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Original Article

Cutaneous Melanoma: Association of Histopathological Subtypes and Breslow Thickness With Occupation and Residence in an Observational Study of 2486 Patients

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ABSTRACT

Background: Cutaneous melanoma has multiple risk factors, including occupation and place of residence, which may influence its development and histopathological characteristics.
Objectives: To analyze the association between melanoma histopathological subtypes and Breslow thickness and patients' occupation and place of residence.
Methods: A retrospective observational study was conducted including melanoma cases diagnosed between 2000 and 2016 at two referral hospitals in Spain. Data on patients' main occupation, place of residence at diagnosis, and melanoma characteristics were collected. Statistical significance was established at $P < .05$. Correspondence analysis was also used to explore associations between occupation, place of residence, and melanoma characteristics.
Results: A total of 2486 melanoma cases were included. Lentigo maligna melanoma was significantly associated with workers in the primary sector ($P = .010$) and the construction or extraction sector ($P = .032$). Acral lentiginous melanoma was more frequent among workers in the primary ($P = .002$) and construction or extraction sectors ($P = .006$). Nodular melanoma was associated with a heterogeneous range of occupations and with suburban populations ($P = .025$). Superficial spreading melanoma tended to occur more frequently among indoor professions and occupations associated with higher socioeconomic status, as suggested by correspondence analysis. Thick melanomas were more frequent among workers in the construction or extraction sector ($P = .032$) and less common among professions associated with higher socioeconomic status ($P = .001$). Melanomas diagnosed in smaller towns tended to present with greater Breslow thickness ($P < .001$).
Conclusions: Occupation and place of residence appear to influence melanoma histopathological subtype and Breslow thickness. These findings highlight the importance of targeted melanoma prevention and screening strategies in high-risk populations.

Introduction

Melanoma, although representing <5% of skin cancers, accounts for more than 80% of deaths from cutaneous malignant neoplasms.[1,2] Moreover, the incidence of melanoma continues to increase worldwide.[3]

Exposure to solar ultraviolet radiation (UVR) is the most recognized environmental risk factor for melanoma development.[4,5] Both intermit-

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tent and chronic or cumulative sun exposure have been associated with melanoma risk.[6] However, UVR does not appear to play a major role in the development of certain melanoma subtypes.[7] Environmental risk factors other than UVR exposure remain poorly understood.[8]

Occupation and place of residence may reflect specific environmental exposures and lifestyle patterns that can interact, overlap, or accumulate over time.

Occupation may influence melanoma risk through occupational UVR exposure.[6,9–13] However, several studies suggest that other occupational factors may also contribute to melanoma development.[5,8,14,15] In addition, the geographical place of residence may influence melanoma characteristics.[16]

The aim of this study was to investigate the association between histological subtypes and tumor thickness of cutaneous melanoma with patients' occupation and place of residence in a cohort of melanoma patients from two referral hospitals in Spain.

Methods

Study design and population

We conducted a multicentre retrospective cohort study including all diagnosed cutaneous melanomas from 1 January 2000 through 31 December 2016 at *Hospital Universitari Arnau de Vilanova de Lleida* (HUAV) and the *Instituto Valenciano de Oncología* (IVO) using each hospital's database. The HUAV database is part of the *Xarxa Melanoma Catalunya* (Network of Melanoma Centres of Catalonia) database.

The research protocol was approved by the Research Ethics Committee of HUAV in Lleida (CEIC 1865). The study followed national and international guidelines for clinical research, including the Declaration of Helsinki and Spanish legislation on data confidentiality (*Ley Orgánica 3/2018, de 5 de diciembre, de Protección de Datos Personales y garantía de los derechos digitales*).

Patients were eligible if the histological subtype of melanoma corresponded to one of the most common variants: superficial spreading melanoma (SSM); nodular melanoma (NM); lentigo maligna or lentigo maligna melanoma (LMM); and acral lentiginous melanoma (ALM) Both in situ and invasive tumors were included. For invasive tumors, cases with unspecified or unmeasurable thickness (e.g., deep margin involvement) were excluded.

The outcome variables were histological subtype and tumor thickness. Tumor thickness was recorded as a continuous variable and categorized as: <1 mm; 1.01–4 mm; and 4 mm. By definition, in situ melanomas do not have Breslow thickness and were included in the thinnest category when thickness was analyzed categorically. Explanatory variables included age, sex, melanoma location, stage (AJCC 8th edition), occupation, and classification of place of residence according to population size.

Occupations were classified according to the Standard Occupational Classification (2018 version) of the United States Department of Labor, as recommended by the Melanostrum working group to ensure maximum homogeneity and reproducibility.[17,18] (Supplementary Table 1). Occupations were categorized as: indoor occupations: predominantly performed inside buildings with minimal direct sunlight exposure; outdoor occupations: involving regular direct exposure to sunlight.

Classification was based on consensus among the authors to minimize subjective bias.

Place of residence was classified according to the number of inhabitants following criteria from the Spanish National Institute of Statistics: urban: $>10{,}000$ inhabitants; suburban: 2001–10,000 inhabitants; and rural: ≤2000 inhabitants (Supplementary Table 2) This categorization indirectly reflects socioeconomic conditions and health care accessibility, as smaller populations are often associated with fewer health care resources and different socioeconomic characteristics.

Correspondence analyses were conducted to reduce the number of occupational categories relative to each outcome analyzed. Subsequently, univariate and multivariate multinomial regression models were performed. Multivariate models were fitted using the forced-entry method to fully adjust for potential confounders. Statistical significance was established at $P < .05$. All statistical analyses were performed using IBM SPSS software (version 22.0).

Results

A total of 2486 melanoma patients were included in the study. There was a slight predominance of women vs men (50.8% vs 49.2%). The median age was 57 years (IQR, 43–69). Regarding melanoma characteristics, the most frequent histological subtype was SSM (1471 cases [59.2%]), followed by NM (386 [15.5%]), LMM (354 [14.2%]), and ALM (114 [4.6%]). A total of 493 cases (19.8%) were in situ and 1993 (80.2%) were invasive. Among invasive melanomas, the median Breslow thickness was 1.10 mm (IQR, 0.60–2.45), with nearly half of the cases ≤1 mm (968 [48.6%]). Regarding occupation, the service sector was the most represented (23.1%). Indoor professions predominated (76.9%) vs outdoor professions (23.1%). Regarding place of residence, most patients lived in urban areas (79.2%), followed by suburban (13.3%) and rural areas (7.5%). The median population size of the towns was 36,685 inhabitants (IQR, 13,088–334,887) (Table 1).

Relationship between clinicopathological melanoma subtypes and occupation or place of residence

Correspondence analysis between histopathological melanoma subtypes and occupation showed that certain occupational groups behaved similarly with respect to melanoma subtype. Consequently, these occupational categories were grouped, resulting in 6 final professional clusters (Table 2).

The correspondence analysis suggested that superficial spreading melanoma (SSM) was more frequent among indoor professions and occupations associated with higher socioeconomic status. Additional correspondence analyses were performed between melanoma subtype and place of residence (Supplementary Figs. 1–3).

A fully adjusted multinomial logistic regression analysis was then performed. Versus SSM (reference group), LMM and ALM were significantly associated with primary sector workers (OR, 2.6; 95%CI, 1.3–5.2; $P = .010$; OR, 7.5; 95%CI, 2.1–27.0; $P = .002$, respectively) and workers in the construction or extraction sector (OR, 2.3; 95%CI, 1.1–5.0; $P = .032$; OR, 5.6; 95%CI, 1.6–19.5; $P = .006$, respectively). Nodular melanoma showed higher risk in association with several occupational groups, including military, service, and production sectors (OR, 1.7; 95%CI, 1.2–2.3; $P = .001$), sales, installation, maintenance, and repair (OR, 1.7; 95%CI, 1.1–2.5; $P = .011$), construction or extraction (OR, 3.0; 95%CI, 1.6–5.6; $P = .001$), and primary sector occupations (OR, 2.0; 95%CI, 1.0–3.8; $P = .057$). No statistically significant differences were observed between melanoma subtypes and the standard classification of indoor vs outdoor professions.

Regarding place of residence, NM was more frequent among individuals living in suburban areas (OR, 1.5; 95%CI, 1.1–2.0; $P = .025$) vs those living in urban areas (Table 3).

Relationship between Breslow thickness and occupation or place of residence

One-way analysis of variance (ANOVA) revealed significant differences in mean Breslow thickness across occupational groups ($P < .001$) (Supplementary Fig. 4).

Correspondence analysis between Breslow thickness and occupational groups identified six professional clusters (Table 4). A similar analysis was conducted between Breslow thickness and place of residence (Supplementary Figs. 5–7).

Table 1
Demographic and histopathological characteristics of all melanomas.

Characteristic	No. (%)
Sex (N = 2486)	
Male	1224 (49.2)
Female	1262 (50.8)
Age, years (N = 2486)	
≤57	1300 (52.3)
> 57	1186 (47.7)
Melanoma histopathological subtype (N = 2486)	
LMM	354 (14.2)
SSM	1471 (59.2)
NM	386 (15.5)
ALM	114 (4.6)
Other or not specified	161 (6.5)
Breslow thickness, invasive melanomas (N = 1993)	
≤1 mm	968 (48.6)
1.01–2 mm	442 (22.2)
2.01–4 mm	326 (16.4)
> 4 mm	257 (12.9)
Location (N = 2486)	
Head and neck	542 (21.8)
Upper extremity	329 (13.2)
Trunk	956 (38.5)
Lower extremity	466 (18.7)
Acral	190 (7.6)
Unknown or not specified	3 (0.1)
Stage (AJCC 8th edition) (N = 2486)	
In situ	493 (19.8)
IA	744 (29.9)
IB	472 (19.0)
IIA	211 (8.5)
IIB	129 (5.2)
IIC	88 (3.5)
IIIA	112 (4.5)
IIIB	122 (4.9)
IIIC	82 (3.3)
IV	18 (0.7)
Unknown or not specified	15 (0.6)
Occupation[a] (N = 2368)	
Management or business	163 (6.9)
Computer, engineering, or scientific	100 (4.2)
Education, legal, arts, or media	252 (10.6)
Health care	104 (4.4)
Services	546 (23.1)
Sales	197 (8.3)
Office and administration	213 (9.0)
Primary sector	256 (10.8)
Construction or extraction	120 (5.1)
Installation, maintenance, or repair	61 (2.6)
Production	279 (11.8)
Transport	71 (3.0)
Military	6 (0.3)
Occupation type (N = 2486)	
Outdoor	575 (23.1)
Indoor	1911 (76.9)
Place of residence[b] (inhabitants) (N = 2486)	
≤2000	186 (7.5)
2001–10,000	330 (13.3)
> 10,000	1970 (79.2)

ALM, acral lentiginous melanoma; LMM, lentigo maligna melanoma; NM, nodular melanoma; SSM, superficial spreading melanoma.

[a] Occupation classified according to the Standard Occupational Classification.
[b] Place of residence classified according to the Spanish National Institute of Statistics.

Multinomial multivariate logistic regression analysis showed that, vs melanomas ≤1 mm (reference group), melanomas with Breslow thickness of 1.01–4 mm were more frequent among installation, maintenance, repair, and transport workers (OR, 1.7; 95%CI, 1.0–3.0; $P = .047$). Melanomas with Breslow thickness > 4 mm were more frequent among workers in the construction or extraction sector (OR, 2.4; 95%CI, 1.1–5.2; $P = .032$). Conversely, melanomas with Breslow thickness of 1.01–4 mm were less frequent among computer, engineering, scientific, and production sector workers (OR, 0.7; 95%CI, 0.6–1.0; $P = .053$). Melanomas with Breslow thickness > 4 mm were less frequent among education, legal, arts, media, health care, office, and administration professionals (OR, 0.4; 95%CI, 0.3–0.7; $P = .001$). No differences in Breslow thickness were observed using the standard classification of indoor vs outdoor occupations or according to place of residence categories (urban, suburban, rural) (Table 5).

However, correlation analysis between Breslow thickness and the number of inhabitants in the patient's place of residence (both variables treated as continuous) showed a statistically significant but weak inverse correlation ($\rho = -0.112$; $P < .001$), indicating that lower population size was associated with greater Breslow thickness (Supplementary Fig. 8).

Discussion

In this multicenter study including a large cohort of melanoma patients from two referral hospitals in Spain, we found that, vs SSM, LMM and ALM were significantly associated with workers in the primary sector and in the construction or extraction sector. NM, in contrast, was associated with several heterogeneous occupational groups and with suburban populations. Additionally, thick melanomas were predominantly observed among workers in the construction or extraction sector, whereas they were less common among professions typically associated with higher socioeconomic status. Furthermore, melanomas of intermediate thickness were associated with occupational sectors related to installation, maintenance, repair, and transport.

Several studies have reported that outdoor occupations are associated with an increased risk of melanoma, particularly sun-exposed professions such as farmers and construction workers.[6,11–13,19–25] However, other studies from different countries have reported no association—or even an inverse association—between melanoma risk and outdoor occupations.[9,10,26,27] These findings highlight the need to explore additional occupational or lifestyle-related risk factors that may contribute to melanoma development.

A large proportion of published studies focus on overall melanoma risk rather than on the distribution of different melanoma subtypes. However, it is well established that melanoma subtypes arise on skin with different UVR-related backgrounds and show distinct molecular and genetic profiles.[7,28–31] Tsoutsos et al. examined the relationship between occupational solar exposure (indoor vs outdoor) and the four classic melanoma subtypes.[32] Their findings suggested that indoor occupations

Table 2
Comparison between preliminary and grouped occupational classifications for histopathological melanoma subtypes.

Preliminary occupational classification	Grouped occupational classification
1. Management, business, or financial occupations	1. Aggregated professional group
2. Computer, engineering, or scientific occupations	
3. Education, legal, community service, arts, or media occupations	
4. Health care occupations	
5. Office and administrative occupations	
6. Military occupations	2. Military, production, and service occupations
7. Production occupations	
8. Service occupations	
9. Sales occupations	3. Sales, installation, maintenance, and repair occupations
10. Installation, maintenance, or repair occupations	
11. Primary sector occupations	4. Primary sector occupations
12. Construction or extraction occupations	5. Construction or extraction occupations
13. Transportation occupations	6. Transportation occupations

were associated with an increased risk of nodular melanoma, whereas outdoor occupations showed no clear association with histopathological melanoma subtypes traditionally linked to UVR exposure.[32] Given this controversy, several studies have suggested alternative carcinogenic factors involved in melanoma development, including dioxins, aromatic hydrocarbons, pesticides, and ionizing or nonionizing radiation.[25,33–36]

ALM is well recognized as a melanoma subtype unrelated to sun exposure, as it develops on non–sun-exposed skin and lacks the classical UVR mutational signature.[7] Instead, ALM has been associated with other risk factors such as pesticide exposure, pressure, and trauma. Fortes et al. reported that pesticide exposure increased melanoma risk, and that the combination of pesticide exposure and occupational UVR doubled the risk vs pesticide exposure alone.[14] In that study, occupational UVR exposure alone was not associated with increased melanoma risk. The authors suggested that UVR exposure may increase skin blood flow and sweating, thereby facilitating pesticide absorption.[14]

Another potential risk factor for ALM is mechanical pressure or trauma. Several studies have reported that ALM frequently arises in areas of the hands and feet subjected to physical stress.[15,37–40] Furthermore, a recent Korean study reported that nearly half of acral melanoma cases occurred in farmers and fishermen.[39] These findings suggest that the increased risk of ALM observed in our study among workers in the primary and construction sectors may be related to a combination of factors such as pesticide exposure and repetitive trauma. Although UVR exposure is common in these occupational settings, it is unlikely to play a direct role in ALM pathogenesis.

LMM has traditionally been associated with chronic UVR exposure and typically arises on the head and neck of older individuals.[7,41,42] Our findings are consistent with this pattern, as LMM was more frequently observed among workers in the primary sector and in construction or extraction occupations. However, when occupations were stratified simply into indoor versus outdoor categories, a clear association between LMM and occupational chronic UVR exposure could not be confirmed. This finding suggests that additional occupational or environmental factors may also contribute to the development of LMM.

In contrast, NM lacks clearly defined risk factors.[7,43] It has been associated with both chronic and intermittent sun exposure, although findings remain inconsistent.[7,43,44] In our study, NM showed increased risk across several heterogeneous occupational groups—including service, production, military, primary sector, and construction occupations—suggesting that no single occupational exposure explains this association.

SSM is generally associated with low cumulative sun damage and typically occurs on body areas exposed to intermittent UVR and sunburns.[7] Correspondence analysis in our study suggested an association between SSM and occupational clusters characterized by predominantly indoor work and higher socioeconomic status. Although these occupations may not directly increase melanoma risk, they share a common pattern of intermittent sun exposure, likely related to recreational activities. This hypothesis, however, was not specifically evaluated in the present study.

Regarding place of residence, we observed that NM was more frequent among individuals living in suburban areas (2001–10,000 inhabitants). Because the etiologic factors for NM remain poorly understood, definitive conclusions cannot be drawn, and further research is required. To our knowledge, no previous studies have investigated this association.

Correspondence analysis also suggested that ALM and LMM tended to be associated with rural populations, whereas SSM was more frequently associated with urban populations. These findings are consistent with previously reported epidemiologic patterns and risk factors for melanoma subtypes.[7,39] However, this association was not confirmed in the multinomial logistic regression analysis.

Socioeconomic status has previously been associated with Breslow thickness, with higher socioeconomic status generally linked to thinner melanomas at diagnosis.[45–47] Our findings are consistent with this observation, as occupations associated with thicker melanomas tended to correspond to lower socioeconomic groups.

Previous studies have also reported greater Breslow thickness and more advanced melanoma stages among patients living in rural areas. This has been attributed to factors such as lower physician density, limited access to dermatologic services, longer travel distances to health care facilities, and a higher proportion of biopsies performed by non-dermatologists.[16,48–51]

In our series, although multinomial logistic regression analysis did not identify a statistically significant association between Breslow thickness and place of residence, correspondence analysis suggested a tendency for thinner melanomas in urban populations and thicker melanomas in rural populations. This observation was further supported by the Spearman rank correlation analysis, which showed a weak but statistically significant inverse relationship between population size and Breslow thickness.

This study has several limitations. Because of its retrospective design, potential selection bias and recall bias regarding occupational history cannot be excluded. Additionally, we were unable to control for several potential confounding factors, including nonoccupational UVR exposure such as sunbed use or recreational sun exposure. Skin phototype was also not included in the analysis and may represent an important confounder.

Furthermore, in cases where individuals held multiple occupations during their lifetime, only the predominant occupation was considered. The classification of population size categories may also be somewhat outdated given recent population growth, suggesting that higher thresholds for defining urban populations may be more appropriate.

Table 3
Multivariate multinomial logistic regression analysis. Relationship between occupation and place of residence with histopathological melanoma subtypes.

	SSM (Ref.)	LMM				NM				ALM			
	N = 1413	N = 328	OR	95%OR	P ratio	N = 367	OR	95%OR	P ratio	N = 107	OR	OR95%	P ratio
Gender													
Female N = 1126 (50.8%)	755 (53.4%)	159 (48.5%)	Ref.	Ref.	Ref.	152 (41.4%)	Ref.	Ref.	Ref.	60 (56.1%)	Ref.	Ref.	Ref.
Male N = 1089 (49.2%)	658 (46.6%)	169 (51.5%)	0.9	0.7–1.2	.584	215 (58.6%)	1.4	1.1–1.8	.019	47 (43.9%)	0.8	0.5–1.2	.243
Age (years)													
≤57 N = 1161 (52.4%)	885 (62.6%)	67 (20.4%)	Ref.	Ref.	Ref.	170 (46.3%)	Ref.	Ref.	Ref.	39 (36.4%)	Ref.	Ref.	Ref.
>57 N = 1054 (47.6%)	528 (37.4%)	261 (79.4%)	5.7	4.2–7.7	<.001	197 (53.7%)	1.7	1.3–2.1	<.001	68 (63.6%)	2.2	1.4–3.4	<.001
Occupation (standard)													
Indoor N = 1708 (77.1%)	1161 (82.2%)	220 (67.1%)	Ref.	Ref.	Ref.	255 (69.5%)	Ref.	Ref.	Ref.	72 (67.3%)	Ref.	Ref.	Ref.
Outdoor N = 507 (22.9%)	252 (17.8%)	108 (32.9%)	1.0	0.6–1.9	.908	112 (30.5%)	1.1	0.7–1.8	.635	35 (32.7%)	0.6	0.2–1.9	.368
Occupation													
Aggrupation[a] N = 773 (34.9%)	574 (40.6%)	82 (25.0%)	Ref.	Ref.	Ref.	91 (24.8%)	Ref.	Ref.	Ref.	26 (24.3%)	Ref.	Ref.	Ref.
Transport N = 69 (3.1%)	43 (3.0%)	10 (3.0%)	1.3	0.5–3.2	.641	15 (4.1%)	1.6	0.7–3.4	.252	1 (0.9%)	0.9	0.1–8.4	.885
Military, service, production sector N = 784 (35.4%)	486 (34.4%)	122 (37.2%)	1.2	0.9–1.7	.253	134 (36.5%)	1.7	1.2–2.3	.001	42 (39.3%)	1.5	0.9–2.6	.127
Sales, installation, maintenance, and repair sector N = 243 (11.0%)	166 (11.7%)	25 (7.6%)	1.0	0.6–1.6	.877	48 (13.1%)	1.7	1.1–2.5	.011	4 (3.7%)	0.6	0.2–1.6	.277
Primary sector N = 233 (10.5%)	94 (6.7%)	68 (20.7%)	2.6	1.3–5.2	.010	45 (12.3%)	2.0	1.0–3.8	.057	26 (24.3%)	7.5	2.1–27.0	.002
Construction/extraction N = 113 (5.1%)	50 (3.5%)	21 (6.4%)	2.3	1.1–5.0	.032	34 (9.3%)	3.0	1.6–5.6	.001	8 (7.5%)	5.6	1.6–19.5	.006
Place of residence (inhabitants)													
>10,000 N = 1754 (79.2%)	1146 (81.1%)	254 (77.4%)	Ref.	Ref.	Ref.	272 (74.1%)	Ref.	Ref.	Ref.	82 (76.6%)	Ref.	Ref.	Ref.
≤2000 N = 165 (7.4%)	99 (7.0%)	29 (8.8%)	0.8	0.5–1.4	.463	25 (6.8%)	0.9	0.5–1.4	.497	12 (11.2%)	1.0	0.5–1.9	.940
2001–10,000 N = 296 (13.4%)	168 (11.9%)	45 (13.7%)	0.9	0.6–1.3	.610	70 (19.1%)	1.5	1.1–2.0	.025	13 (12.1%)	0.8	0.4–1.5	.445

[a] Aggrupation occupations: Management/business/financial occupations; Computer/engineering/science occupations; Education/legal/community service/arts/media occupations; Healthcare occupations; Office and administrative occupations.

Table 4

Comparison between preliminary and grouped occupation classification in Breslow thickness analysis. The table displays the preliminary classification of occupations in the left column and their corresponding grouping in the right column.

Preliminary occupation classification	Grouped occupation classification
1. Management/business/financial occupations 2. Service occupations 3. Sales occupations	1. Management/business/financial, service and sales occupations
4. Computer/engineering/science occupations 5. Production occupations	2. Computer/engineering/science and production occupations
6. Education/legal/community service/arts/media occupations 7. Healthcare occupations 8. Office and administrative occupations	3. Education/legal/community service/arts/media, healthcare, and office and administrative occupations
9. Primary sector 10. Military occupations	4. Primary and military occupations
11. Construction/extraction occupations	5. Construction/extraction occupations
12. Installation/maintenance/repair occupations 13. Transportation occupations	6. Installation/maintenance/repair and transportation occupations

Table 5

Multivariate multinomial logistic regression analysis. Relationship between occupation and place of residence with Breslow thickness.

	≤1 mm	1.01–4 mm				≤1 mm	>4 mm			
	N = 968	*N* = 768	OR	95%OR	*P* ratio	*N* = 968	*N* = 257	OR	95%OR	*P* ratio
Gender										
Female *N* = 956 (50.2%)	548	348	Ref.	Ref.	Ref.	548	104	Ref.	Ref.	Ref.
Male *N* = 950 (49.8%)	420	420	1.4	1.1–1.7	.005	420	153	1.3	1.0–1.9	.005
Age (years)										
≤57 *N* = 1052 (55.2%)	606	403	Ref.	Ref.	Ref.	606	80	Ref.	Ref.	Ref.
>57 *N* = 854 (44.8%)	362	365	1.5	1.2–1.8	<.001	362	177	2.9	2.1–4.0	<.001
Occupation										
Indoor *N* = 1485 (77.9%)	811 (83.8%)	575 (74.9%)	Ref.	Ref.	Ref.	811 (83.8%)	165 (64.2%)	Ref.	Ref.	Ref.
Outdoor *N* = 421 (22.1%)	157 (16.2%)	193 (25.1%)	1.4	0.9–2.1	.159	157 (16.2%)	92 (35.8%)	1.3	0.7–2.3	.461
Occupation										
Management/business/financial, service and sales occupations *N* = 745 (39.1%)	368 (39.7%)	289 (39.4%)	Ref.	Ref.	Ref.	368 (39.7%)	88 (35.9%)	Ref.	Ref.	Ref.
Computing, engineering, science, and production sectors *N* = 308 (16.2%)	159 (17.2%)	103 (14.0%)	0.7	0.6–1.0	.053	159 (17.2%)	46 (18.8%)	1.1	0.7–1.6	.760
Education/legal/community service/arts/media, health care, and office and administrative occupations *N* = 451 (23.7%)	263 (28.4%)	165 (22.5%)	0.8	0.7–1.1	.190	263 (28.4%)	23 (9.4%)	0.4	0.3–0.7	.001
Primary and military sectors *N* = 201 (10.5%)	78 (8.4%)	72 (9.8%)	0.7	0.4–1.2	.229	78 (8.4%)	51 (20.8%)	1.3	0.6–2.7	.507
Construction/extraction sector *N* = 98 (5.1%)	28 (3.0%)	46 (6.3%)	1.4	0.7–2.5	.338	28 (3.0%)	24 (9.8%)	2.4	1.1–5.2	.032
Installation/maintenance/repair and transport sectors *N* = 103 (5.4%)	31 (3.3%)	59 (8.0%)	1.7	1.0–3.0	.047	31 (3.3%)	13 (5.3%)	1.3	0.6–2.9	.514
Place of residence (inhabitants)										
≤2000 *N* = 147 (7.7%)	68 (7.0%)	52 (6.8%))	Ref.	Ref.	Ref.	68 (7.0%)	181 (70.4%)	Ref.	Ref.	Ref.
2001–10,000 *N* = 258 (13.5%)	124 (12.8%)	101 (13.2%)	1.0	0.6–1.6	.991	124 (12.8%)	31 (12.1%)	0.9	0.5–1.6	.641
>10,000 *N* = 1501 (78.8%)	776 (80.2%)	181 (80.1%)	1.1	0.7–1.6	.692	776 (80.2%)	181 (70.4%)	0.7	0.4–1.1	.132

Nevertheless, stratifying patients by occupation and place of residence provides insight into broader lifestyle and environmental contexts that may contribute to melanoma risk.

In conclusion, this large multicenter study describes the association between histopathological melanoma subtypes and Breslow thickness and patients' occupation and place of residence. Our findings suggest that occupational and environmental factors may influence melanoma characteristics and highlight the importance of targeted melanoma prevention and screening strategies for high-risk populations. Educational and screening initiatives focusing on specific occupational groups, as well as increased awareness among general practitioners involved in their care, may contribute to earlier melanoma detection and improved patient outcomes.

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Conflicts of interest

None declared.

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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.ad.2026.104620.

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