

Knowledge, Attitude, and Behavior of Photoprotection in Thai Vitiligo Patients

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Background: Vitiligo is a chronic pigmentary disorder characterized by the progressive loss of melanocytes, resulting in skin depigmentation. Although UV-based therapies, such as narrowband UVB, are commonly used for treatment, excessive sun exposure may aggravate the disease. Understanding patients' perceptions and behaviors related to sun exposure is crucial, particularly in tropical countries like Thailand, where UV levels are high.

Purpose: To assess the knowledge, attitudes, and photoprotection behaviors of Thai vitiligo patients compared to healthy controls.

Patients and Methods: A cross-sectional study was conducted from January to August 2025 using a self-administered questionnaire. The questionnaire assessed participants' demographics, vitiligo-related characteristics, knowledge and attitudes toward sun exposure, perceived skin cancer risk, and sun protection practices. Data from 105 vitiligo patients and 85 controls were analyzed using chi-square and descriptive statistics.

Results: Vitiligo patients showed greater awareness of the effects of sunlight on their condition than the control group. A higher proportion thought mild sunlight may improve vitiligo (57.1% vs 31.8%, $p < 0.001$). Only 25.7% of patients believed they had an increased risk of skin cancer. Vitiligo patients were more likely to use sunscreen regularly (53.3% vs 37.6%, $p = 0.031$) and during outdoor activities (61.0 vs 40.0%, $p = 0.004$) compared to control. However, reapplication rates were suboptimal with 75.2% of vitiligo patients never reapplied sunscreen, and fewer patients reapplied occasionally compared to controls (18.1% vs 37.6%, $p = 0.002$).

Conclusion: Thai vitiligo patients demonstrated moderate understanding of photoprotection and skin cancer risk, but significant behavioral gaps exist, notably in terms of sunscreen reapplication and comprehensive sun protection methods. These findings underscore the need for focused educational efforts to close the knowledge-practice gap, highlighting both the benefits and risks of UV exposure in vitiligo treatment.

Keywords: photoprotection, phototherapy, skin cancer, sunburn, vitiligo

Introduction

Vitiligo is a chronic pigmentary disorder characterized by the progressive loss of melanocytes, resulting in skin depigmentation. Vitiligo affects between 0.5% and 2% of the global population and can occur in patients of any age, gender, or skin type.¹ Treatment of vitiligo aims to stabilizing active disease and restore pigmentation. Options include topical therapies (eg, corticosteroids, calcineurin inhibitors, and JAK inhibitors), phototherapies (narrowband UVB [NB-UVB], 308-nm excimer lamp, 308-nm excimer laser, home phototherapy), immunosuppressants, and surgical melanocyte transplantation. The choice of treatment is determined by several factors, including disease type, duration, and lesion location.²

Although vitiligo is not physically harmful, it can significantly affect patients' psychological well-being. The vitiliginous skin lacks melanin and is therefore more sensitive to sunlight, making it more prone to erythema upon sun exposure. Lower minimal erythema dose to UVB was demonstrated in vitiliginous lesions compared to normal skin in Fitzpatrick's skin phototypes III, IV and V.³

Despite its common use in vitiligo treatment, ultraviolet (UV) is thought to be the primary cause of Koebnerization. The mechanism by which UV aggravates vitiligo is not well understood. However, fragile melanocytes in patients with vitiligo are known to be easily damaged via apoptosis and necrosis after overexposure to UV.⁴ Overexposure to sunlight has been identified as a common exacerbating factor in vitiligo. The common sunlight trigger locations are the face and acral parts. Other triggering factors included trauma, burn, stress, and chemical injury.⁵

General recommendations for vitiligo patients include avoiding excessive sunlight and using sun protection measures such as sunscreen and protective clothing. The expert panel advised vitiligo patients to regularly expose their lesional skin to UV light without sunscreen until their vitiligo lesions turned pink. When the vitiligo lesions are pink or repigmented, SPF50+ broad-spectrum sunscreen is required to prevent sunburn and Koebnerization.⁶

Carcinogenesis is one of the patients' main concerns with vitiligo. Although light skin types are more likely to develop skin cancer, vitiligo patients have a lower risk of developing both melanoma and nonmelanoma skin cancer (NMSC).⁷ Rooker et al conducted a systematic review and meta-analysis that demonstrated vitiligo patients do not have an increased risk of developing NMSC owing to heightened immune surveillance. Furthermore, the reduced relative risk suggests that vitiligo has a potential protective effect on developing NMSC.⁷

Phototherapy further supports vitiligo's protective effect against NMSC. Bae et al demonstrated that long-term NB-UVB phototherapy in vitiligo does not raise the incidence of NMSC, melanoma, or Bowen disease, even for the patients getting exceptionally long-term treatment (≥ 500 sessions). However, those who received 200 or more sessions of NB-UVB phototherapy were considerably more likely to develop actinic keratosis (AK), a precancerous lesion. Despite this, no progression of AK to skin cancer was detected, probably due to enhanced immune surveillance in vitiligo patients.⁸

In terms of vitiligo, the survey of 209 vitiligo patients in the United States revealed that nearly half of them believed vitiligo increased their risk of skin cancer, and most reported increased sunscreen use following the vitiligo diagnosis.⁹ Similarly, a study in Turkey comparing 153 vitiligo patients with 106 healthy individuals found that those with vitiligo tended to use sunscreen and seek shade.¹⁰

Thailand, as a tropical country with high levels of UV radiation throughout the year, presents a unique situation in which photoprotection is especially vital. However, general awareness of sun protection remains low, and no local research has been conducted to assess the knowledge, attitudes, and behavior of Thai vitiligo patients in terms of photoprotection. Given the disease's chronic and often treatment-resistant nature, the goal of this study is to examine vitiligo patients' knowledge and attitude about sunlight improvement and aggravation, as well as their perceptions of carcinogenesis. The study will also look at how vitiligo patients use photoprotection in their daily lives.

Material and Methods

A self-administered questionnaire-based study was conducted between January 2025 and August 2025 at the Dermatology clinic, Department of Dermatology, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand. Inclusion criteria included patients diagnosed with vitiligo aged 18 years or older. The control group was individuals from the general population aged 18 years or older, without any current dermatologic conditions requiring treatment. Informed consent was obtained from both groups. Individuals who do not consent to participate in the study were excluded. This study was approved by the Siriraj Institutional Board (COA no.SI 982/2024). This study complied with all of the principles set forth in the Declaration of Helsinki (1964) and all of its later amendments.

The multiple-choice questionnaire was designed and tailored to the Thai context by OW and NS. The questionnaire collected demographic and vitiligo-related characteristics, general knowledge about sunlight exposure in vitiligo, patient attitudes towards sunlight exposure in vitiligo, perceptions of risk regarding sunburn and skin cancer, and sun protection behaviors. The questionnaire was in the Thai language and distributed through both onsite and online platforms using a QR code, which provided participants with access to the online survey. Upon agreeing to participate in the study, informed consent was obtained electronically via the online questionnaire interface.

Statistical Analysis

This study aimed to evaluate the knowledge and attitudes of vitiligo patients toward photoprotection. A previous study Baykal Selçuk et al reported that 83% of vitiligo patients were aware that "intense sunlight can trigger disease progression".¹⁰ In the

present study, the investigators assumed that 80% of patients would have this knowledge. With a margin of error set at 8%, the required sample size was calculated to be 97 participants using the n4Studies program. To account for potential incomplete data, an additional 10% was added, resulting in a final target sample size of 110 vitiligo patients.

For the control group, it was hypothesized that 45% would be aware that “intense sunlight can trigger vitiligo progression.” With a margin of error set at 10%, the calculated required sample size was 96 participants, using the n4Studies program. To account for potential incomplete data, a 5% buffer was added, resulting in a total of 100 participants in the control group. Continuous variables were summarized using mean and standard deviation (SD), or median with interquartile range (25th and 75th percentiles), as appropriate. Categorical variables were presented as frequency and percentage (n, %). Comparisons of categorical data were performed using the Pearson Chi-square test, Pairwise Chi-Square Tests with Bonferroni Correction. A p-value of < 0.05 was considered statistically significant. Data were analyzed using IBM SPSS Statistics 20.

Results

Demographic Characteristics

A total of 190 participants were included, comprising 105 vitiligo patients and 85 controls (Table 1). The mean age was 49.3 ± 15.4 years in the vitiligo group and 47.0 ± 14.3 years in the control group. Females predominated in both groups (74.3% vs 80.0%). The Fitzpatrick skin phototype IV was more frequent among vitiligo patients (55.2%), while type III

Table 1 Characteristics of Participants

	Vitiligo, n (%) (n=105)	Control, n (%) (n=85)
Sex		
• Male	27 (25.7)	17 (20.0)
• Female	78 (74.3)	68 (80.0)
Age, years (mean $\pm$ SD)	49.3 $\pm$ 15.4	47.0 $\pm$ 14.3
Skin phototype		
• Type III	36 (34.3)	48 (56.5)
• Type IV	58 (55.2)	33 (38.8)
• Type V	11 (10.5)	4 (4.7)
Education		
• Primary school or less	11 (10.5)	11 (12.9)
• Secondary school or equivalent	21 (20.0)	16 (18.8)
• Bachelor's degree	50 (47.6)	40 (47.1)
• Master's degree or higher	23 (21.9)	18 (21.2)
History of skin cancer	0 (0.0)	0 (0.0)
Family history of skin cancer	2 (1.9)	2 (2.4)
Age at onset of vitiligo, years (mean $\pm$ SD)	40.9 $\pm$ 18.5	
Type of vitiligo		
• Non-segmental	88 (83.8)	-
• Segmental	17 (16.2)	-
Vitiligo affected area, %BSA (mean $\pm$ SD)	2.4 $\pm$ 3.1	-
Location of vitiligo		
• Face	66 (62.9)	-
• Neck	39 (37.1)	-
• Body	50 (47.6)	-
• Arms	43 (41.0)	-
• Hands	46 (43.8)	-
• Legs	40 (38.1)	-
• Feet	35 (33.3)	-

(Continued)

Table 1 (Continued).

	Vitiligo, n (%) (n=105)	Control, n (%) (n=85)
Exposure area		-
• Exposed only	52 (49.5)	-
• Non-exposed only	5 (4.8)	-
• Exposed and non-exposed	48 (45.7)	-
Treatment modalities		
• Medical treatment	104 (99.0)	-
○ Topical treatment	104 (99.0)	-
○ Oral or systemic treatment	48 (45.7)	-
• Phototherapy	85 (81.0)	-
○ NB-UVB	63 (60.0)	-
○ Targeted phototherapy	23 (21.9)	-
○ Home-use device	2 (1.9)	-
○ PUVA	0 (0.0)	-
■ Topical PUVA	0 (0.0)	-
■ Oral PUVA	0 (0.0)	-

Abbreviations: SD, standard deviation; BSA, body surface area; NB-UVB, narrowband ultraviolet B; PUVA, psoralen plus ultraviolet A.

was more common in controls (56.5%). The majority of participants had attained at least a bachelor's degree (vitiligo 47.6%, controls 47.1%). None of the participants had a personal history of skin cancer, but a small proportion reported a family history (1.9% in vitiligo vs 2.4% in controls).

Among vitiligo patients, the mean age at onset of the disease was 40.9 ± 18.5 years, with non-segmental vitiligo being the predominant type (83.8%). The mean body surface area (BSA) involvement was $2.4 \pm 3.1\%$. The most commonly affected sites were the face (62.9%), hands (43.8%), and body (47.6%). Most patients (99.0%) had received medical treatment, and 81.0% had undergone phototherapy, primarily with NB-UVB (60.0%). (Table 1)

Knowledge and Attitudes Toward Sunlight Exposure and Vitiligo

Table 2 highlights the participants' knowledge about sunlight's role in vitiligo. One-third of vitiligo patients (33.3%) believed they were not at a higher risk of developing skin cancer than persons without vitiligo. This was substantially higher than the control group (16.5%, $p = 0.008$). The majority of those who believed that vitiligo was associated with a higher risk obtained information from the internet.

Nearly half of the vitiligo group (47.6%) stated that intense sunlight exposure could cause vitiligo progression, whereas 57.1% believed that mild sunlight exposure could help improve their condition. Patients with vitiligo were more likely than controls to believe there was no increased risk of sunburn (42.9% vs 17.6%, $p < 0.001$). Only 6.7% of vitiligo patients believed NB-UVB phototherapy increased skin cancer risk, significantly lower than controls (18.8%, $p = 0.011$).

Table 2 General Knowledge About Sunlight Exposure and Vitiligo

	Vitiligo, n (%) (n=105)	Control, n (%) (n=85)	p-value
Do you think that individuals with vitiligo have a higher risk of developing skin cancer compared to those without vitiligo?			0.030*
• Yes	35 (33.3)	34 (40.0)	0.342
• No	35 (33.3)	14 (16.5)	0.008*
• Not sure	35 (33.3)	37 (43.5)	0.150

(Continued)

Table 2 (Continued).

	Vitiligo, n (%) (n=105)	Control, n (%) (n=85)	p-value
If you answered "Yes" to the previous question, from whom did you receive this information?			
• Dermatologist	6 (17.1)	4 (11.8)	0.734
• General practitioner	1 (2.9)	0 (0)	1.0
• Internet	22 (62.9)	15 (44.1)	0.119
• Social media	8 (22.9)	12 (35.3)	0.255
• Friends or family members	2 (5.7)	4 (11.8)	0.428
• Others			
○Self-initiated	10 (9.5)	9 (10.6)	0.787
○Insurance	1 (1.0)	0 (0.0)	1.000
○Book/Journal	0 (0.0)	3 (3.5)	0.239
Do you think intense sunlight exposure can trigger the progression of vitiligo?			0.471
• Yes	50 (47.6)	44 (51.8)	0.570
• No	33 (31.4)	20 (23.5)	0.227
• Not sure	22 (21.0)	21 (24.7)	0.539
Do you think mild sunlight exposure can help improve vitiligo?			0.375
• Yes	60 (57.1)	40 (47.1)	0.166
• No	20 (19.0)	19 (22.4)	0.575
• Not sure	25 (23.8)	26 (30.6)	0.294
Do you think vitiligo increases the risk of sunburn?			0.001*
• Yes	39 (37.1)	45 (52.9)	0.029*
• No	45 (42.9)	15 (17.6)	<0.001*
• Not sure	21 (20.0)	25 (29.4)	0.132
Do you think that treatment with NB-UVB phototherapy increases the risk of developing skin cancer?			0.006*
• Yes	7 (6.7)	16 (18.8)	0.011*
• No	63 (60.0)	34 (40.0)	0.006*
• Not sure	35 (33.3)	35 (41.2)	0.265

Notes: *Statistical significance at $p < 0.05$. Statistic: Pearson Chi-Square.

Abbreviation: NB-UVB, narrowband ultraviolet B.

Table 3 demonstrates that 60.0% of vitiligo patients reported that intense sunlight made vitiligo more visible. More than one-third (36.2%) believed that sunlight could worsen their condition, whereas 35.2% believed sunlight could help improve it. Notably, 74.3% felt the need to protect themselves from sunlight due to vitiligo, although only 25.7% believed they had an increased risk of developing skin cancer.

Table 3 Patients' Attitudes Toward Sunlight Exposure and Vitiligo

	Vitiligo, n (%) (n=105)
Does exposure to intense sunlight make vitiligo more visible?	
• Yes	63 (60.0)
• No	27 (25.7)
• Not sure	15 (14.3)
Does sunlight cause your vitiligo to increase?	
• Yes	38 (36.2)
• No	45 (42.9)
• Not sure	22 (21.0)

(Continued)

Table 3 (Continued).

	Vitiligo, n (%) (n=105)
Does sunlight help improve your vitiligo?	
• Yes	37 (35.2)
• No	43 (41.0)
• Not sure	25 (28.8)
Do you need to protect yourself from sunlight because you have vitiligo?	
• Yes	78 (74.3)
• No	23 (21.9)
• Not sure	4 (3.8)
Do you believe that you have an increased risk of developing skin cancer because you have vitiligo?	
• Yes	27 (25.7)
• No	46 (43.8)
• Not sure	32 (30.5)

Photoprotection Behaviors

Patients with vitiligo exhibited similar levels of physical photoprotection compared to control groups, reflected in wearing long-sleeved clothing, a hat, sunglasses and an umbrella. Overall, while physical protection practices were comparable between groups, differences in sunscreen use patterns and SPF awareness are highlighted in [Table 4](#) and [Figure 1](#).

Table 4 Sun Protection Behaviors

	Vitiligo, n (%) (n=105)	Control, n (%) (n=85)	p-value
Do you wear long-sleeved clothing when going out in strong sunlight?			0.453
• Always	30 (28.6)	18 (21.2)	0.243
• Often	20 (19.0)	20 (23.5)	0.451
• Sometimes	37 (35.2)	36 (42.4)	0.316
• Never	18 (17.1)	11 (12.9)	0.423
Do you wear clothing with a UPF rating to protect yourself from the sun?			0.184
• Always	10 (9.5)	8 (9.4)	0.979
• Often	7 (6.7)	7 (8.2)	0.681
• Sometimes	20 (19.0)	27 (31.8)	0.043*
• Never	68 (64.8)	43 (50.6)	0.049*
Do you wear a hat when going out in strong sunlight?			0.677
• Always	24 (22.9)	22 (25.9)	0.628
• Often	16 (15.2)	16 (18.8)	0.511
• Sometimes	38 (36.2)	31 (36.5)	0.968
• Never	27 (25.7)	16 (18.8)	0.259
Do you wear sunglasses when going out in strong sunlight?			0.440
• Always	19 (18.1)	11 (12.9)	0.333
• Often	10 (9.5)	11 (12.9)	0.455
• Sometimes	31 (39.5)	32 (37.6)	0.237
• Never	45 (42.9)	31 (36.5)	0.372
Do you use an umbrella when going out in strong sunlight?			0.170
• Always	25 (23.8)	13 (15.3)	0.145
• Often	11 (10.5)	15 (17.6)	0.153
• Sometimes	36 (34.3)	36 (42.4)	0.254
• Never	33 (31.4)	21 (24.7)	0.307

(Continued)

Table 4 (Continued).

	Vitiligo, n (%) (n=105)	Control, n (%) (n=85)	p-value
Do you apply sunscreen every day?			0.085
• Always	56 (53.3)	32 (37.6)	0.031*
• Often	8 (7.6)	14 (16.5)	0.058
• Sometimes	25 (23.8)	21 (24.7)	0.886
• Never	16 (15.2)	18 (21.2)	0.288
Do you apply sunscreen when participating in outdoor activities?			0.031*
• Always	64 (61.0)	34 (40.0)	0.004*
• Often	10 (9.5)	14 (16.5)	0.152
• Sometimes	14 (13.3)	20 (23.5)	0.068
• Never	17 (16.2)	17 (20.0)	0.496
Do you reapply sunscreen every 2–3 hours when outdoors or during sports?			0.009*
• Always	5 (4.8)	2 (2.4)	0.463
• Often	2 (1.9)	0 (0.0)	0.503
• Sometimes	19 (18.1)	32 (37.6)	0.002*
• Never	79 (75.2)	51 (60.0)	0.025*
What level of SPF do you typically use in your sunscreen?			0.035*
• 50+	76 (72.4)	66 (77.6)	0.406
• 30	4 (3.8)	9 (10.6)	0.066
• 15	1 (1.0)	1 (1.2)	1.000
• Not sure	22 (22.9)	9 (10.6)	0.026*

Notes: *Statistical significance at $p < 0.05$. Statistic: Pearson Chi-Square, Fisher-Freeman-Halton Exact Test.

Abbreviations: UPF, Ultraviolet Protection Factor; SPF, Sun Protection Factor.

More vitiligo patients reported applying sunscreen daily compared with controls (53.3% vs 37.6%, $p = 0.031$). Moreover, sunscreen use during outdoor activities was significantly higher among patients than controls (61.0% vs 40.0%, $p = 0.004$). Reapplication of sunscreen every 2–3 hours was infrequent, with 75.2% of vitiligo patients and 60.0% of controls never reapplying sunscreen ($p = 0.025$). Additionally, occasional reapplication was reported significantly less often by vitiligo patients than controls (18.1% vs 37.6%, $p = 0.002$). While the majority of participants in both groups reported using SPF 50+ products, the difference was not statistically significant (72.4% of vitiligo patients vs 77.6% of controls, $p = 0.406$). Nevertheless, uncertainty regarding SPF level was significantly more common among vitiligo patients compared to controls (22.9% vs 10.6%, $p = 0.026$).

Multiple Binary Logistic Regression on Sun Protection Behaviors was performed (Table 5). Patients with vitiligo were more likely to apply sunscreen when participating in outdoor activities compared with controls (aOR 2.37, 95% CI 1.22–4.60). Older participants were more likely to wear hats (aOR 1.02, 95% CI 1.00–1.04), whereas individuals with higher education levels showed an opposite trend (aOR 0.49, 95% CI 0.25–0.95). Female participants were more likely to wear long-sleeved clothing than males (aOR 2.20, 95% CI 1.07–4.54) while males were more likely to wear sunglasses. Younger participants and females tended to apply sunscreen daily (aOR 0.96, 0.94–0.98), (aOR 6.52, 95% CI 2.89–14.71) and during outdoor activities (aOR 0.97, 95% CI 0.95–0.99), (aOR 4.42, 95% CI 2.05–9.51) respectively.

Discussion

This study explored the knowledge, attitudes, and behaviors regarding photoprotection among Thai vitiligo patients compared with healthy controls. Our findings highlight both strengths and gaps in photoprotection awareness and practices among individuals with vitiligo. One-third of vitiligo patients recognized a potential increased risk of skin cancer, while another one-third were unsure. This perception may be influenced by the relatively low reported incidence of melanoma and non-melanoma skin cancer in vitiligo patients. In a non-concurrent cohort study encompassing 10,040 Italian vitiligo patients, Paradisi et al observed a lower incidence of skin cancer, which the authors suggested could be

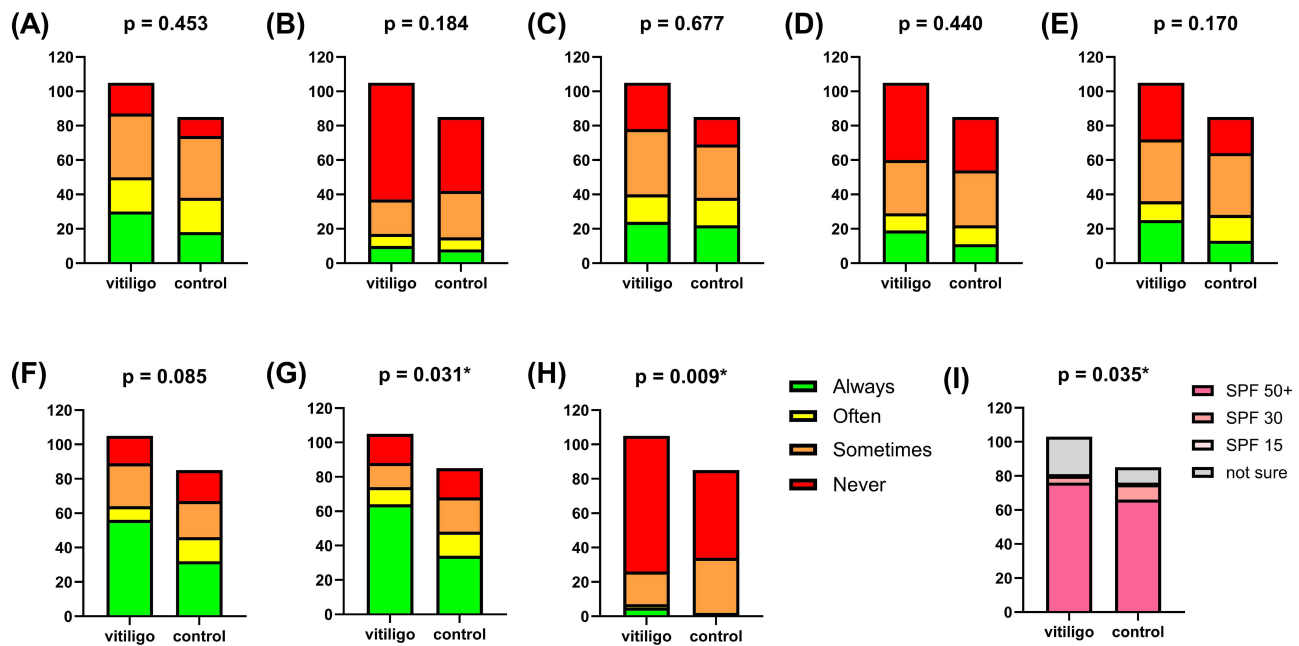


Figure 1 Sun Protection Behaviors Stacked bar chart illustrating proportion of sun protection behaviors between vitiligo and control groups. The chart displays the key of sun-protective practices, including (A) Wear long-sleeved clothing when going out in strong sunlight (B) Wear clothing with a UPF rating to protect from the sun (C) Wear a hat when going out in strong sunlight (D) Wear sunglasses when going out in strong sunlight (E) Use an umbrella when going out in strong sunlight (F) Apply sunscreen every day (G) Apply sunscreen when participating in outdoor activities (H) Reapply sunscreen every 2–3 hours when outdoors or during sports (I) Level of SPF in sunscreen. *Statistical significance set at $p < 0.05$.

Abbreviation: SPF, Sun Protection Factor.

related to an anti-melanocyte immune response.¹¹ Similarly, a study by Teulings et al proposed that patients with vitiligo have a lower risk of both melanoma and NMSC, with no further risk in patients receiving phototherapy.¹²

Depigmented skin is inherently more susceptible to sunburn due to the lack of melanin, which reinforces the importance of photoprotection to prevent erythema and disease exacerbation. Over half of both groups believed that mild sunlight might improve vitiligo, which may be related to the role of phototherapy in the treatment. Less than half of vitiligo patients associated intense sun exposure with worsening of their condition. The majority of vitiligo patients in this study acknowledged the need for sun protection, yet only one in four perceived themselves at higher risk for skin cancer. This suggests a disconnection between general awareness and personal risk perception. While patients may understand the disease-related impact of sun exposure, they may underestimate its potential to cause broader health implications such as sunburn or vitiligo progression. Gonzalez et al reported that nearly half of vitiligo patients (45%) believed they were at increased risk of skin cancer due to vitiligo, but sun-protective behaviors still remained low, with only 24.4% reported daily sunscreen use.⁹ This highlights that recognizing risk alone is not enough for consistent protective behaviors.

Table 5 Results of Multiple Binary Logistic Regression of Each Sun Protection Behavior on Four Independent Variables

Sun Protection Behaviors	Vitiligo Group aOR (95% CI)	Age (Years) aOR (95% CI)	Sex: Female aOR (95% CI)	Education: Bachelor's Degree or Above aOR (95% CI)
Wear long-sleeved clothing when going out in strong sunlight	1.23 (0.68, 2.22)	0.98 (0.96, 1.00)	2.20 (1.07, 4.54)*	0.76 (0.39, 1.46)
Wear clothing with a UPF rating to protect from the sun	0.93 (0.43, 2.02)	0.99 (0.97, 1.02)	1.37 (0.52, 3.60)	1.13 (0.47, 2.71)
Wear a hat when going out in strong sunlight	0.72 (0.39, 1.31)	1.02 (1.00, 1.04)*	0.95 (0.46, 1.93)	0.49 (0.25, 0.95)*
Wear sunglasses when going out in strong sunlight	0.97 (0.49, 1.91)	1.02 (1.00, 1.05)	0.33 (0.16, 0.70)*	1.44 (0.67, 3.10)
Use an umbrella when going out in strong sunlight	1.06 (0.57, 1.96)	1.01 (0.99, 1.03)	1.78 (0.83, 3.85)	1.28 (0.64, 2.55)
Apply sunscreen every day	1.74 (0.91, 3.35)	0.96 (0.94, 0.98)*	6.52 (2.89, 14.71)*	0.91 (0.45, 1.85)
Apply sunscreen when participating in outdoor activities	2.37 (1.22, 4.60)*	0.97 (0.95, 0.99)*	4.42 (2.05, 9.51)*	1.48 (0.72, 3.01)
Level of SPF in sunscreen	2.32 (0.73, 7.41)	0.96 (0.92, 1.00)	2.58 (0.75, 8.86)	1.48 (0.44, 5.04)

Notes: *Statistical significance at $p < 0.05$. Statistical analyses were conducted using logistic regression.

Abbreviations: CI, confidence interval; UPF, Ultraviolet Protection Factor; SPF, Sun Protection Factor; OR, odds ratio.

Although vitiligo patients used sunscreen more frequently than controls, the application and reapplication were inconsistent. Less than 5% of vitiligo patients reported reapplying sunscreen every 2–3 hours, despite 72.4% using high SPF products (SPF 50 or higher). Behavioral studies have revealed that frequent reapplication is required to maintain appropriate photoprotection, particularly in outdoor settings, indicating a key area for patient counseling. A study by Baykal Selçuk et al indicated that vitiligo patients who were part of a support group had double the rates of sunscreen reapplication as those who were not.¹⁰ This suggests that encouraging participation in support groups may be a useful method to reinforce sun protective behaviors. Other photoprotective measures, such as wearing UPF-rated clothing or using umbrellas, were infrequently practiced in both groups. This pattern reflects a tendency to rely on sunscreen as the primary photoprotection method rather than adopting a comprehensive approach.

These findings are particularly important in the context of Thailand's tropical environment, where year-round UV exposure is high. Without adequate photoprotection, vitiligo patients face increased risk of sunburn and potential lesion progression due to Köebnerization. Nevertheless, reassuringly, the lower risk of NMSC in vitiligo, as demonstrated by Rooker et al and supported by our patients' phototherapy safety perceptions, should be emphasized to reduce unnecessary fear and improve compliance with treatment and prevention strategies. Understanding patients' views of potential hazards and benefits from UV radiation, whether natural or artificial, is crucial as it is one of the primary treatments for vitiligo. According to Bhatia et al, patients in a support group had a safer attitude toward sun exposure, with superior photoprotection habits and a lower frequency of sunburns with skin peeling.¹³

To our knowledge, this is one of the studies in Thailand to explore the photoprotection knowledge, attitude, and practices among patients with vitiligo. The study highlights the need for targeted educational interventions that not only improve understanding but also promote behavior change. Clear guidance on the differentiation between therapeutic and harmful UV exposure, practical use of sunscreen (including reapplication), and alternative sun protection methods (eg, UPF clothing, shade-seeking, hats, umbrella) is essential.

This study's limitations include its cross-sectional design and its reliance on self-reported behaviors, which may be subject to recall bias. The sample was recruited from a single center, which may limit generalizability. Future studies should explore interventions that combine patient education with behavioral reinforcement and evaluate their impact on photoprotection practices and disease outcomes.

Conclusion

Thai vitiligo patients showed a moderate awareness of photoprotection and skin cancer risk, but there are major behavioral gaps, particularly in terms of sunscreen reapplication and comprehensive sun protection strategies. These findings show the need for targeted educational efforts to overcome the knowledge-practice gap, emphasizing both the advantages and hazards of UV exposure in vitiligo treatment.

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Disclosure

The authors report no conflicts of interest in this work.

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