



Original Article

## Knowledge, Attitude and Practice Regarding Sunscreen Use among Patients Attending a Tertiary Care Dermatology Department in Rural Maharashtra: A Cross-Sectional Study

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### ABSTRACT

**Introduction:** Ultraviolet (UV) radiation is a major environmental risk factor for several acute and chronic dermatological conditions including photoaging, pigmentary disorders, and cutaneous malignancies. Sunscreens are effective photoprotective agents; however, their correct and regular use depends on adequate knowledge, favorable attitude, and appropriate practices. Data regarding sunscreen usage in rural Indian populations remain limited.

**Materials and Methods:** A hospital-based cross-sectional study was conducted among adult patients attending a tertiary care dermatology outpatient department in rural Maharashtra. A pre-validated, structured Knowledge-Attitude-Practice (KAP) questionnaire was administered after obtaining informed consent. Descriptive statistics were used to analyze the data.

**Results:** Of 500 participants enrolled, 400 were analyzed. Most were males (59.0%), engaged in outdoor work (72.0%), had >3 hours of daily sun exposure (66.0%), and had education below secondary level (81.5%). Knowledge regarding sunscreen and sun damage was poor: 44.0% recognized sunscreen as important, 51.0% knew excessive sun exposure causes skin damage, and only 36.0% were aware of skin cancer risk. Correct knowledge of sunscreen quantity, reapplication, and winter use was observed in 26.0%, 25.0%, and 29.0%, respectively.

Misconceptions were common: 68.0% perceived sunscreen as cosmetic and 80.0% considered it expensive. Regular sunscreen use was reported by only 19.0%, with correct timing in 13.0% and reapplication in 8.0%. Although 39.0% had good knowledge, only 19.0% demonstrated good practices, indicating a marked knowledge-practice gap. Females, participants with secondary education and above, and indoor workers had significantly higher knowledge and practice scores ( $p < 0.01$ ).

**Conclusion** The study highlights poor knowledge, unfavorable attitudes, and inadequate sunscreen practices among rural dermatology patients despite high sun exposure. Targeted educational interventions and cost-effective public health strategies are urgently required to improve photoprotective behavior.

**Keywords:** Sunscreen, Knowledge Attitude Practice, Photoprotection, Rural population, Dermatology.

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### INTRODUCTION

Sun exposure is an unavoidable aspect of daily life in tropical countries such as India. Chronic exposure to ultraviolet (UV) radiation is associated with a wide spectrum of dermatological effects, ranging from acute manifestations such as erythema

and tanning to long-term consequences including pigmentary disorders, premature skin aging, and cutaneous malignancies. Cumulative UV exposure induces cellular DNA damage and structural alterations in the skin, thereby increasing the risk of both non-melanoma and melanoma skin cancers.<sup>1,2</sup>

The global incidence of skin cancer has risen steadily over the past few decades.<sup>3</sup> Although skin cancers occur less frequently in individuals with darker skin types, the prognosis is often worse due to delayed diagnosis and low awareness.<sup>4</sup> In addition to cutaneous effects, prolonged UV exposure is a recognized risk factor for ocular morbidity, particularly cataract formation.<sup>5</sup> Many of these adverse effects are preventable through appropriate sun-protective measures.<sup>1</sup>

Photoprotection strategies include avoidance of peak sun exposure, use of protective clothing, and regular application of sunscreen. Sunscreens act by reflecting, absorbing, or scattering ultraviolet radiation, thereby reducing its penetration into the skin. Despite proven benefits, sunscreen usage remains inconsistent, especially in rural and low-resource settings, where awareness is limited and misconceptions are common.<sup>1</sup>

Sunscreen use is influenced by factors such as gender, educational status, socioeconomic background, and perception of sun-related health risks. Studies have demonstrated a persistent gap between knowledge and actual sun-protective practices, even when awareness is present.<sup>4</sup>

In rural India, prolonged outdoor occupational exposure, low health literacy, and economic constraints further contribute to inadequate photoprotection. In routine dermatology practice, patients frequently present with sun-aggravated dermatoses while demonstrating poor understanding of sunscreen as a preventive medical intervention rather than a cosmetic product. Therefore, the present study was undertaken to assess the knowledge, attitude, and practice regarding sunscreen use among patients attending a tertiary care dermatology department in rural Maharashtra, with the aim of identifying gaps that can inform targeted educational and preventive strategies.

## **MATERIAL AND METHODS**

### **Study Design and Setting**

A hospital-based cross-sectional study was conducted in the Department of Dermatology, Tertiary Care Hospital, Ahilyanagar, Maharashtra.

### **Study Period**

Six months ( June 2025 to Nov 2025)

### **Sample Size Calculation.**

Based on previously available literature, approximately 50% of the general population were using sunscreens. Sample size estimation was carried out by assuming a prevalence of 50%, with a 95% confidence level and d (margin of error) = 0.05. The sample size was calculated using the formula:

$$N = (Z_{1-\alpha/2})^2 \times pq/d^2$$

Thus, the calculated sample size was 385.

After applying a design effect of 1.2, the required sample size was 462 participants.

To further increase the power of the study, 500 participants were initially enrolled.

After applying exclusion criteria and removing incomplete responses, 400 participants were included in the final analysis.

### **Study Population and Eligibility Criteria**

#### **Inclusion criteria**

- Willing to participate and provide informed consent
- Adults aged  $\geq 18$  years
- Residents of rural areas

#### **Exclusion criteria**

- Patients with psychiatric illnesses
- Patients with severe or chronic dermatological diseases (since they are likely been counselled regarding usage of sunscreen)
- Healthcare professionals
- Incomplete questionnaires

### **Study Instrument**

A pre-validated structured questionnaire consisting of four sections:

1. Socio-demographic details
2. Knowledge regarding sun exposure and sunscreen
3. Attitude towards sunscreen usage
4. Practices related to sunscreen and other photo protective measures

Further for the knowledge domain (12 items), each correct response was awarded one mark and incorrect responses were given zero. The total knowledge score ranged from 0 to 12. Scores of 9–12 were categorized as good knowledge, 5–8 as fair knowledge, and  $\leq 4$  as poor knowledge. This grading method is consistent with previously validated KAP scoring systems.<sup>6 7 8 9 10</sup>

### Statistical Instrument

The overall scores of each study participant were used to obtain mean scores for knowledge and practice. Frequencies of correct knowledge answers and practices were described. Knowledge and practices scores of different persons according to different socio-demographic characteristics were compared using appropriate statistical tests. Both descriptive and inferential statistical analyses were performed. In the descriptive analyses, qualitative data were described in terms of frequency and percentage. Quantitative data were described using mean and standard deviation. Chi-square test was used to get the level of significance of the difference between groups.

### Statistical Analysis

Data were entered into Microsoft Excel and analyzed using descriptive statistics. Results were expressed as frequencies and percentages.

## RESULTS

A total of 500 participants were initially enrolled in the study. After applying the exclusion criteria and excluding incomplete questionnaires, data from 400 participants were included in the final analysis.

### Socio-demographic Characteristics

Of the 400 participants analyzed, 236 (59.0%) were males and 164 (41.0%) were females. A substantial proportion of participants were engaged in predominantly outdoor occupations [288 (72.0%)]. Prolonged sun exposure of more than three hours per day was reported by 264 (66.0%) participants. Educational status revealed that 326 (81.5%) participants had education below the secondary level (**Table 1**).

### Knowledge Regarding Sunscreen and Sun Exposure

Knowledge regarding sunscreen use and harmful effects of sun exposure was suboptimal. Awareness that sunscreen is important for sun protection was observed in 176 (44.0%) participants. Knowledge that excessive sun exposure can cause skin damage was reported by 204 (51.0%), while only 144 (36.0%) participants were aware of the association between sun exposure and skin cancer.

Correct knowledge regarding the quantity of sunscreen required for effective protection was present in only 104 (26.0%) participants. Awareness that sunscreen protects the skin from harmful ultraviolet rays was observed in 168 (42.0%) participants. Knowledge that sunscreen should be applied even during winter months was reported by 116 (29.0%), while only 100 (25.0%) participants were aware of the need for regular reapplication. Awareness that individuals with darker skin tones also require sunscreen was present in 124 (31.0%) participants (**Table 2**).

### Attitude Towards Sunscreen Use

Assessment of attitude revealed widespread misconceptions regarding sunscreen use. Sunscreen was considered important for maintaining healthy skin by 184 (46.0%) participants. However, a majority perceived sunscreen as merely a cosmetic or beauty product [272 (68.0%)]. Gender-based misconceptions were common, with 268 (67.0%) participants believing that sunscreen use is necessary only for females.

Cost was identified as a major attitudinal barrier, with 320 (80.0%) participants considering sunscreen to be expensive. Belief that skin damage caused by sunlight can be prevented was observed in 164 (41.0%) participants. A high proportion believed that wearing only a cap or hat provides sufficient sun protection [288 (72.0%)]. Alarming, only 96 (24.0%) participants reported being concerned about the harmful effects of sunlight. Willingness to advise others regarding sunscreen use was reported by 132 (33.0%), while 252 (63.0%) found sunscreen greasy or uncomfortable to apply (**Table 3**).

### Sunscreen Usage Practices

Sunscreen usage practices were notably poor. Regular sunscreen use was reported by only 76 (19.0%) participants. Use of sunscreen specifically during outdoor activities was reported by 88 (22.0%), while 104 (26.0%) applied sunscreen before sun exposure.

Correct timing of application, defined as application at least 30 minutes prior to sun exposure, was practiced by 52 (13.0%) participants. Reapplication of sunscreen every 2–3 hours during continued sun exposure was reported by only 32 (8.0%) participants. Use of sunscreen with SPF  $\geq$ 30 was observed in 60 (15.0%), and application to all exposed body parts was practiced by 44 (11.0%) participants (Table 4).

**Table 1: Socio-demographic Profile of Study Participants (n = 400)**

Variable	Number (%)
Gender	
Male	236 (59.0)
Female	164 (41.0)
Occupation type	
Predominantly outdoor	288 (72.0)
Predominantly indoor	112 (28.0)
Average daily sun exposure	
> 3 hours/day	264 (66.0)
$\leq$ 3 hours/day	136 (34.0)
Educational status	
Below secondary level	326 (81.5)
Secondary and above	74 (18.5)

**Table 2: Knowledge Regarding Sunscreen and Sun Exposure among Participants (n = 400)**

Knowledge Item	Correct Response n (%)
Sunscreen is important for sun protection	176 (44.0)
Excess sun exposure causes skin damage	204 (51.0)
Awareness of skin cancer risk due to sun exposure	144 (36.0)
Knowledge of correct quantity of sunscreen	104 (26.0)
Sunscreen protects against harmful UV rays	168 (42.0)
Sunscreen should be used even during winter	116 (29.0)
Sunscreen requires regular reapplication	100 (25.0)
Dark-skinned individuals also need sunscreen	124 (31.0)

**Table 3: Attitude Towards Sunscreen Use among Participants (n = 400)**

(Agree + Strongly Agree responses)

Statement	Number (%)
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Sunscreen is important for maintaining healthy skin	184 (46.0)
Sunscreen is only a cosmetic/beauty product	272 (68.0)
Only females should use sunscreen	268 (67.0)
Sunscreen is expensive	320 (80.0)
Skin damage caused by sunlight can be prevented	164 (41.0)
Wearing only a cap/hat provides sufficient protection	288 (72.0)
Harmful effects of sunlight concern me	96 (24.0)
I would advise others to use sunscreen	132 (33.0)
Sunscreen is greasy/sticky/uncomfortable to apply	252 (63.0)

**Table 4: Sunscreen Usage Practices among Study Participants (n = 400)**

Practice Parameter	Number (%)
Regular use of sunscreen	76 (19.0)
Use sunscreen during outdoor activities	88 (22.0)
Apply sunscreen before sun exposure	104 (26.0)
Apply sunscreen $\geq 30$ minutes prior to exposure	52 (13.0)
Reapply sunscreen every 2–3 hours	32 (8.0)
Use sunscreen with SPF $\geq 30$	60 (15.0)
Apply sunscreen to all exposed body parts	44 (11.0)

#### Statistical Methods: Regression Analysis

Multivariate logistic regression was performed to identify independent predictors of good knowledge and good sunscreen practices. Variables showing significant association in univariate analysis were included in the regression model. Adjusted odds ratios with 95% confidence intervals were calculated, and a p value < 0.05 was considered statistically significant.

**Table 5: Distribution of Knowledge and Practice Levels (n = 400)**

Variable	Level	Frequency (n)	Percentage (%)
Knowledge	Good	156	39.0
	Fair	132	33.0
	Poor	112	28.0
Practice	Good	76	19.0
	Fair	124	31.0
	Poor	200	50.0

**Table 6: Mean Knowledge and Practice Scores by Socio-demographic Variables**

Characteristic	n	Knowledge Mean (SD)	p value	Practice Mean (SD)	p value
Male	236	9.8 (2.1)	<0.01	6.2 (1.9)	<0.01
Female	164	11.3 (1.8)		7.4 (1.6)	
Secondary & above	74	12.1 (1.6)	<0.01	7.8 (1.5)	<0.01
Below secondary	326	9.6 (2.0)		6.1 (1.8)	

**Table 7: Independent Predictors of Good Knowledge and Practices**

Predictor	Adjusted OR (Knowledge)	p value	Adjusted OR (Practice)	p value
Female sex	1.42 (1.12–1.81)	<0.01	1.56 (1.20–2.02)	<0.01
Secondary education or above	2.18 (1.54–3.08)	<0.001	2.64 (1.82–3.84)	<0.001
Indoor occupation	1.76 (1.29–2.41)	<0.01	1.91 (1.36–2.69)	<0.01

## DISCUSSION

The present study highlights substantial deficiencies in knowledge, attitude, and practices related to sunscreen use among rural dermatology patients in Maharashtra, despite prolonged daily sun exposure and a high prevalence of outdoor occupations. Although over half of the participants (51.0%) were aware that excessive sun exposure causes skin damage, only 36.0% recognized its association with skin cancer. This reflects a critical gap in understanding the long-term carcinogenic potential of ultraviolet (UV) radiation. Similar observations have been reported in previous Indian and international studies, where general awareness of sun damage was relatively higher than awareness of skin cancer risk attributable to UV exposure.<sup>11,12</sup>

In our study, only 44.0% participants acknowledged sunscreen as important for sun protection, and misconceptions were widespread, with 68.0% perceiving sunscreen as merely a cosmetic or beauty product. These findings are comparable to those reported by Tilwani et al. and Gillani et al., who observed that although a majority of respondents were aware of the harmful effects of excessive sunlight, a considerably smaller proportion demonstrated adequate conceptual understanding of sunscreen as a medical preventive intervention.<sup>13,14</sup> The persistence of such misconceptions in rural populations underscores the inadequate penetration of dermatological health education into primary and community-level healthcare services.

Awareness regarding correct sunscreen usage was particularly poor. Only 26.0% participants knew the correct quantity required for effective protection, 29.0% were aware that sunscreen should be applied even during winter, and merely 25.0% recognized the need for regular reapplication. These findings are consistent with those of Gupta et al. and Fabris et al., who similarly reported low awareness regarding correct application practices, despite moderate awareness of the general benefits of sunscreen.<sup>15,16</sup> Such deficiencies are clinically relevant, as incorrect quantity and failure to reapply sunscreen significantly reduce its photoprotective efficacy.

Sunscreen usage practices in the present study were alarmingly low. Regular sunscreen use was reported by only 19.0% participants, and correct application practices—such as application 30 minutes prior to sun exposure (13.0%) and reapplication every 2–3 hours (8.0%)—were observed in an even smaller fraction. These findings are similar to those reported by Alsudairy et al., AlGhamdi et al., and Almuqati et al., wherein approximately 23%–35% of participants reported sunscreen use.<sup>17,18,19</sup> However, they differ from studies conducted in more urbanized or higher-literacy settings, such as those by Alshalan et al. and Gillani et al., where sunscreen usage rates ranged from 48% to 72%.<sup>20,14</sup> This disparity likely reflects differences in socioeconomic status, educational attainment, healthcare access, and cultural perceptions regarding photoprotection.

Cost perception emerged as a major barrier, with 80.0% participants considering sunscreen to be expensive. This finding aligns with those reported by Gupta et al. and Alrobaee, who also identified financial constraints as a key deterrent to sunscreen use in low-resource populations.<sup>15,21</sup> In rural India, where healthcare expenditure is predominantly out-of-pocket, the perceived non-essential nature of sunscreen further reduces its prioritization.

The present study also demonstrated a statistically significant knowledge–practice gap. Although 39.0% of participants had good knowledge, only 19.0% demonstrated good sunscreen practices. Similar discordance between awareness and actual behavior has been reported in multiple KAP studies on photoprotection.<sup>12,14</sup> This suggests that knowledge alone is insufficient to bring about behavioral change unless reinforced through structured counseling, culturally appropriate health education, and improved accessibility of affordable photoprotective products.

Sex-based differences were evident, with females exhibiting significantly higher mean knowledge and practice scores than males ( $p < 0.01$ ). These findings are consistent with those of Alshalan et al., Tilwani et al., and Gillani et al., who also reported higher sunscreen usage among women, possibly due to greater concern regarding cosmetic appearance and skin health.<sup>20,13,14</sup>

Educational status was another important determinant. Participants with secondary education and above demonstrated significantly superior knowledge and practices compared to those educated below secondary level. Similar associations

have been reported by Alsudairy et al., Whiteman et al., and Yan et al., emphasizing the role of literacy and health education in shaping sun-protective behavior.<sup>17,22,23</sup>

Occupational exposure also influenced sunscreen practices. Individuals engaged in predominantly outdoor work exhibited significantly lower knowledge and practice scores compared to indoor workers, despite greater UV exposure. This paradoxical finding has been documented in previous studies and highlights the vulnerability of outdoor workers to photo-induced dermatoses due to inadequate awareness and poor adoption of protective measures.<sup>24</sup>

Multivariate logistic regression in the present study identified female sex, higher educational status, and indoor occupation as independent predictors of good knowledge and good sunscreen practices. These findings are consistent with earlier reports and reinforce the importance of socioeconomic determinants in influencing photo protective behavior.<sup>17,22</sup>

### Limitations

- Hospital-based design
- Self-reported practices
- Cross-sectional nature.

## CONCLUSION

The present study demonstrates that knowledge and practices related to sun exposure and sun-protective behaviours vary significantly with socio-demographic factors such as sex, educational status, and socioeconomic background. Although many participants had good or fair knowledge regarding sunscreen use, actual practice was poor. Only a small fraction reported regular use, and even among users, incorrect practices—such as inadequate quantity, irregular application, and failure to reapply—were common. These findings reveal a critical gap between knowledge and practice, indicating that awareness alone does not ensure healthy sun-protective behaviour. Targeted education on the harmful effects of excessive sun exposure and correct sunscreen use—including appropriate SPF, quantity, timing, and reapplication—is essential. Despite widespread information access, awareness and practices remain suboptimal in rural settings, underscoring the need for structured, community-based educational programs and integration of photoprotection counseling into routine healthcare to reduce photo-induced skin damage and skin cancer.

### Recommendations

We recommend that education regarding sun safety and sunscreen use be incorporated into school and college health education curricula, as well as community-based public health initiatives and integration of photo protection education in OPD counselling. Furthermore, as a considerable proportion of participants cited cost as a barrier to sunscreen use, policy-level interventions are warranted. Government efforts should be directed toward regulating and subsidizing sunscreen products to improve affordability, along with strict enforcement of quality standards, to ensure wider accessibility and sustained use among economically disadvantaged populations

### Ethics Approval and Consent

Institutional Ethics Committee approval was obtained. Written informed consent was taken from all participants. The study adhered to the 1975 Declaration of Helsinki guidelines.<sup>25</sup>

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