on me when I have a tan</i>					.686
Strongly agree	73 (25.6)	22 (26.2)	36 (24.2)	15 (28.8)	
Agree	110 (38.6)	29 (34.5)	64 (43.0)	17 (32.7)	
Neutral	92 (32.3)	31 (36.9)	43 (28.9)	18 (34.6)	
Disagree	5 (1.8)	0 (0.0)	4 (2.7)	1 (1.9)	
Strongly disagree	5 (1.8)	2 (2.4)	2 (1.3)	1 (1.9)	
<i>15. Sunbathing helps prevent health problems</i>					.622
Strongly agree	18 (6.3)	5 (6.0)	11 (7.4)	2 (3.8)	
Agree	152 (53.3)	50 (59.5)	80 (53.7)	22 (42.3)	
Neutral	52 (18.2)	13 (15.5)	27 (18.1)	12 (23.1)	
Disagree	48 (16.8)	12 (14.3)	23 (15.4)	13 (25.0)	
Strongly disagree	15 (5.3)	4 (4.8)	8 (5.4)	3 (5.8)	
<i>16. I like how the sun feels on my skin when I am lying on the beach</i>					.161
Strongly agree	66 (23.2)	22 (26.2)	35 (23.5)	9 (17.3)	
Agree	126 (44.2)	28 (33.3)	71 (47.7)	27 (51.9)	
Neutral	51 (17.9)	15 (17.9)	25 (16.8)	11 (21.2)	
Disagree	26 (9.1)	10 (11.9)	13 (8.7)	3 (5.8)	
Strongly disagree	16 (5.6)	9 (10.7)	5 (3.4)	2 (3.8)	
<i>17. It is worth the trouble to use sunscreen to avoid problems in the future</i>					.337
Strongly agree	266 (93.3)	81 (96.4)	137 (91.9)	48 (92.3)	
Agree	17 (6.0)	3 (3.6)	11 (7.4)	3 (5.8)	
Neutral	1 (0.4)	0 (0.0)	1 (0.7)	0 (0.0)	
Strongly disagree	1 (0.4)	0 (0.0)	0 (0.0)	1 (1.9)	

Table 2 (Continued)

	Total n = 286	None n = 84	1-2 n = 150	≥ 3 n = 52	P
18. Sunscreens do not feel good on my skin					.554
Strongly agree	14 (4.9)	2 (2.4)	8 (5.4)	4 (7.7)	
Agree	42 (14.7)	11 (13.1)	24 (16.1)	7 (13.5)	
Neutral	55 (19.3)	12 (14.3)	34 (22.8)	9 (17.3)	
Disagree	90 (31.6)	31 (36.9)	41 (27.5)	18 (34.6)	
Strongly disagree	84 (29.5)	28 (33.3)	42 (28.2)	14 (26.9)	
19. It is worthwhile using sunscreen even if I do not get a tan					< .001 ^b
Strongly agree	192 (67.4)	70 (83.3)	94 (63.1)	28 (53.8)	
Agree	75 (26.3)	12 (14.3)	46 (30.9)	17 (32.7)	
Neutral	14 (4.9)	2 (2.4)	6 (4.0)	6 (11.5)	
Disagree	4 (1.4)	0 (0.0)	3 (2.0)	1 (1.9)	
20. People with tans are more attractive					.906
Strongly agree	28 (9.8)	8 (9.5)	14 (9.4)	6 (11.5)	
Agree	87 (30.5)	24 (28.6)	44 (29.5)	19 (36.5)	
Neutral	134 (47.0)	39 (46.4)	74 (49.7)	21 (40.4)	
Disagree	25 (8.8)	8 (9.5)	12 (8.1)	5 (9.6)	
Strongly disagree	11 (3.9)	5 (6.0)	5 (3.4)	1 (1.9)	
21. Sunbathing is healthy for my body					.029
Strongly agree	21 (7.4)	4 (4.8)	14 (9.4)	3 (5.8)	
Agree	161 (56.5)	51 (60.7)	88 (59.1)	22 (42.3)	
Neutral	64 (22.5)	18 (21.4)	32 (21.5)	14 (26.9)	
Disagree	35 (12.3)	8 (9.5)	14 (9.4)	13 (25.0)	
Strongly disagree	4 (1.4)	3 (3.6)	1 (0.7)	0 (0.0)	
22. Sunbathing relaxes me					.170
Strongly agree	75 (26.4)	19 (22.6)	40 (27.0)	16 (30.8)	
Agree	129 (45.4)	36 (42.9)	69 (46.6)	24 (46.2)	
Neutral	47 (16.5)	12 (14.3)	25 (16.9)	10 (19.2)	
Disagree	24 (8.5)	11 (13.1)	11 (7.4)	2 (3.8)	
Strongly disagree	9 (3.2)	6 (7.1)	3 (2.0)	0 (0.0)	
23. Having a tan makes me look younger and more relaxed					.144
Strongly agree	29 (10.2)	8 (9.5)	13 (8.8)	8 (15.4)	
Agree	75 (26.4)	19 (22.6)	46 (31.1)	10 (19.2)	
Neutral	107 (37.7)	27 (32.1)	56 (37.8)	24 (46.2)	
Disagree	51 (18.0)	19 (22.6)	25 (16.9)	7 (13.5)	
Strongly disagree	22 (7.7)	11 (13.1)	8 (5.4)	3 (5.8)	
24. Sunbathing makes me feel better					.098
Strongly agree	59 (20.8)	19 (22.6)	32 (21.6)	8 (15.4)	
Agree	123 (43.3)	29 (34.5)	71 (48.0)	23 (44.2)	
Neutral	76 (26.8)	23 (27.4)	35 (23.6)	18 (34.6)	
Disagree	16 (5.6)	6 (7.1)	8 (5.4)	2 (3.8)	
Strongly disagree	10 (3.5)	7 (8.3)	2 (1.4)	1 (1.9)	
25. I like sunbathing					.323
Strongly agree	85 (29.9)	25 (29.8)	45 (30.4)	15 (28.8)	
Agree	118 (41.5)	31 (36.9)	65 (43.9)	22 (42.3)	
Neutral	51 (18.0)	16 (19.0)	23 (15.5)	12 (23.1)	
Disagree	21 (7.4)	6 (7.1)	13 (8.8)	2 (3.8)	
Strongly disagree	9 (3.2)	6 (7.1)	2 (1.4)	1 (1.9)	
26. When I am on the beach I prefer to sit in the shade					.627
Strongly agree	36 (12.7)	15 (17.9)	15 (10.1)	6 (11.5)	
Agree	75 (26.4)	21 (25.0)	42 (28.4)	12 (23.1)	
Neutral	86 (30.3)	24 (28.6)	42 (28.4)	20 (38.5)	
Disagree	82 (28.9)	22 (26.2)	46 (31.1)	14 (26.9)	

Table 2 (Continued)

	Total n = 286	None n = 84	1-2 n = 150	≥ 3 n = 52	P
27. I dislike high protection factor sunscreens because they look unattractive					< .001 ^b
Strongly agree	2 (0.7)	0 (0.0)	1 (0.7)	1 (1.9)	
Agree	17 (6.0)	4 (4.8)	11 (7.4)	2 (3.8)	
Neutral	53 (18.7)	9 (10.7)	27 (18.2)	17 (32.7)	
Disagree	90 (31.7)	23 (27.4)	48 (32.4)	19 (36.5)	
Strongly disagree	122 (43.0)	48 (57.1)	61 (41.2)	13 (25.0)	
28. Sunscreens prevent skin aging caused by exposure to the ultraviolet radiation in sunlight					.031
False	51 (18.0)	9 (10.7)	35 (23.6)	7 (13.5)	
True	233 (82.0)	75 (89.3)	113 (76.4)	45 (86.5)	
29. Sun exposure is the leading cause of skin cancer					.321
False	5 (1.8)	0 (0.0)	4 (2.7)	1 (1.9)	
True	279 (98.2)	84 (100.0)	144 (97.3)	51 (98.1)	
30. Exposure to sunlight causes spots on the skin					.396
False	2 (0.7)	0 (0.0)	2 (1.4)	0 (0.0)	
True	282 (99.3)	84 (100.0)	146 (98.6)	52 (100.0)	
31. If I use a total sunblock I can stay in the sun all day without risk					.486
False	271 (95.4)	81 (96.4)	142 (95.9)	48 (92.3)	
True	13 (4.6)	3 (3.6)	6 (4.1)	4 (7.7)	
32. Avoiding the sun during the middle of the day (12-4 pm) is the most effective way of protecting the skin from the sun					.420
False	40 (14.1)	14 (16.7)	17 (11.5)	9 (17.3)	
True	244 (85.9)	70 (83.3)	131 (88.5)	43 (82.7)	
33. Avoiding excessive exposure to sunlight before the age of 18 reduces the risk of skin cancer by 80%					.442
False	86 (30.3)	22 (26.2)	45 (30.4)	19 (36.5)	
True	198 (69.7)	62 (73.8)	103 (69.6)	33 (63.5)	
34. Once my skin is tanned I no longer need to use sun protection measures					.721
False	282 (99.3)	83 (98.8)	147 (99.3)	52 (100)	
True	2 (0.7)	1 (1.2)	1 (0.7)	0	

^a The data are expressed as means (SD) and frequencies (%).

^b Linear association test

decreased as the students advanced in their studies. This decline could be explained by the lack of maturity and scant awareness of the risk of disease among younger people.¹⁸ Another reason for the decline could be that as students advance in their studies, their medical knowledge increases and they become more aware of the medical facts, and place a greater value on their own health. Despite this, the percentage of sixth year students in our study who reported sunburn episodes was high.

In our study, male sex was associated with sunburns, but the data on this association in earlier studies in inconsistent.^{8,10,13} Our finding could be due to the fact that the women used more sunscreen and products that had a higher SPF. In a literature review on skin cancer prevention published by Stanton et al. in 2004, several of the articles

included indicated that men and young people are at greater risk of sunburn. Those authors also noted that women were more knowledgeable about skin cancer and tended to exhibit more protective behaviors. This is in contradiction with the fact that women are more likely than men to perceive tanning as desirable,^{11,13} a finding confirmed in our study.

In our study, a low skin phototype was a protective factor, by contrast with the results of other studies in which phototypes I, II and III are compared with phototype IV.⁸ Probably students with phototypes I and II have suffered severe sunburn in the past and are more aware of the need for protective habits and measures, while individuals with higher skin phototypes do not make adequate use of sunscreens or use them to increase the length of exposure to the sun.^{11,19,20}

Table 3 Multivariate Logistic Regression.

	Low Grade Burns vs No Burn		High Grade Burns vs No Burn	
	P	OR (95% CI)	P	OR (95% CI)
Age, by year	.001	0.85 (0.77; 0.94)	-	-
Male sex	.019	2.24 (1.14; 4.38)	< .001	6.83 (2.23; 20.89)
Academic year				
1st (Ref.)	-	-	-	1
3rd	-	-	.526	0.68 (0.21; 2.22)
6th	-	-	.002	0.09 (0.02; 0.42)
2. Skin phototype				
Phototype I (Ref.)	-	-	-	1
Phototype II	-	-	.542	1.59 (0.36; 7.09)
Phototype III	-	-	.010	0.14 (0.03; 0.62)
Phototype IV	-	-	.003	0.07 (0.01; 0.40)
19. It is worthwhile using sunscreen even though it stops me from tanning, by academic year.			.014	3.37 (1.28; 8.90)
27. I dislike high protection factor sunscreens because they look unattractive, by academic year.	-	-	.012	0.50 (0.29; 0.86)

In our study and in those mentioned above,^{8-13,16} the photoprotection measure most often used were topical sunscreens. The statement "It is worthwhile using sunscreen even though it stops me from tanning" was negatively associated with sunburn. The statement "I dislike high protection creams because they look unattractive" was positively associated with sunburn. These findings highlight the importance of developing cosmetically acceptable, high SPF topical sunscreens that are easy to apply and would facilitate adherence to sun protection measures in the general population.

The percentage of knowledge questions answered correctly was very high, and this did not vary across the 3 academic years. In spite of this, the students expressed positive attitudes toward sun exposure and reported inadequate use of photoprotection, a phenomenon that has already been described.^{13,19} The authors of a study of Australian adolescents concluded that a high level of knowledge is not related to the adequate use of photoprotection and that attempts to modify attitudes and behaviors in adolescents have limited success.²¹ The question with the lowest percentage of correct answers was perhaps the most specific: "Avoiding sun exposure when you are young (before 18 years of age) reduces the risk of skin cancer by 80%." Prevention campaigns tend to focus on the overall risk of skin cancer and not emphasize that children and adolescents are the population in which the impact of exposure on the future of skin cancer is greatest.

The main limitation of our work is that the study population was geographically and sociologically delimited, so the data cannot be extrapolated to the population as a whole. Moreover, it was a cross-sectional study based on a questionnaire which, although specifically designed and validated for this type of study, may be susceptible to memory bias or a desire to provide socially desirable answers. Our work does show that a thorough knowledge of the risks of sun exposure and its relationship with skin cancer is not necessarily associated with proper preventive behaviors or a lower frequency of sunburn, even in a presumably sensitized population, such

as a group of medical students including those who have completed 6 years of advanced studies and have studied skin disease.

Conclusions

Our findings, obtained in a selected population with the maximum possible knowledge about sun exposure, suggest that photoprotection campaigns should focus more on modifying attitudes than providing knowledge. To do this, they need to influence the population at a younger age and look for other possible strategies, such as using social referents (athletes, actors, or singers) as models.²¹ At the same time, the current aesthetic model needs to be modified because darker skin tone is still synonymous with beauty.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at [doi:10.1016/j.adengl.2018.10.025](https://doi.org/10.1016/j.adengl.2018.10.025).

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