

Sun-protective Behaviours among patients with Cutaneous Hyperpigmentation in Saudi Arabia: A Cross Sectional Study

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Abstract

Background: Hyperpigmentation is a dermatologic disorder, and because dermatologic diseases are visible, they have a profound psychological impact on persons who are affected.

Aim: To assess the sun protection practices in Saudi Arabia among patients with cutaneous hyperpigmentation.

Method: In October 2022, an online cross-sectional study of patients with cutaneous hyperpigmentation was conducted in Saudi Arabia. Data were collected by questionnaire-based survey, which was designed by the researcher after a thorough literature review. Using binary logistic regression analysis, the factors that influence sunscreen use were identified.

Results: A total of 418 people took part in this study. More than half (63.6%) of them reported post-inflammation or acne pigmentation. Almost half (49.0%) reported having this health condition for less than a year. Only about half of the patients (45.0%) said they use sunscreen. Approximately 47.0% of sunscreen users reported using sunscreen with a UV protection factor of 21-50. Almost one-third (35.0%) of the patients reported not reapplying sunscreen during the day. Only 4.8% of patients said they frequently use a hat or sunshade while they are outside, and 40.4% said they frequently stay in the

shade when they are outside. Male patients were less likely than female patients to apply sunscreen (Odds ratio: 0.80 (95% CI: 0.64-0.99), ($p \leq 0.05$),

Conclusion: Saudi hyperpigmentation patients use sunscreen inadequately. Males used sunscreen less than females. Healthcare authorities should conduct an educational campaign to inform this group of patients about their condition and the necessity of sunscreen. Social media should be utilized to educate the public about different types of sunscreens and improve their use of sunscreens to prevent sun-related skin problems.

Keywords: Cutaneous Hyperpigmentation; Saudi Arabia; Sunscreen; Sun-protective

Introduction

Diffuse hyperpigmentation preferentially affects sun-exposed areas such as the hands, neck, and face [1]. There are several hyperpigmentation conditions, and melasma and lentigines are two of the most prevalent types of hyperpigmentation. UV radiation is the most potent environmental cause for Melasma [2, 3]. Furthermore, solar lentigines are known to range in size from less than 1 mm to a few centimeters in diameter, and they may consolidate into even larger lesions in sections of skin that has been badly sunburned [3]. All of these indications highlight the need to identify sun protection behaviours among hyperpigmented people in order to assess the relationship between this condition and potential sun protection behaviours and, ultimately, to eliminate harmful sun protection practices that increase the risk of hyperpigmentation. In 2022, researchers conducted a second study among Saudi university students. This study found that characteristics independently linked with sunscreen use included female gender, high family wealth, degree of education, history of sunburn, use of tanning beds, and utilization of other sun safety measures [4]. Another cross-sectional hospital-based study was conducted in Jordan in order to evaluate the degree of knowledge, attitude, and behaviour about sunscreen and sun-protective practices among 418 melasma patients [5]. The distribution of melasma was primarily centrofacial (49.8%). The findings revealed that only 40.7% of the patients thought sun exposure was a factor in their condition. For most participants (92.9%), skin browning was the most noticeable side effect of sun exposure. Almost 59.0% of respondents reported using sunscreens, with a higher percentage of females doing so while males used more broad-spectrum sunscreens. High cost (94%) was cited as the main deterrent to using sunscreen [5]. In another prospective study of 197 Tunisian patients, Guinot et al. found that the majority (84%) of patients identified sun exposure as exacerbating the condition while the majority (51%) of the female patients indicated sun exposure as a melasma trigger [6]. Higher outcomes were seen when using a sunscreen product (67.5%), according to Maymone et al's study on sun-protective behaviours in patients with cutaneous hyperpigmentation. Only 7.6% of respondents reapplied sunscreen every two hours, and nearly half of those were unaware whether their sunscreen offered wide spectrum protection. Additionally, males, those with disease durations of less than a year, and those with post-inflammatory hyperpigmentation reported less sunscreen use [7].

On the other hand, hyperpigmentation is a dermatologic condition, and because dermatologic diseases are visible, they have a significant psychological impact on those who are afflicted [8]. Therefore, in order to reduce the occurrence of hyperpigmentation and, in turn, the potential psychological effects that it may permit, the link between hyperpigmentation and sun protective behaviours must be sought out and measured. Furthermore, little is known, and nearly nothing is known in Saudi Arabia, concerning

the sun protection practices of patients with diseases of hyperpigmentation [7]. We therefore intended to assess the sun protection practices in Saudi Arabia among patients who have cutaneous hyperpigmentation, which would also almost make our study the first in Saudi Arabia to investigate such an important problem. Therefore, the aim of our study was to assess the sun protection practices in Saudi Arabia among patients with cutaneous hyperpigmentation.

Method

Study design:

This was an online cross sectional study that was conducted in Saudi Arabia among patients with cutaneous hyperpigmentation, in October 2022.

Study population and sampling procedure:

In Saudi Arabia, the study population consisted of all patients who had cutaneous hyperpigmentation. Adult male or female participants who were 18 years of age or older met the inclusion criteria for the study. Patients who did not meet the inclusion criteria were not included in the study. The convenience sampling technique was used to recruit the study participants. This sampling technique involves the participation of any patient who is willing to participate and meets the inclusion criteria.

Data collection:

To accomplish the goal of the study, data were gathered by questionnaire-based surveys utilizing a questionnaire tool that was created by the researcher after a thorough literature review [4, 5, 7, 9]. 16 multiple choices and yes/no questions formed the questionnaire tool. The participants were asked to give their consent for participation before beginning the questionnaire after the study's goals and objectives were explained in the cover letter. There were two sections to our survey instrument. The study participants' demographic characteristics were covered in the first section (age, gender, nationality, level of education, colour of skin, type of hyperpigmentation, and duration of complaining of hyperpigmentation condition). The second section of the questionnaire asked the participants general questions about their use of sunscreen (whether the sun is the cause of their hyperpigmentation, whether they use sunscreen, sun protection factor (SPF) strength, frequency of reapplying sunscreen, whether their sunscreen is broad spectrum, hours spent in the sun on the weekends, hours spent in the sun on the weekdays, use of hats or umbrellas when outside in the sun, and how many times they reapply sunscreen).

Validity of the questionnaire:

Experienced clinicians assessed and validated the questionnaire tool itself. They were questioned about the questionnaire's items and whether or not they accurately measured the study's objectives and were simple enough for the target audience to understand. They confirmed the clarity and understandability of the questionnaire's items.

Piloting phase:

Prior to the actual data collection, a pilot study was conducted with a small sample of patients from the target group to see if they had any questions or comments concerning the questionnaire's items. The patients verified that the questionnaire was simple for them to complete and that all of the questions were understandable.

Sample size:

Using a 95% confidence interval, a 0.5 standard deviation (SD), and a 5% margin of error, the minimum required sample size was 385 people.

Statistical analysis:

Statistical Package for Social Science, version 27, was used to analyse the data (SPSS, Armonk, NY: IBM Corp). The demographics of the patients as well as qualitative data were presented using descriptive measures as frequency and percentage. The factors that affect sunscreen use were

identified using binary logistic regression analysis. Based on the patients' reported use of sunscreen, the dummy variable for the regression analysis was defined. Two-sided $p < 0.05$ was used to define statistical significance.

Results**1. Participants' demographic characteristics**

A total of 418 individuals participated in this study. The majority of them (70.1%) were males and aged 18-24 years (70.3%). The vast majority of the study participants (93.5%) were Saudis. More than half of them (64.8%) reported that they hold bachelor degree and have a medium skin colour (57.9%). More than half of them (63.6%) reported that they have post-inflammation or acne pigmentation. Almost half of them (49.0%) reported that they have had this health condition for less than one year. For further details on the demographic characteristics of the patients, refer to Table 1.

Table 1: Participants' demographic characteristics

Variable	Frequency	Percentage
Gender		
Males	293	70.1%
Females	125	29.9%
Age categories		
18-24 years	294	70.3%
25-34 years	70	16.7%
35-44 years	29	6.9%
45-54 years	18	4.3%
55 years and over	7	1.7%
Nationality		
Saudis	391	93.5%
Education level		
High school level or lower	122	29.2%
Bachelor degree	271	64.8%
Higher education	25	6.0%
What colour is your skin?		
White	162	38.8%
Medium	242	57.9%
Black or dark	14	3.3%
The type of skin hyperpigmentation patients have:		
Melasma	152	36.4%
Post-inflammation or acne pigmentation	266	63.6%
Duration of skin hyperpigmentation?		
Less than one year	205	49.0%
1-5 years	79	18.9%
More than 5 years	134	32.1%

2. Sunscreen utilisation profile

When the patients were asked about the role of exposure to sun and the emergence of skin pigmentation, more than half of them (56.7%) confirmed that sun exposure is a contributing factor and has a role in the emergence of skin pigmentation. Less than half of the patients (45.0%) reported that they use sunscreen. Around 47.0% of sunscreen users reported that they use sunscreen of 21-50 sun protection factor (SPF). Almost one-third of the patients (35.0%) reported that they do not reapply the sunscreen during the day. More than half of them (57.4%) reported that they use wide spectrum sunscreen. More than half of the patients (53.3%) reported that they expose to the sun 1-2 hours during the weekdays and 76.6% during the weekends. Only 4.8% of the patients reported that they frequently use a hat or sunshade when you they are outside and 40.4% reported that they frequently stay in the shade when they are outside. For further details on the patients' sunscreen utilisation pattern, refer to Table 2.

Table 2: Sunscreen utilisation profile

Variable	Frequency	Percentage
Does exposure to the sun have a role in the emergence of skin pigmentation?		
Yes	237	56.7%
Do you use sunscreen?		
Yes	188	45.0%
What is the sun protection factor (SPF) for your sunscreen?		
10-20	37	19.7%
21-50	88	46.8%
More than 50	63	33.5%
How many times do you reapply sunscreen per day?		
Every two hours	17	9.0%
1-3 times daily	39	20.7%
Every now and then	66	35.1%
I do not reapply it during the same day	66	35.1%
Do you use a broad spectrum sunscreen?		
Yes	108	57.4%
Hours you spend exposed to the sun during weekdays:		
1-2 hours	223	53.3%
2-5 hours	141	33.7%
More than 5 hours	54	12.9%
Hours you spend exposed to the sun during weekends:		
1-2 hours	320	76.6%
2-5 hours	87	20.8%
More than 5 hours	11	2.6%
Do you use a hat or sunshade when you are outside?		
Rarely	316	75.6%
Sometimes	82	19.6%
Frequently	20	4.8%
How often do you stay in the shade when you are outside?		
Rarely	45	10.8%
Sometimes	204	48.8%
Frequently	169	40.4%

3. Factors influencing the use of sunscreen among patients with skin hyperpigmentation

Binary logistic regression analysis identified that male patients were less likely to use sunscreen compared to female patients (Odds ratio: 0.80 (95% CI: 0.64-0.99), ($p \leq 0.05$), Table 3.

Table 3: Factors influencing the use of sunscreen among patients with skin hyperpigmentation

Variable	Odds ratio of using sunscreen (95% confidence interval)	P-value
Gender		
Female (Reference group)	1.00	
Males	0.80 (0.64-0.99)	0.044*
Age categories		
18-24 years (Reference group)	1.00	
25-34 years	1.09 (0.65-1.83)	0.749
35-44 years	0.50 (0.22-1.13)	0.097
45-54 years	0.81 (0.30-2.18)	0.679
55 years and over	0.191 (0.02-1.60)	0.127
Nationality		
Non-Saudis (Reference group)	1.00	
Saudis	1.67 (0.72-3.83)	0.230
Education level		
High school level or lower (Reference group)	1.00	
Bachelor degree	1.16 (0.77-1.74)	0.486
Higher education	0.83 (0.36-1.91)	0.655
What colour is your skin?		
White (Reference group)	1.00	
Medium	0.78 (0.53-1.16)	0.217
Black or dark	0.34 (0.09-1.26)	0.106
The type of skin hyperpigmentation patients have:		
Melasma (Reference group)	1.00	
Post-inflammation or acne pigmentation	0.81 (0.50-1.30)	0.382
Duration of skin hyperpigmentation?		
Less than one year (Reference group)	1.00	
1-5 years	1.13 (0.75-1.71)	0.565
More than 5 years	0.79 (0.48-1.31)	0.362

* $p \leq 0.05$

Discussion

The aim of this study was to assess the sun protective practices in Saudi Arabia among patients with cutaneous hyperpigmentation. The key findings were as the following: 1) more than half of the study participants identified that exposure to the sun has an important role in the emergence of skin pigmentation, 2) sunscreen was used by less than half of the patients with cutaneous hyperpigmentation, 3) around half of the patients use sunscreen of 21-50 SPF, 4) one-third of the patients do not reapply the sunscreen during the day, 5) more than half of them use wide spectrum sunscreen, 6) more than half of them expose to the sun 1-2 hours during the weekdays and the weekends, and 7) the use of hat or sunshade was not common among the patients when they are outside.

In our study, when the patients were asked about the role of exposure to sun and the emergence of skin pigmentation, more than half of them (56.7%) confirmed that. Due to photo-oxidation of produced melanin, acute UV radiation exposure causes an acute pigment-darkening reaction [10]. This is followed by a delayed tanning reaction; where the mechanism is uncertain. Uneven pigment distribution is a side effect of prolonged UV exposure. Ephelides, solar lentigines, and pigmented solar keratoses are the most prevalent pigmented lesions in chronically sun-exposed skin. Idiopathic guttate hypomelanosis, which is frequent in skin that has been exposed to the sun, could be viewed as a symptom of photo-aging. It also seems that persistent UV causes cutaneous melanomas [10]. Additionally, a number of keratinocyte-related tumours are connected to enhanced pigmentation, which raises the possibility of a concurrent change in melanocyte function, as is the case with pigmented actinic keratoses and pigmented epitheliomas [10].

In our study, less than half of the patients (45.0%) reported that they use sunscreen. Around 47.0% of sunscreen users reported that they use sunscreen of 21-50 sun protection factor (SPF). According to a previous cross-sectional survey, the majority of non-medical students in Saudi Arabia, are aware of the risks of unprotected sun exposure [9]. However, 34.1% of respondents claimed that sunscreens are harmful for the skin. The most popular means of sun protection were seeking shade and wearing protective clothes (58.1% and 43.1%, respectively). Only a third (23.6%) of people used sunscreen. Another study in Jordan also showed similar findings that almost one-third of the study participants were aware of the harmful effect of sun exposure on their skin condition [5]. Additionally, 64.9% of participants were unaware of sunscreen products' SPF. Melanin production rises as a result of many reasons in pigmentary disorders such as melasma and post-inflammatory hyperpigmentation. Particularly in places that are exposed, such as the face, the hyperpigmentation that develops can significantly affect the patients' quality of life [11]. Sunscreen use is a crucial part of treatment for photosensitive diseases including melasma and post-inflammatory hyperpigmentation since exposure to UV and visible light exacerbates these conditions [12]. Sunscreen with both UV and visible light protection is a

crucial adjuvant therapy to reduce hyperpigmentation exacerbation and to make these conditions look better. This is particularly true for individuals with skin of colour who are less inclined to employ photo-protection, even when they have been identified as having these photo-exacerbated conditions [12]. According to the American Academy of Dermatology, SPF 30 filters out 97%, which is the recommended starting point for SPF levels [13]. The American Food and Drug Administration (FDA) has issued a number of recommendations to lower the risk of skin aging and cancer through routine use of broad spectrum sunscreen with an SPF value of 15 or higher in conjunction with other protective measures like restricting time spent in the sun, particularly between the hours of 10 AM and 2 PM, covering exposed skin with clothing, using a water-resistant sunscreen, and reapplying sunscreen, even if it is water-resistant, at least every 2 hours [14]. In addition, it's worth mentioning that there isn't enough evidence to support the claim that products with SPF values higher than 50 offer users greater protection than those with SPF values of 50 [14].

In our study, almost one-third of the patients (35.0%) reported that they do not reapply the sunscreen during the day. No matter how often you reapply sunscreen, using one that is easily washed off your skin won't provide any protection from the sun [15]. The lowest skin exposure occurs from early reapplication into the sun exposure time, not at 2 to 3 hours after first application, for sunscreens that bind to skin moderately or well, characteristic of modern waterproof or water-resistant formulations. Usually, reapplying sunscreen at 20 minutes only protects against 60% to 85% of the UV radiation that would otherwise occur at 2 hours [15]. The recommendation for sunscreen users should be to apply sunscreen thoroughly to exposed locations 15 to 30 minutes before going outside and then again 15 to 30 minutes after sun exposure starts. After engaging in strenuous activities like swimming, towelling, or prolonged periods of intense perspiration and rubbing, additional reapplication may be required [15].

In our study, more than half of the patients (57.4%) reported that they use wide spectrum sunscreen. In addition, more than half of the patients (53.3%) reported that they are exposed to the sun 1-2 hours during the weekdays and 76.6% during the weekends. Only 4.8% of the patients reported that they frequently use a hat or sunshade when they are outside and 40.4% reported that they frequently stay in the shade when they are outside. This was aligning with the findings of a previous study [7], which reported that approximately 67.5% of respondents said they regularly use sunscreen, and 91% supported the use of sunscreen with a UV protection factor of 21 or higher. Only 7.6% of participants reapplied sunscreen every two hours, and 48.5% were unsure if their sunscreen offered broad-spectrum protection [7]. Another study in Saudi Arabia reported that the majority of the participants were not aware if their sunscreen is broad spectrum and only one-third of them use sunscreen on both sunny and cloudy days [4]. A broad-spectrum sunscreen is designed to protect your skin from both UVA and UVB rays, which are both hazardous to the skin [13]. The more potent UVB

radiation can result in sunburns and the majority of skin malignancies. While UVA rays are often responsible for early aging, they may also play a role in some cases of skin cancer [13]. Compared to former organic filters, large molecular last generation UVB-UVA broad spectrum sunscreens have a higher benefit-risk ratio because they provide better UVA band protection and are non-toxic and non-allergenic. With the help of these compounds, sunscreen efficacy could be improved, particularly in terms of preventing primary skin cancer [16].

Male patients were less likely to use sunscreen compared to female patients (Odds ratio: 0.80 (95% CI: 0.64-0.99), ($p \leq 0.05$). This confirms the findings of a previous study by Maymone et al., which reported that males were less likely to use sunscreen compared to females [7]. Another study by Seetan in Jordan and other studies in Saudi Arabia also confirmed the same findings [4, 5, 17].

Limitations:

This study has several strengths. This is among the first few studies to explore the use of sun protectors among patients with cutaneous hyperpigmentation conditions in Saudi Arabia. The use of online survey enabled us to reach a wide group of patients across the country. At the same time, this study has limitations. The cross-sectional study design did not allow us to follow up with the patients or explore causality. The use of online survey might have missed some of the targeted population. Therefore, our findings should be interpreted carefully.

Conclusion

In Saudi Arabia, the pattern of sunscreen use among patients with cutaneous hyperpigmentation is suboptimal. Males were significantly less likely to apply sunscreen. The healthcare authorities should conduct educational campaigns to inform this group of patients about this type of condition and the need of using sunscreen for their condition. Social media platforms should be utilized to improve public awareness about the usage of different types of sunscreens and to educate the public about the many types of sunscreen products. This will increase the public's use of sunscreens and prevent the development of sun-related skin conditions.

Statement of the Institutional Review Board:

The IMSIU research ethics committee approved the study (project number 310-2022; approval date, 27 September 2022). All writings were made in accordance with the ethical principles of the Declaration of Helsinki. A brief description of the study was included with the survey link, with a full explanation on the survey's front page. The participants were told that consent was given by filling out the survey. All participants' consent and data were obtained in complete confidence throughout the study.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Authors' Contributions:

All authors have contributed equally to all the processes of the research work. They have read and agreed to the published version of the manuscript.

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Data Availability Statement:

Data supporting the findings of this study are available from the corresponding author, Mohammed Almashali., upon reasonable request.

Conflicts of interest:

The authors report that there are no conflicts of interest in this work.

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