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CASE AND RESEARCH LETTERS

Risk Factors for Melanoma in a Latin American Population: A Case-Control Study*

Factores de riesgo para melanoma en una población latinoamericana: estudio de casos y controles

To the Editor,

Melanoma incidence continues to rise in different populations and ethnic groups worldwide¹⁻³. Epidemiological data and known risk factors for melanoma are mostly based on studies of US, Australian, and European populations. Very few population-based studies have been conducted in Latin American or Hispanic communities⁴.

Latin America is known for its significant ethnic diversity secondary to interracial relationships that vary from one country to the next depending on population structure and migration history. In Colombia, for example, the population is the result of interactions between indigenous/native populations, Spanish people, and Africans, with mestizos representing the largest segment. The aim of this study was to identify possible risk factors for cutaneous melanoma in a Colombian population in the city of Medellín, Colombia.

We conducted a retrospective age- and sex-matched case-control study. Cases were patients with a histopathologically confirmed diagnosis of in situ or invasive melanoma, while controls were randomly selected patients without a personal history of melanoma who were seen for any dermatologic condition. The ratio of cases to controls was 1:2. We analyzed the medical records of patients older than 18 years seen at the Dermatology Department of Clínica Aurora, a specialized skin cancer center, in Medellín between May 2014 and October 2017. We included both incident and prevalent cases of melanoma. In other words, we studied patients newly diagnosed with melanoma during the study period and those with an existing diagnosis. The required sample size was estimated at 62 cases and 125 controls

based on an alpha error of 5%, a beta error of 20% (95% confidence level and 80% statistical power) and an odds ratio (OR) of 3 associated with the presence of multiple melanocytic nevi as the main risk factor for melanoma. The calculations were performed in the statistical software program Epi Info.

We analyzed the medical records of 187 patients (62 cases and 125 controls). Their phenotypic, sociodemographic, and sun exposure characteristics are given in [Table 1](#). [Table 2](#) summarizes the characteristics of the patients with melanoma, while [Table 3](#) presents the results of the bivariate and multivariate analyses.

Similarly to previous reports in the literature⁵⁻⁷, our multivariate analysis showed that patients with melanoma were more likely to have a history of recreational or intermittent sun exposure (OR = 4.2; 95% CI, 1.8-9.6) and a lifetime history of sunburn (OR = 5.6; 95% CI, 2.2-14.6), suggesting that these patterns of exposure are risk factors for melanoma in our study population. By contrast, use of 2 or more sun protection measures exerted a protective effect (OR = 0.2; 95% CI, 0.1-0.5). Unlike other studies, we did not observe an association between number of common or atypical nevi and melanoma risk^{5,8}. We observed a protective effect for a personal history of basal cell carcinoma, possibly because the control population was selected from a specialized center, where patients with skin cancer predominate and basal cell carcinoma would be expected to be relatively common.

Our study has some limitations. First, the controls were selected from a referral center for patients with skin cancer and their exposure habits may not therefore be representative of the general population in the area, possibly resulting in an overestimation of the proportion of patients with a history of skin cancer and biasing our results for use of sun protection measures, access to health care, and level of education. Second, recall bias may have affected the accuracy or completeness of important data for our analyses, as some of the information was based on subjective perceptions of past events the patients may not have remembered.

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Table 1 Sociodemographic, Phenotypic, and UV Radiation Exposure Characteristics.

Variable	Controls N = 125 (%)	Cases N = 62 (%)	Total N = 187 (%)
Sociodemographic characteristics			
<i>Sex</i>			
Male	61 (49)	35 (56)	96 (51)
Female	64 (51)	27 (44)	91 (49)
Median age (interquartile range), y ^a	53 (37-63)	53 (35-66)	
<i>Civil status</i>			
Married	93 (74)	44 (71)	137 (73)
Single	32 (26)	18 (29)	50 (27)
<i>Place of residence</i>			
Urban	106 (85)	58 (94)	164 (88)
Rural	15 (12)	2 (3)	17 (9)
Abroad	4 (3)	2 (3)	6 (3)
<i>Social security regime</i>			
None	10 (8)	7 (11)	17 (9)
Subsidized	1 (1)	1 (2)	2 (1)
Contributive	19 (15)	7(11)	26 (14)
Policy	95 (76)	47(76)	142 (76)
Phenotypic characteristics			
<i>Red/blonde hair</i>	13 (10)	7 (11)	20 (10)
<i>Blue/green/gray eyes</i>	22 (18)	13 (21)	35 (19)
<i>Facial freckles</i>	4 (3)	0 (0)	4 (2)
<i>Fitzpatrick skin type I or II</i>	34 (27)	10 (6)	44 (23)
<i>> 5 clinically dysplastic nevi or at least 2 per condition</i>	15 (12)	18 (29)	33 (17)
<i>Sun-damaged skin</i>	103 (82)	46 (74)	149 (80)
<i>Personal history of melanoma</i>	5 (4)	5 (8)	10 (5)
<i>Personal history of nonmelanoma skin cancer</i>	23 (18)	6 (10)	29 (15)
<i>Family history of melanoma in a first- to third-degree relative</i>	14 (11)	10 (16)	24 (13)
<i>Number of common nevi</i>			
0-20	44 (35)	8 (13)	52 (28)
20-50	32 (25)	10 (16)	42 (22)
50-100	17 (14)	12 (19)	29 (16)
> 100	27 (22)	11 (18)	38 (20)
Not described	5 (4)	21 (34)	26 (14)
<i>Number of nevi on trunk and upper extremities (based on photographs)</i>			
0-20	45 (36)	8 (13)	53 (29)
20-50	32 (26)	12 (19)	44 (23)
50-100	23 (18)	11 (18)	34 (18)
> 100	18 (14)	10 (16)	28 (15)
Not described	7 (6)	21 (34)	28 (15)
<i>Nevi: predominant dermoscopic pattern</i>			
Reticular diffuse	78 (62)	24 (38)	102 (54)
Reticular patchy	4 (3)	0 (0)	4 (2)
Peripheral reticular pattern with central hypopigmentation	0 (0)	0 (0)	0 (0)
Peripheral reticular pattern with central hyperpigmentation	0 (0)	1 (2)	1 (1)
Peripheral reticular pattern with central hypopigmentation	0(0)	0 (0)	0 (0)
Homogenous pattern	2 (2)	0 (0)	2 (1)
Peripheral globules	1 (1)	0 (0)	1 (1)
Globular	1 (1)	0 (0)	1 (1)
Two components	7 (6)	5 (8)	12 (6)
Multiple components	0 (0)	1 (2)	1 (1)
Not described	32 (26)	31 (50)	63 (33)

Table 1 (Continued)

Variable	Controls N = 125 (%)	Cases N = 62 (%)	Total N = 187 (%)
<i>Congenital melanocytic nevus</i>			
None	117 (93)	59 (96)	176 (94)
Small (< 1.5 cm)	8 (6)	0 (0)	8 (4)
Median (1.6-19.9 cm)	0 (0)	2 (3)	2 (1)
Large (> 20 cm)	0 (0)	1 (1)	1 (1)
<i>Solar lentigines</i>			
In 1 area	66 (53)	32 (52)	98 (52)
In 2 areas	44 (35)	21 (34)	65 (35)
In ≥3 areas	15 (12)	8 (13)	23 (12)
Not described	0 (0)	1 (1)	1 (1)
<i>Actinic keratosis</i>			
None	104 (83)	47 (76)	151 (81)
< 10	17 (14)	7 (11)	24 (13)
> 10	4 (3)	8 (13)	12 (6)
<i>History of another cancer</i>			
No	119 (95)	61 (99)	180 (96)
Yes	6 (5)	1 (1)	7 (4)
<i>Chronic immunosuppression</i>			
No	125 (100)	62 (100)	187 (100)
Yes	0 (0)	0 (0)	0 (0)
<i>Genodermatosis</i>			
No	125 (100)	62 (100)	187 (100)
Yes	0(0)	0 (0)	0 (0)
<i>Parkinson disease</i>			
No	124 (99)	62 (100)	186 (99)
Yes	1 (1)	0 (0)	1 (1)
UV radiation exposure			
<i>Skin reaction to sunlight</i>			
No effect	0 (0)	0 (0)	0 (0)
Tan	17 (14)	12 (19)	29 (16)
Mild sunburn then tan	75 (60)	30 (48)	105 (56)
Sunburn without blisters	29 (23)	13 (21)	42 (22)
Sunburn with blisters	3 (2)	1 (2)	4 (2)
Not described	1 (1)	6 (10)	7 (4)
<i>Lifetime history of sunburn</i>			
No episodes	68 (54)	13 (21)	81 (43)
< 3 episodes	34 (28)	25 (40)	59 (32)
> 3 episodes	22 (17)	6 (10)	28 (15)
	1 (1)	18 (29)	19 (10)
<i>Sunburn before age of 20 years</i>			
No	74 (59)	16 (26)	90 (48)
Yes	50 (40)	29 (47)	79 (42)
Not described	1 (1)	17 (27)	18 (10)
<i>Frequency of sunscreen use</i>			
Never	17 (13)	7 (11)	24 (13)
Only during intense sun exposure	14 (11)	3 (5)	17 (9)
Occasional	22 (18)	11 (18)	33 (17)
Once a week	1 (1)	0 (0)	1 (1)
Once a day	66 (53)	29 (47)	95 (51)
At least twice a day	5 (4)	0 (0)	5 (3)
Not described	0 (0)	12 (19)	12 (6)

(Continued)

Variable	Controls N = 125 (%)	Cases N = 62 (%)	Total N = 187 (%)
<i>Frequency of use of other sun protection measures</i>			
Never	13 (11)	8 (13)	21 (12)
Sometimes	53 (42)	25 (40)	78 (42)
Often	56 (45)	13 (21)	69 (37)
Always	3 (2)	0 (0)	0 (0)
Not described	0 (0)	16 (26)	16 (9)
<i>Lifetime use of physical sun protection measures</i>			
1 method	24 (19)	19 (31)	43 (23)
2 methods	89 (71)	27 (43)	116 (62)
3 or more methods	12 (10)	0 (0)	12 (6)
Not described	0 (0)	16 (26)	16 (9)
<i>Use of sunscreen before age of 18 years</i>			
Never	47 (38)	20 (32)	67 (36)
Sometimes	65 (52)	24 (39)	89 (47)
Often	1 (1)	0 (0)	1 (1)
Always	0 (0)	0 (0)	0 (0)
Not described	12 (9)	18 (29)	30 (16)
<i>Use of tanning booths</i>			
Never	111 (89)	39 (63)	150 (80)
Yes, before age of 25 years	6 (5)	3 (5)	9 (5)
Yes, after age of 25 years	8 (6)	4 (6)	12 (6)
Not described	0	16 (26)	16 (9)
<i>History of sunburn</i>			
None	84 (67)	17 (28)	101 (54)
Intermittent	31 (25)	31 (50)	62 (33)
Chronic	9 (7)	2 (3)	11 (6)
Not described	1 (1)	12 (19)	13 (7)
At least 1 modifiable factor ^b			101 (54)
At least 1 nonmodifiable factor ^b			48 (26)

^a Interquartile range: minimum, 18 years; maximum, 88 years.

^b Nonmodifiable factors refer to phenotypic characteristics.

80 In conclusion, recreational or intermittent sun expo-
81 sure and a lifetime history of sunburn were risk factors
82 for melanoma in our study population, while use of 2 or
83 more sun protection measures exerted a protective effect.
Our findings are consistent with reports from different

84 regions in the world, indicating that UV radiation plays an
85 important role in populations other than Whites and that
86 primary prevention efforts are also essential for prevent-
87 ing skin cancer in mestizo populations such as those in
Colombia.

Table 2 Characteristics of Patients With Melanoma (n = 62).

Variable	N = 62 (%)
<i>Person who detected the lesion</i>	
Patient	5 (8)
Dermatologist	56 (90)
Another doctor	1 (2)
<i>Tumor site</i>	
Extremities	24 (39)
Trunk	21 (34)
Head and neck	13 (21)
Abdomen	4 (6)
<i>Dermoscopic features</i>	
Atypical network	22 (35)
Atypical globules	15 (24)
Atypical vessels	9 (15)
Regression	7 (11)
Crystalline structures	6 (10)
Multicomponent	31 (50)
Not described	13 (21)
<i>Histologic features</i>	
Melanoma in situ	41 (66)
Invasive	21 (34)
Breslow thickness < 0.8 mm	15 (24)
Breslow thickness > 0.8 mm	6 (10)
Ulceration	1 (2)
Regression	5 (8)
Perineural invasion	1 (2)
Lymphovascular invasion	0
Microsatellites	0
<i>Histologic subtype</i>	
Superficial spreading	21 (34)
Nodular	6 (10)
Lentigo maligna	8 (13)
Acral lentiginous	2 (3)
Other: blue nevus-like	1 (2)
<i>Mitoses/mm²</i>	
Not applicable	39 (63)
< 1	11 (18)
> 1	12 (19)
<i>Growth phase</i>	
Radial	53 (85)
Vertical	9 (15)
<i>Staging</i>	
In situ	41 (66)
I	16 (26)
II	2 (3)
III	2 (3)
IV	1 (2)

Table 3 Bivariate and Multivariate Analysis of Risk Factors for Melanoma.

Bivariate analysis	P Value	Odds Ratio (95% CI)
<i>Hair color</i>		
Blonde/red	.802	1 (0.4-3.1)
Light Fitzpatrick skin type	.279	1 (0.5-2.5)
<i>Eye color</i>		
Blue/green/gray	.547	1.3 (0.6-2.8)
<i>Personal history of squamous cell carcinoma</i>		
Use of tanning booths	.779	1.4 (0.3-5.9)
Frequency of tanning booth use	.567	1.42 (0.5-4.9)
Presence of actinic keratosis	.242	1.5 (0.7-3.3)
No. of common nevi	.085	1.7 (0.6-4.8)
History of melanoma in a first- to third-degree relative	.767	1.7 (0.5-6.1)
Personal history of melanoma	.245	2.1 (0.6-7.5)
Number of nevi on trunk and upper extremities	.158	2.1 (0.8-5.7)
Dysplastic nevus	.022	2.5 (1.1-5.7)
Sunburn before age of 20 years	.005	2.6 (1.3-5.4)
≥ 1 predominant dermoscopic pattern	.06	2.9 (0.9-9.6)
Lifetime history of sunburn	.003	3.8 (1.7-8.4)
Recreational sun exposure	< .001	4.9 (2.4-10.1)
Presence of sun-damaged skin	.246	0.6 (0.3-1.3)
Personal history of basal cell carcinoma	.037	0.2 (0.0-0.9)
Congenital nevus	.502	0.4 (0.1-2.4)
Use of sun protection methods	.978	0.9 (0.4-1.9)
Physical sun protection	.040	0.3 (0.2-0.8)
Sun protection before age of 18 years	.660	1.1 (0.6-2.4)
Multivariate analysis ^a		OR (95% CI)
History of sunburn		5.63 (2.2-14.6)
History of reactive sun exposure		4.17 (1.8-9.6)
Use of 2 or more physical sun protection measures		0.19 (0.1-0.5)

χ^2 test or Fisher exact test for counts below 5. Logistic regression was used for polytomous variables. Variables with a P value < .25 (Hosmer-Lemeshow goodness of fit test) were entered into the multivariate analysis.

^a Logistic regression analysis was applied using a variable selection method evaluated using the omnibus test (< .001), R-squared (.285), and Hosmer-Lemeshow test (.055), with a correct classification percentage of 76.4%; 95% CI.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:<https://doi.org/10.1016/j.adengl.2021.10.009>.

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