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Melanoma risk awareness and sun-protective behavior: Does the sun only hurt on the beach? A cross-sectional survey on 1288 families of a Mediterranean population

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Abstract

Most of the literature describing sun protection for children is based on population surveys and questionnaires, and these have shown that parents have considerable knowledge about sun exposure, its correlation with skin cancer, and proper protection. We conducted research to evaluate the habits not of the individual but of the families and the degree to which children and their parents understand sun protection and sun exposure. A cross-sectional descriptive study included the parents of children aged 8 to 10 years attending primary schools. Each student was given a simple questionnaire by the teacher and was instructed to take it to their parents for completion. The questions addressed the type and duration of vacation, knowledge of damage that can be caused by sun exposure, and the use of sun protection devices both in the city and in other situations. Of the 2,985 distributed questionnaires, 1,288 were returned, resulting in a final sample of 1,288 families included in the analysis. Most families reported taking either one week (44%) or two weeks (41%) of holiday. During holidays, 53% stated that they applied sunscreen more than once per day on days with typical sun exposure; however, 72% reported adopting no additional preventive measures during outdoor activities. Considering that most families take no more than two weeks of holiday per year, they remain without adequate protection during outdoor activities for approximately 97% of the year. This suggests a need for more targeted education and awareness campaigns, emphasizing the importance of sun protection measures in various settings, including urban environments and year-round activities.

Introduction

In the past few decades, there has been a steady increase in the incidence of skin cancer.[1,2] It is widely recognized that intentional sun exposure to ultraviolet radiation (UVR) is the primary risk factor for both malignant melanoma (MM) and non-melanoma skin cancer (NMSC). Thus, protecting the skin from UVR is a priority to prevent the development of these lesions.[3,4]

A child's skin is particularly vulnerable to damage from UVR due to specific unfavorable features such as a thinner stratum corneum, lower melanin concentration, and greater surface area/weight ratio.[5] Additionally, the number of melanocytic nevi represents a major risk factor for MM, and it has been proven that the density of melanocytic nevi during childhood is directly related to sun exposure and sunburn in early infancy.[6-9] Therefore, it is crucial to protect children from UVR, and interventions should be implemented early in life to maximize effectiveness and have long-term effects.

Because of their young age, children cannot completely understand the real consequences of sun exposure or independently take sun protection measures. Even though adults often also have difficulties understanding the consequences, children need to rely on their parents for protective

measures. Most of the literature describing sun protection for children is based on population surveys and questionnaires,[10,11] and these have shown that parents have considerable knowledge about sun exposure, its correlation with skin cancer, and proper protection. However, common beliefs that sun exposure has some advantages, such as activating Vitamin D and improving health, may act as barriers to sun protection. Sunscreen is the most common form of sun protection in Mediterranean populations, but it is often used in an incorrect or negligent way.[5,12] According to recommendations, various measures should be combined to ensure adequate protection, but few studies have investigated combined sun protection measures. Therefore, we conducted research to evaluate the habits not of the individual but of the families and the degree to which children and their parents understand sun protection, collected data on sun exposure and sun protection levels in children, and examined the determinants of parental sun protection behavior.

Materials and Methods

Participant recruitment

This cross-sectional descriptive study included the parents of children aged 8 to 10 years attending primary schools (from 8 to 11 years of age) in the province of Perugia, a city in central Italy (hilly town about 2 hours by road from the nearest marine beaches), from April to May 2019. Each student was distributed a questionnaire by the teacher and was instructed to take it to their parents for completion, which would be returned during the following days. The anonymous questionnaire included very simple questions addressing the sun exposure habits of the family. Participation was entirely voluntary and not compulsory in any way. Refusals were not documented; no incentives were provided. This study was approved by the local Institutional School Review Board (resolution n. 253, 19 March 2018).

Questionnaire

The questionnaire was developed based on a literature review and similar studies conducted worldwide,[10,11] and was administered in a confidential and self-administered manner by the parents. An anonymous 17-question multiple-choice questionnaire was developed collaboratively by the authors. It was written in Italian, printed out, and offered, from July 2, 2019 to March 9, 2020, by teachers. The questions addressed the type and duration of vacation, knowledge of damage that can be caused by sun exposure, the use of sun protection devices both in the city and in other situations (*e.g.*, recreation, vacation, or outdoor activities), and the differences in protection for adults *vs.* children. The questions were designed as multiple-choice with only one answer. Multiple responses were possible and were treated accordingly.

Statistical analysis

Potential respondents were provided with written information about the study; participation was anonymous and optional. Participation in the survey was considered informed consent. The study was conducted in accordance with the Declaration of Helsinki. The underlying population consisted of parents with children. Results were analyzed and discussed by a collaborative group of statisticians and physicians. Statistical associations between basic and demographic variables and questionnaire items were evaluated using the chi-square test. Multivariable logistic regression was computed to assess the association of patients' survey responses. Odds ratios (OR) with 95% confidence intervals (CI) were computed. The program used for statistical analysis was "R statistical software, version 4.1.2".

Results

Of the 2,985 distributed questionnaires, 1,288 were returned, resulting in a final analysis that included 1,288 families. Most families reported taking either one week (44%) or two weeks (41%) of holiday. During holidays, 53% stated that they applied sunscreen more than once per day on days with typical sun exposure; however, 72% reported not adopting any additional preventive measures during outdoor activities (Table 1). The collected data were analyzed considering three distinct domains: perception of melanoma as potential sun damage; sunburn as damage caused by incorrect exposure; and sunscreen use during outdoor daily activities.

Melanoma perception as potential sun damage

The majority of the respondents perceived melanoma as a potential harm caused by excessive sun exposure (63%, 800/1267 subjects), although those who mentioned melanoma as a risk were significantly less aware of sunburn (91% *vs.* 94%, p=0.016), but were more concerned with photoaging and photoallergy (61% *vs.* 20%, p≤0.001; 26.3% *vs.* 5%, p≤0.001) (Table 2). Regarding sources of information, those who saw melanoma as a risk of sun damage were more likely to rely on dermatologists (50% *vs.* 25%, p≤0.001), newspapers/magazines (43% *vs.* 19%, p≤0.001), primary care physicians (37% *vs.* 31%, p=0.05), internet (36% *vs.* 23%, p≤0.001), specialist training (13% *vs.* 7%, p≤0.001) and specialized press (13% *vs.* 4%, p≤0.001), They also showed significantly more attention to the use of sunscreen/high-protection sunscreens (62% *vs.* 57%, p=0.05; 67% *vs.* 43%, p≤0.001) and frequent application (31% *vs.* 18%, p<0.001) during holidays, as well as greater recognition of the importance of reapplying cream after bathing (32% *vs.* 16%, p≤0.001).

Furthermore, subjects who perceived melanoma as a potential harm caused by sun exposure preferred using sunscreens with a sun protection factor (SPF) >30 (83% *vs.* 68%, p≤0.001), with a greater tendency to apply cream several times a day. This particular population subset also took significantly more sunscreen supplements (13% *vs.* 9%, p=0.03) and were very concerned about the water resistance properties (30% *vs.* 15%, p≤0.001).

When considering this population as caregivers for their children, there was a tendency to apply cream several times. Moreover, those who were aware of melanoma as damage from incorrect exposure showed significantly more attention to the use of sunscreen with SPF >50 for their children (67% *vs.* 46%, p≤0.001). In multivariable model (Table 3), the recognition of melanoma as harm from incorrect exposure was found to be directly and significantly associated with the importance given to the use of water-resistant cream (OR=1.98, 95% CI [1.45-2.74]), applied frequently (OR=1.66, 95% CI [1.22-2.27]) by people that choose seaside as a typical holiday (OR=1.54, 95% CI [1.05-2.24]). Those who recognized melanoma as a consequence of improper sun exposure were more likely to consult a dermatologist and other specialized sources of information. They were also more likely to use sunscreen with SPF >30 for themselves during holidays (OR=2.22, 95% CI [1.64-3.01]).

Sunburns as damage caused by incorrect exposure

The majority of the interviewed participants (92%, 1166 out of 1267) correctly identified sunburn as a sign of excessive sun exposure; however, only 62% were aware of the associated risk of developing melanoma. There was a notable increase in awareness regarding photoaging as a potential harm among those who identified sunburn as a risk *vs.* the others (48% *vs.* 23%, p≤0.001). However, there was no statistical evidence indicating a higher awareness of photoallergy as a potential harm (p=0.43). Participants who recognized sunburn as a harmful consequence of sun exposure relied significantly more on dermatologists (42% *vs.* 29%, p=0.01), followed by specialized training and primary care physicians (11% *vs.* 4%, p=0.02; 35% *vs.* 24%, p=0.02), and paid more attention to sunscreen SPF (62% *vs.* 39%, p≤0.001; 59% *vs.* 46%, p=0.01), to the application frequency (28% *vs.* 9%, p<0.001), as well as to the importance of reapplying cream after bathing (27% *vs.* 12%, p≤0.001) and the use of water-resistant creams (26% *vs.* 16%, p=0.02) (Table 4). In contrast, they took significantly fewer sun supplements (9.5% *vs.* 31%, p≤0.001). A significantly lower percentage of those who knew about the dangers of sunburn used sunlamps (6% *vs.* 12%, p=0.03). Additionally, they showed significantly more attention to the use of sunscreens with SPF >50 in their children (60% *vs.* 46%, p≤0.01). Furthermore, they had a greater tendency to apply sunscreen to their children multiple times a day (54% *vs.* 30%, p≤0.001). In the multivariable model (Table 5), recognizing sunburn as a harmful consequence of incorrect sun exposure was directly and significantly associated with greater

importance attributed to the use of sunscreen during holidays (OR=2.10, 95% CI [1.32-3.38]), more frequent sunscreen application (OR=3.09, 95% CI [1.52-7.18]), and avoidance of sun exposure to prevent harm during holidays (OR=2.10, 95% CI [1.32-3.38]) (Table 6). Parents who were aware of melanoma as a potential consequence of incorrect sun exposure were more likely to have received specific training and to apply sunscreen to their child more frequently (Table 5).

Sunscreen use in daily outdoor activities

The responses of those who pay attention to the use of sunscreen in daily outdoor activities are shown in Table 6. Only 28% (n=354 out of 1258 subjects) of the sample reported using sunscreen during daily outdoor activities in the city (Table 1). The majority of the sample expressed concern about the potential risk of sunburns (92%, Table 6), those who used sunscreen in urban/outdoor settings were notably more aware of the risks associated with melanoma (70% *vs.* 61%, p=0.003), photoaging (58% *vs.* 42%, p<0.001) and photoallergy (25% *vs.* 16%, p<0.001). This subset of individuals statistically relied more on dermatologists (49% *vs.* 38%, p≤0.001) and specialized media and training.

Participants who apply sunscreen during urban outdoor activities demonstrated significantly more attention to the use of high-protection sunscreens during holidays (70% *vs.* 53%, p≤0.001), with a frequent application during sun exposure (35% *vs.* 23%, p<0.001), as well as a greater recognition of the importance of reapplying sunscreen after bathing (30% *vs.* 24%, p=0.02). They also exhibited greater use of solar supplements (20% *vs.* 8%, p≤0.001) and valued sunscreen water resistance (54% *vs.* 41%, p≤0.001). Furthermore, these individuals showed a greater tendency to apply sunscreen even when using sunlamps (36% *vs.* 14%, p≤0.001). As caregivers for their children, they exhibited a greater tendency to apply sunscreen multiple times per day, using sunscreen with an SPF 50+ (70% *vs.* 54%, p≤0.001).

In the multivariable model, sunscreen use in urban settings or during outdoor activities was directly and significantly associated with recognizing photoaging as a consequence of improper sun exposure (OR=1.47, 95% CI [1.12-1.95]), acknowledging the need to avoid excessive exposure to prevent harm (OR=1.90, 95% CI [1.42-2.57]), reporting frequent sunscreen application (OR=1.62, 95% CI [1.21-2.17]), and the use of oral sun-protection supplements (OR=3.40, 95% CI [2.32-4.99]) (Table 7). Moreover, individuals who use sunscreen in urban settings or during outdoor activities are significantly more likely to seek information through specialized training programs (OR=1.84, 95% CI [1.23-2.72]) and the dermatologist (OR=1.32, 95% CI [1-1.74]).

Discussion

Our study investigated the level of comprehension among parents regarding sun protection and the effects of sun exposure, emphasizing the examination of family routines. Additionally, we explored the variations in protective measures for adults and children while on vacation or engaging in daily activities.

Based on the questionnaire responses from the 1,288 participants, our findings indicate that 63% of the parents are aware of the risk of melanoma resulting from incorrect sun exposure and are properly informed about skin cancer prevention and control measures, such as the use of sunscreen, solar supplements, t-shirts, and hats, particularly during summer holidays or when directly exposed to UVR. About this topic, the existing literature is contradictory, with some studies reporting a high level of awareness of the disease,[13,14] partially confirming our results, while others show a lack of awareness.[15,16] In any case, our findings are concerning: in our study, about 40% of parents, speaking on behalf of their families, were unaware of the link between sun exposure and the risk of melanoma. Probably, as previously described,[17] the awareness of the importance of photoprotection to prevent melanoma largely depends on a person's educational level, along with strong preventive strategies, which are becoming more common in Western countries, while some other countries still lack them. Based on our study, it is evident that most of the families interviewed showed greater concern about the risks of sunburn than about the development of melanoma. Moreover, it is noteworthy that the majority of caregivers did not recognize the link between sunburn and melanoma. Even when acknowledging sunburn as skin damage, melanoma was not perceived as a consequence of improper sun exposure (62% *vs.* 74%); instead, caregivers were more concerned about photoaging (Table 4). These findings suggest a lack of understanding among caregivers regarding the link between sunburn and melanoma. Furthermore, it was observed that a significant portion of those particularly concerned about sunburns obtained their information from newspapers and magazines, indicating that prevention campaigns may have emphasized this aspect more than the risk of cutaneous melanoma. This underscores the presence of a potential knowledge gap and the need for increased awareness regarding the severe implications of melanoma. While sunburns are a visible and immediate consequence of excessive sun exposure, it is crucial not to overlook the long-term risks associated with melanoma.

An extremely important finding that emerges from our study is a lower consciousness about the implications of sun exposure during daily activities in any season. Particularly, our findings revealed that among the entire study population, 72% of parents do not use sun protection devices in the city and during outdoor activities, despite more than half being aware of the consequences of improper sun exposure. Moreover, the higher knowledge regarding sun exposure and photoprotection is linked

to a proper education about skin cancer prevention measures through healthcare professionals during visits and consults (OR=1.32, 95% CI [1.00-1.74], p=0.05), together with specific training (OR=1.84, 95% CI [1.23-2.72], p=0.0001) (Table 7). This resulted in a conscious use of sunscreen throughout the year by choosing products with higher SPF, water-resistant formulations, and occasionally combined with solar supplements, as indicated by several physicians.

Another interesting finding from our study is that a significant portion of individuals who reported using sunscreen only during out-of-town vacations also reported taking vacations for a maximum of one or two weeks per year. This data raises some important questions about their overall sun protection behavior. It suggests that for most of the year, these individuals are not taking adequate precautions to protect themselves from the harmful effects of sun exposure. So, as mentioned before, although parents generally present extensive knowledge about sun protection advice, they usually adapt measures of sun protection depending on the time of year. This finding is consistent with previous literature.[18] A recent study addressed the lack of attention given to sun exposure and shade levels at children's playgrounds internationally, despite playgrounds being a central place for physical activity and social interaction for children. The study found that, on average, only 41% of the total playground area was shaded, while a mere 22% of the main play area for children was in the shade. As a result, many children end up playing in direct sunlight while parents and caregivers sit in the shade.[19]

Therefore, awareness-raising campaign should be promoted by health organizations not only to enhance the visibility on skin cancers, but also to promote a conscious knowledge of the main risk factors to emphasize the use of multiple sun protection measures as essential parts of a sun protection plan which should not be restricted to summer months nor to the holiday season, but acquired as a daily life routine during childhood, leading to stronger sun safety behavior in adolescence and adulthood.

Based on our study results, the participants interviewed tended to associate the dangers of sun exposure primarily with summer and the beach, while being less aware of the risks posed by sun exposure in other settings or during everyday urban activities. This may be due, in part, to prevention campaigns that have wrongly used the beach umbrella, the sea, or the beach as symbols of sun exposure.

It is crucial to raise awareness among the general population about the importance of protecting oneself from the sun's harmful rays, not only during summer months or while at the beach, but also during everyday activities, such as walking to work or running errands. We believe that healthcare professionals can play an important role in educating the public about skin cancer prevention measures and the proper use of sun protection devices.

Limitations

This study has several limitations that should be considered when interpreting the findings. First, all information on sun exposure and protective behaviors was obtained through parent-completed questionnaires and may therefore be affected by recall bias and social desirability bias. Second, the cross-sectional design of the survey does not allow any causal inference regarding the associations observed between knowledge, attitudes, and behaviors. Third, the study was conducted in a single Italian province, which may limit the generalizability of the results to other regions or countries with different climatic, cultural, or socio-economic characteristics. Fourth, we focused on families with children aged 8-11 years, thus excluding both younger children and adolescents, whose patterns of sun exposure and degree of independence from parental control may differ substantially. Finally, we did not include any objective measures (*e.g.*, direct observation, dosimetry, or clinical assessment of sun damage) to validate the self-reported sun protection behaviors.

Conclusions

In conclusion, our study highlights the importance of education and awareness campaigns on sun protection beyond the traditional association of sun exposure with summer and beach holidays. While the majority of parents in our sample demonstrated a good level of awareness of the risks of melanoma and the use of protective measures during summer months, there was a lower level of awareness regarding the implications of sun exposure during daily activities in any season. Therefore, considering that most families do not take more than two weeks of holidays a year, for 97% of the year, they are without adequate protection during outdoor activities. This suggests a need for more targeted education and awareness campaigns, emphasizing the importance of sun protection measures in a variety of settings, including urban environments and year-round activities.

Additionally, our study reveals a discrepancy in the perceived risks of sun exposure between the risk of melanoma and other sun-related conditions, such as photoaging and photoallergy. While caregivers in our sample were more concerned about the latter conditions, melanoma poses a far greater health risk and requires attention and preventative measures.

Finally, our study highlights the importance of healthcare professionals in promoting sun protection measures and educating patients and caregivers on the risks and preventive measures of sun exposure. Further research is needed to better understand the factors influencing sun protection behavior and to develop more effective strategies to promote sun protection measures among children and their caregivers. We believe that by promoting a better understanding of the risks and the importance of sun protection, we can reduce the incidence of skin cancer and other sun-related health issues.

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Table 1. Descriptive features of the cohort (n=1,288).

Variable	**N (%)**
Average duration of your holiday	
1 week	566 (44)
2 weeks	520 (41)
1 month	126 (9.8)
2 months	36 (2.7)
More than listed	16 (1.2)
Variable	17 (1.3)
Missing	7
How many times do you apply sunscreen on a normal sun exposure day during a holiday?	
Every two hours	391 (34)
Once a day	95 (8)
More than once	604 (53)
not at all	60 (5)
Missing	138
How much do you value the water resistance characteristic when choosing a new sun protection cream?	
I care a lot	564 (45)
I care	568 (45)
I don’t care very much	122 (10)
Missing	34
What do you use in town or when doing outdoor activities?	
Sunscreen	354 (28)
Nothing	904 (72)
Missing	30

Table 2. Melanoma perception as potential sun damage.

Variable		**Overall, n (%)** n=1,267	**Recognize risk, n (%)** n=800	**Do not recognize risk, n (%)** n=467	**p-value***
General knowledge	Typical holidays: seaside	1,101 (87)	716 (90)	385 (83)	<0.001
	Typical holidays: mountains	219 (17)	147 (19)	72 (15)	0.2
	Missing	8	7	1	
	Average duration of your holiday				0.5
	More/variable	704 (56)	451 (57)	253 (54)	
	One week/var	558 (44)	346 (43)	212 (46)	
	Missing	5	3	2	
	Can you list the potential damage caused by incorrect exposure to the sun?				
	Sun rash/burn as damage from incorrect exposure	1,166 (92)	725 (91)	441 (94)	0.016
	Photoaging as damage due to incorrect exposure	586 (46)	491 (61)	95 (20)	<0.001
	Photoallergy as damage from incorrect exposure	231 (18)	210 (26)	21 (4.5)	<0.001
	Sunscreen use in the city				0.003
	Sunscreen	346 (28)	242 (31)	104 (23)	
	No sunscreen	892 (72)	542 (69)	350 (77)	
	Missing	29	16	13	
	How did you acquire this knowledge?				
	Specialized training	137 (11)	105 (13)	32 (6.9)	<0.001
	Internet	396 (31)	289 (36)	107 (23)	<0.001
	Newspapers/Magazines	432 (34)	345 (43)	87 (19)	<0.001
	Specialized press	121 (9.6)	103 (13)	18 (3.9)	<0.001
	Primary care physician	436 (35)	292 (37)	144 (31)	0.046
	Dermatologist	517 (41)	401 (50%)	116 (25)	<0.001
	Pharmacist	132 (10)	83 (10)	49 (11)	>0.9
	Elsewhere	236 (19)	123 (15)	113 (24)	<0.001
	Missing	7	3	4	
Sun protection during holiday	Protection from potential sun damage				
	Sunscreen	758 (60)	496 (62)	262 (57)	0.052
	High protection cream application	733 (58)	536 (67)	197 (43)	<0.001
	Avoid exposure	794 (63)	544 (68)	250 (54)	<0.001
	Apply creams frequently	335 (27)	250 (31)	85 (18)	<0.001
	Use water resistant creams	318 (25)	242 (30)	76 (16)	<0.001
	Always reapply sunscreen after bathing	328 (26)	252 (32)	76 (16)	<0.001
	Missing	6	2	4	

	Do you use SPF4 >30 sunscreen for yourself?				
	No	288 (23)	138 (17)	150 (32)	<0.001
	Yes	979 (77)	662 (83)	317 (68)	
	Use of supplements				
	No	1,095 (89)	684 (87)	411 (91)	0.029
	Yes	142 (11)	102 (13)	40 (8.9)	
	Missing	30	14	16	
	How many times do you apply sunscreen on a normal sun exposure day?				
	Every 2 hours	325 (26)	223 (28)	102 (22)	<0.001
	Once a day	151 (12)	75 (9.5)	76 (17)	
	More than once	739 (59)	476 (60)	263 (58)	
	Not at all	32 (2.6)	18 (2.3)	14 (3.1)	
	Missing	20	8	12	
Everyday sun protection	Use a sunscreen during the lamp				
	Yes	159 (20)	126 (28)	33 (9.6)	<0.001
	No	641 (80)	329 (72)	312 (90)	
	Missing	467	345	122	
Family sun protection	What SPF do you use for your children?				
	50+	662 (59)	469 (67)	193 (46)	<0.001
	30-50	437 (39)	248 (35)	189 (45)	0.001
	15-25	48 (4.3)	23 (3.3)	25 (6.0)	0.031
	6-10	11 (1.0)	1 (0.1)	10 (2.4)	<0.001
	No SPF	27 (2.4)	9 (1.3)	18 (4.3)	0.001
	Missing	144	96	48	
	On a normal day of sun exposure, how often do you apply sunscreen to your children?				<0.001
	Every 2 hours	388 (34)	271 (38)	117 (28)	
	Once a day	91 (8.1)	52 (7.3)	39 (9.2)	
	More than once	593 (52)	360 (51)	233 (55)	
	Not at all	58 (5.1)	25 (3.5)	33 (7.8)	
	Missing	137	92	45	

Information missing for 21 patients; *Pearson's chi-squared test; SPF, sun protection factor.

Table 3. Multivariable model of factors associated with acknowledgment of incorrect sun exposure risks in melanoma.

Characteristic		**OR**	**95% CI**	**p-value**
Typical holiday	Others	–	–	
	Seaside location	1.54	1.05-2.24	0.025
Prevention	Water resistant cream use to prevent harm during holiday			
	No	–	–	
	Yes	1.98	1.45-2.74	<0.001
	Frequent application to prevent harm during holiday			
	No	–	–	
	Yes	1.66	1.22-2.27	0.001
Source of information	Dermatologist			
	No	–	–	
	Yes	2.69	2.04-3.55	<0.001
	Specialized press			
	No	–	–	
	Yes	3.10	1.81-5.59	<0.001
	Specific training			
	No	–	–	
	Yes	2.91	1.87-4.62	<0.001
	Newspaper/magazines			
	No	–	–	
	Yes	3.20	2.39-4.33	<0.001
Sunscreen use	Do you use SPF >30 sunscreen for you during holidays?			
	No	–	–	
	Yes	2.22	1.64-3.01	<0.001

OR, odds ratio; CI, confidence interval; SPF, sun protection factor.

Table 4. Acknowledgement of sunburns as potential sun damage.

Variable		Overall, n (%) n=1,267	Recognize risk, n (%) n=1,166	Do not recognize risk, n (%) n=101	p-value*
General knowledge	Typical holidays: seaside	1,101 (87)	1,028 (88)	73 (75)	<0.001
	Typical holidays: mountains	219 (17)	195 (17)	24 (25)	0.047
	Missing	8	4	4	
	Average duration of your holiday				0.003
	More/variable	704 (56)	634 (55)	70 (70)	
	One week/var	558 (44)	528 (45)	30 (30)	
	Missing	5	4	1	
	Can you list the potential damage caused by incorrect exposure to the sun?				
	Melanomas as damage from incorrect exposure	800 (63)	725 (62)	75 (74)	0.016
	Photoaging as damage due to incorrect exposure	586 (46)	563 (48)	23 (23)	<0.001
	Photoallergy as damage from incorrect exposure	231 (18)	216 (19)	15 (15)	0.4
	How did you acquire this knowledge?				
	Specialized training	137 (11)	133 (11)	4 (4.0)	0.023
	Internet	396 (31)	365 (31)	31 (31)	>0.9
	Newspapers/Magazines	432 (34)	400 (34)	32 (32)	0.7
	Specialized press	121 (9.6)	108 (9.3)	13 (13)	0.2
	Primary care physician	436 (35)	412 (35)	24 (24)	0.024
	Dermatologist	517 (41)	488 (42)	29 (29)	0.013
	Pharmacist	132 (10)	119 (10)	13 (13)	0.4
	Elsewhere	236 (19)	219 (19)	17 (17)	0.7
	Missing	7	5	2	
	Protection from potential sun damage				
	Sunscreen	758 (60)	719 (62)	39 (39)	<0.001
	High protection cream application	733 (58)	687 (59)	46 (46)	0.008
	Avoid exposure	794 (63)	755 (65)	39 (39)	<0.001
	Apply creams frequently	335 (27)	326 (28)	9 (8.9)	<0.001
	Use water resistant creams	318 (25)	302 (26)	16 (16)	0.024
	Always reapply sunscreen after bathing	328 (26)	316 (27)	12 (12)	<0.001
	Missing	6	6	0	
Everyday sun protection	Sunscreen use in the city				0.8
	Sunscreen	346 (28)	319 (28)	27 (27)	
	No sunscreen	892 (72)	819 (72)	73 (73)	
	missing	29	28	1	
	Use of supplements				<0.001
	No	1,095 (89)	1,028 (90)	67 (68)	
	Yes	142 (11)	111 (9.7)	31 (32)	
	Missing	30	27	3	

	Has a habit of making sunlamps				
	Yes	83 (6.7)	71 (6.2)	12 (12)	0.027
	No	1156 (93)	1,068 (94)	88 (88)	
Family sun protection	What SPF do you use for your children?				
	50+	662 (59)	619 (60)	43 (46)	0.009
	30-50	437 (39)	398 (39)	39 (42)	0.5
	15-25	48 (4.3)	46 (4.5)	2 (2.2)	0.4
	6-10	11 (1.0)	9 (0.9)	2 (2.2)	0.2
	No SPF	27 (2.4)	20 (1.9)	7 (7.5)	0.005
	Unknown	144	136	8	
	On a normal day of sun exposure, how often do you apply sunscreen to your children?				<0.001
	Every 2 hours	388 (34)	355 (34)	33 (36)	
	Once a day	91 (8.1)	67 (6.5)	24 (26)	
	More than once	593 (52)	565 (54)	28 (30)	
	Not at all	58 (5.1)	51 (4.9)	7 (7.6)	
	Missing	137	128	9	

Information missing for 21 patients; *Pearson’s chi-squared test; SPF, sun protection factor.

Table 5. Multivariable model of factors associated with the acknowledgment of harm from sunburn due to incorrect sun exposure.

Characteristic		**OR**	**95% CI**	**p-value**
Typical holiday	Others	–	–	
	Seaside location	1.75	0.96-3.09	0.058
Prevention	Sunscreen during holiday			
	No/I do something else	–	–	
	Yes	2.10	1.32-3.38	0.002
	Frequent application to prevent harm during holiday			
	No/I do something else	–	–	
	Yes	3.09	1.52-7.18	0.004
	Avoid exposure to prevent harm during holiday			
	No/I do something else	–	–	
	Yes	2.54	1.59-4.11	<0.001
Source of information	Specific training			
	No/others	–	–	
	Yes	3.03	1.17-10.4	0.042
Supplementation	Use of solar supplements			
	Yes	–	–	
	No	3.32	1.90-5.67	<0.001
Children	How often do you apply sunscreen to your children on a normal sunny day?			
	Never	–	–	
	Once/2h	5.04	1.87-13.1	0.001
	Once/day	4.87	1.77-13.2	0.002
	More than once	8.52	3.27-21.3	<0.001

OR, odds ratio; CI, confidence interval; SPF, sun protection factor.

Table 6. Sunscreen use in daily outdoor activities.

Variable		Overall, n (%) n=1,258	Sunscreen, n (%) n=354	No sunscreen, n (%) n=904	p-value*
General knowledge	Typical holidays: seaside	1,093 (88)	315 (90)	778 (87)	0.15
	Typical holidays: mountains	214 (17)	51 (15)	163 (18)	0.12
	Missing	10	3	7	
	Average duration of your holiday				0.5
	More/variable	697 (56)	201 (57)	496 (55)	
	One week/variable	554 (44)	151 (43)	403 (45)	
	Missing	7	2	5	
	Can you list the potential damage caused by incorrect exposure to the sun?				
	Sun rash/burn as damage from incorrect exposure	1,138 (92)	319 (92)	819 (92)	0.8
	Melanomas as damage from incorrect exposure	784 (63)	242 (70)	542 (61)	0.003
	Photoaging as damage due to incorrect exposure	573 (46)	201 (58)	372 (42)	<0.001
	Photoallergy as damage from incorrect exposure	229 (18)	88 (25)	141 (16)	<0.001
	Missing	20	8	12	
	How did you acquire this knowledge				
	Specialized training	138 (11)	55 (16)	83 (9.3)	<0.001
	Internet	394 (32)	111 (32)	283 (32)	>0.9
	Newspapers/Magazines	423 (34)	124 (36)	299 (33)	0.4
	Specialized press	118 (9.5)	43 (12)	75 (8.4)	0.031
	Primary care physician	434 (35)	121 (35)	313 (35)	>0.9
	Dermatologist	510 (41)	169 (49)	341 (38)	<0.001
	Pharmacist	133 (11)	45 (13)	88 (9.8)	0.11
	Elsewhere	231 (19)	41 (12)	190 (21)	<0.001
	Missing	13	6	7	
Sun protection during holiday	Protection from potential sun damage				
	Sunscreen	752 (60)	197 (56)	555 (62)	0.051
	High protection cream application	724 (58)	247 (70)	477 (53)	<0.001
	Avoid exposure	786 (63)	255 (72)	531 (59)	<0.001
	Apply creams frequently	327 (26)	122 (35)	205 (23)	<0.001
	Use water resistant creams	315 (25)	83 (24)	232 (26)	0.4
	Always reapply sunscreen after bathing	323 (26)	107 (30)	216 (24)	0.023
	Missing	7	1	6	
	Use of supplements				
	No	1,097 (89)	275 (80)	822 (92)	<0.001
	Yes	142 (11)	70 (20)	72 (8.1)	
	Do you use SPF4 >30 sunscreen for yourself?				
	Yes	981 (78)	311 (88)	670 (74)	<0.001
	No	277 (22)	43 (12)	234 (26)	
	How many times do you apply sunscreen on a normal sun exposure day?				<0.001
	Every 2 hours	325 (26)	138 (39)	187 (21)	
	Once a day	155 (12)	22 (6.3)	133 (15)	

	More than once	738 (59)	192 (55)	546 (61)	
	Not at all	33 (2.6)	0 (0)	33 (3.7)	
	Missing	7	2	5	
	How much do you value the water resistance when choosing a new sun protection?				<0.001
	I care a lot	552 (45)	190 (54)	362 (41)	
	I care	565 (46)	143 (41)	422 (48)	
	I don't care	121 (9.8)	19 (5.4)	102 (12)	
	Missing	20	2	18	
Everyday sun protection	Do you use sunlamps regularly?				0.5
	Yes	84 (6.7)	26 (7.4)	58 (6.5)	
	No	1,163 (93)	324 (93)	839 (94)	
	Missing	11	4	7	
	Do you use sunscreen during the sunlamp?				<0.001
	Yes	159 (20)	74 (36)	85 (14)	
	No	646 (80)	134 (64)	512 (86)	
	Missing	453	146	307	
Family sun protection	What SPF do you use for your children?				
	50+	661 (59)	230 (70)	431 (54)	<0.001
	30-50	437 (39)	100 (30)	337 (42)	<0.001
	15-25	49 (4.4)	13 (4.0)	36 (4.5)	0.7
	6 10	11 (1.0)	2 (0.6)	9 (1.1)	0.5
	No SPF	29 (2.6)	3 (0.9)	26 (3.3)	0.024
	Missing	132	26	106	
	On a normal day of sun exposure, how often do you apply sunscreen to your children?				<0.001
	Every 2 hours	387 (34)	155 (47)	232 (29)	
	Once a day	94 (8.3)	19 (5.7)	75 (9.4)	
	More than once	592 (52)	151 (46)	441 (55)	
	Not at all	60 (5.3)	6 (1.8)	54 (6.7)	
	Missing	125	23	102	

Information missing for 30 patients; *Pearson's chi-squared test; SPF, sun protection factor.

Table 7. Multivariable model of factors associated with sunscreen use in the city or during outdoor activities.

Characteristic		**OR**	**95% CI**	**p-value**
Recognize photoaging as harm from incorrect exposure	No	–	–	
	Yes	1.47	1.12-1.95	0.006
Prevention	Avoid exposition to prevent harm during holiday			
	No/I do something else	–	–	
	Yes	1.90	1.42-2.57	<0.001
	Frequent application to prevent harm in holidays			
	No/I do something else	–	–	
	Yes	1.62	1.21-2.17	0.001
Supplementation	Solar supplements			
	No	–	–	
	Yes	3.40	2.32-4.99	<0.001
Source of information	Specific training			
	No/others	–	–	
	Yes	1.84	1.23-2.72	0.003
	Dermatologist			
	No	–	–	
	Yes	1.32	1.00-1.74	0.052

OR, odds ratio; CI, confidence interval; SPF, sun protection factor.