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A questionnaire based assessment of awareness and knowledge about sunscreens among medical interns in a tertiary care institute: A cross-sectional study

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Abstract

Introduction: Melanoma and non-melanoma skin cancers are a critical global public health concern, with a rising incidence. Sunscreens are known to mitigate sunburn and prevent skin cancer in humans. However, studying their protective effects on humans is challenging due to confounding factors. Topical sunscreen use is a key sun-related behavior to combat the harmful effects of UV radiation (UVR). Medical interns, serving as the primary point of contact with patients, play a pivotal role in healthcare and in this instance Sunscreen usage. Equipping them with sunscreen knowledge strengthens their ability to combat UVR-related conditions.

Objective: We aimed to assess the awareness and knowledge of sunscreens and sun protection practices among medical interns.

Methods: A hospital-based cross-sectional study was conducted from April to June 2023, using digital questionnaires among interns at a tertiary care institute.

Results: Among 110 respondents (80 female, 30 male), 24% did not use sunscreens. Of sunscreen users, only 21% applied it more than once a day, and 20% experienced sunburn in the past year. Approximately 91% of interns scored low or moderately on the sunscreen knowledge questionnaire. While there was no significant knowledge difference between sexes, there was a significant difference in sunscreen usage.

Conclusion: Despite their critical role as the initial point of contact with patients, medical intern's exhibit limited knowledge about sunscreens, which is fundamental in dermatology. While there is no gender disparity in knowledge, differences in sunscreen use exist. Raising awareness among interns can indirectly improve treatment outcomes for patients with photo-related disorders.

Keywords: Sunscreen, Skin cancer, medical interns, UV radiation, Sun protection practices

Introduction

The surge in melanoma and non-melanoma skin cancers globally, accentuated by increased UV radiation exposure and cultural beliefs associating a tan with beauty, necessitates urgent public health attention.[1] Sunscreens, recognized for mitigating sunburns and preventing skin cancer in humans, face challenges in human studies due to confounding factors.[2] This study addresses the critical gap in comprehensive awareness among medical interns, pivotal healthcare providers, assessing their knowledge of sunscreens. As front-line defenders against UV radiation-related conditions, equipping medical interns becomes imperative. Limited information in the Indian context underscores the significance of this exploration.

Aims and Objectives

To determine the sunscreen practices and knowledge about sunscreens among medical interns

Methods and Materials

A) Ethics approval obtained: This study was approved by the Institutional Ethical Committee (approval no: AJEC/REV/93/2023).

B) Selection and Description of Participants:

This is hospital based cross-sectional study. The study was conducted via digital questionnaire at a tertiary care institute. A total of 110 medical Interns were recruited for the study. The study was conducted from April 2023 to June 2023. The questionnaire was electronically sent to all the medical interns from the student register simultaneously and the first 110 participants were included.

C) Inclusion criteria: Interns working at a tertiary care institute, from April 2023 to June 2023.Willingness to give consent for the study.

D) Exclusion criteria: Not willing to give consent for the study.

The participants were explained regarding the objectives as well as the method of study. Medical interns fulfilling the inclusion criteria will be sent the questionnaire via electronic medium and data was collected.

E) Statistics: Based on the study conducted by Vivek Kumar Dey et al. [3] assuming p=46.6% with 95% confidence interval, 10% allowable error the sample size estimated for the study was 100. Further assuming 10% nonresponse rate the final sample size was estimated at 110. Analysis of the data was done via SPSS 23

software. Collected data was summarized by frequency, percentage. Comparison was done by Binomial test and chi square test.

Results

There were 110 participants in the study with minimum age of 21 yrs. and maximum age of 30 yrs. with a mean age of 23.72 years. Of these 80(72.7%) were female and 30(27.3%) were males. (Table 1).

Table1: Number of males and females included in the study

		Count	Column%
Sex	Female	80	72.7%
	Male	30	27.3%
	Total	110	100.0%

Out of the 110 participants 84(76.4%) used sunscreens and the rest 26(23.6%) did not. The most common reason for non-usage with 9 out of 26 (34.6%) was surprisingly found to be "I'm too lazy to apply it" (Table 2).

Table 2: Reason for non usage of sunscreens

	Frequency	Percent
I feel I don't go out enough to warrant it's use	3	2.7
I feel I don't go out enough to warrant it's use; I'm too lazy to apply it	1	.9
IfeelIdon'tgooutenough towarrantit'suse;I'mtool azytoapplyit;I'mafraido fitsside-effectlikeacne;Itmakes myskinoily/greasey	1	.9
IfeelIdon'tgooutenough towarrantit'suse;I'mtool azytoapplyit;Itmakesm yskinoily/greasey;Itgiv esawhitetinttomyskin	1	.9
I'm too lazy to apply it	3	2.7
I'm too lazy to apply it; It makes my skin oily/greasy	1	.9
I'm unaware of its need	3	2.7
It gives a white tint to my skin	3	2.7
It makes my skin oily/greasy	2	1.8
It's too costly	2	1.8
It's too costly; I'm too lazy to apply it ; It makes my skin oily/ greasy	1	.9
It's too costly; I'm unaware of its need	1	.9
It'stoocostly;Itmakesm yskinoily/greasey;Itgiv esawhitetinttomyskin	1	.9
Too time consuming	2	1.8
Too time consuming; I'm too lazy to apply it; It makes my skin oily/greasy	1	.9
Total	26	23.6

The most common Fitzpatrick type of skin among them was Type 4 with a prevalence of 38.1%. About 54.8 % (n=46) of the sunscreen users use a sunscreen with SPF between 30-50 but majority of them which is 78.6% (n= 66) use it just once a day (Table 3). About 17(20.2%)

have had a sunburn in the last year and the most common cause was Sports (Table 4).

Table 3: The skin type (Fitzpatrick classification), Spf of sunscreen and the number of times used per day

		Count	Column%
How would you describe your skin?	Always Burns, Never Tans	1	1.2%
	Never Burns,Always Tans	21	25.0%
	Rarely Burn,Tans Easily	32	38.1%
	Sometimes Burns,Tans Gradually	8	9.5%
	Usually Burns,Tans Minimally	6	7.1%
	Very Rarely Burn, Tans Very Easily	16	19.0%
What Spf sunscreen do you usually use?	<10	3	3.6%
	15-30	11	13.1%
	30-50	46	54.8%
	Morethan50	24	28.6%
How many times do you apply Sunscreen in a day?	1	66	78.6%
	2	18	21.4%

Table 4: If they have experienced a sunburn in the last year and their activity during the same

		Count	Column%
Have you had a sun burn in the last year?	No	67	79.8%
	Yes	17	20.2%
What were you doing while you experienced sunburn?	Attending postings	1	5.9%
	Outside in general	1	5.9%
	Sports	4	23.5%
	Sunbathing	1	5.9%
	Swimming	1	5.9%
	Travelling	9	52.9%

To quantify the UV-protection behavioral practices the Sun protection behavior score (SPBS) was assessed. This showed a Cronbach's Alpha value of 0.671 and the score ranged from 7 to 35 with a mean of 25.03 and a standard deviation of 3.6 (Table 5) (Table 6).

Table 5: Sun Protection Behaviour score

	Frequency	Percent	Mean	S.D
Poor	2	2.4	25.03	3.6
Moderate	39	46.4		
Good	43	51.2		
Total	84	100.0		

Table 6: Showing differences in SPBS between males and females.

		Sex			
		Female		Male	
		Count	Column%	Count	Column%
Sun Protection Behaviour score	Poor	1	1.4%	1	6.7%
	Moderate	30	43.5%	9	60.0%
	Good	38	55.1%	5	33.3%

The study contained 11 questions asked to assess the knowledge about sunscreens in which wrong responses were seen in 8 of those questions with a significance difference ($p < 0.05$). The score was divides into low (from 0-3), moderate (from 4-7), high (from 8-11). Mean score was 4.38 with Standard deviation of 1.99. Only 6.4 %(n=7) got a Score of 8 or more out of 11(Table 7).

Table 7: Total score on the sunscreen knowledge based questions

	Frequency	Percent
Low	32	29.1
Moderate	45	40.9
High	7	6.4
Total	84	76.4

The scores were divided into low: 0-3, moderate: 4-7, high: 8-11.

The most significant part of the findings was the fact that between the sexes there was no significant difference in knowledge about sunscreens (*p=0.153*) But there was a significant difference in use of sunscreen among them with males using Sunscreens significantly lesser (*p<0.001*) (Table 8).

Table 8: Correlation between the sexes and their usage and knowledge about sunscreens

		Sex				
		Female		Male		
		Count	Column %	Count	Column %	Chi square test p
Do you use Sunscreen?	No	11	13.8%	15	50.0%	0.001
	Yes	69	86.3%	15	50.0%	
Total score	Low	23	33.3%	9	60.0%	0.153
	Moderate	40	58.0%	5	33.3%	
	High	6	8.7%	1	6.7%	

There were no significant differences in SPBS between the sexes (p=0.195). There also no significant correlation between SPBS and skin type (p=0.922), between skin type and knowledge about sunscreens (p=0.386), but there was a significant correlation between SPBS and the sunscreen SPF that they use (p=0.001) and between the skin types and incidence of sunburns in the last year (p=0.012). However there was no correlation between the SPF used and the number of times they use sunscreen in a day (p=0.506) (Table 9) (Table 10) (Table 11).

Table 9: Correlation between Sun protection behavior score, sexes, skin type and SPF of sunscreen used.

Sun Protection Behaviour with Following parameters	chi-square(C) / Fishers exact test(F)	p value
Sex	F	0.195
How would you describe your skin?	F	0.922
What Spf sunscreen do you usually use?	F	0.001

Table 10: Correlation between Skin type and knowledge about sunscreen and history of sunburn

How would you describe your skin? with Following parameters	chi-square(C)/Fishers exact test(F)	p value
Have you had sunburn in the last year?	F	0.012
Total knowledge score	F	0.386

Table 11: Correlation between SPF and number of times sunscreen usage in a day

		How many times do you apply Sunscreen in a day?		Total
		1	2	
What Spf sunscreen do you usually use?	<10	2	1	3
	15-30	10	1	11
	30-50	34	12	46
	Morethan50	20	4	24
Total		66	18	84

Fishers exact test p=0.506

Discussion

Sunscreens are topical formulations that contain agents that filter and/or scatter UVR. So essentially they are exogenous chromophores applied to the skin.[4] They

usually contain a mix of organic filters with different absorption spectra as well as micropigments that may be physical (e.g. zinc oxide) or organic. They are formulated and tested to prevent erythema and their main index of protection is the sun protection factor (SPF). The SPF is calculated by the following formula: SPF = [24 h MED on protected skin]/ [24 h MED on unprotected skin]. The recommended application density is of 2 mg/cm². Theoretically, an SPF of 15 if used correctly will reduce erythemal exposure to 1/15th of that which would otherwise have been received for a given time in the sun.

Sunscreens must have good UVB protection, but there is a recent trend for better UVA protection resulting in broad spectrum protection though the indices of UVA protection may vary with regulatory body.[5] Recent changes to the testing and labeling of sunscreens within the European Union have divided them into low (SPF 6-10), medium (SPF 15-25), high (SPF 30-50) and very high (SPF 50+) protection, with the level of UVA protection at least one-third of the SPF. An indirect consequence of better UVA protection for a given SPF is reduced UVB protection.

As stated, the SPF is an index of protection from erythema after a single exposure to Solar simulating radiation (SSR). Assuming sunscreen use on a beach, a typical person should use about 100 mL/day, assuming three whole body applications, to achieve the labeled SPF. This is theoretical and in reality people apply sunscreen much thinner than SPF test conditions which results in lower efficacy than indicated by the labeled SPF.[6,7] This means that people may overestimate their degree of protection. Thus use of a labeled SPF 15 product may in reality be giving protection equivalent to SPF of 3-5. Thus people may be getting much less photoprotection than they think from sunscreens, especially with intentional solar exposure. This is a public health issue that has to be addressed either by encouraging people to use more sunscreen or to use a higher SPF to compensate for inadequate application.

Sunscreens, when used optimally reduce UV penetration into the skin. This may help those with lighter skin tone, who would normally get sunburns with any significant sun exposure, to get exposed to intense sunlight for prolonged periods, thereby achieving a significantly higher cumulative UV irradiation than would otherwise have been possible. This is more likely to happen if sunscreens with low protection against UVA are used. An ideal sunscreen should block completely the transmission of both UVB (280-320 nm) and UVA (320-400 nm) but at the same time be cosmetically acceptable and pleasant to use. Additional desirable properties are durability such as photostability and water resistance. Certain studies have shown that, although UVB causes much more DNA damage to cells near the epidermal surface, the basal layer is particularly sensitive to UVA, owing to its higher penetration through the epidermis to inflict DNA damage (as measured by cyclobutane pyrimidine dimer formation) at the level at which both melanocytes and basal keratinocytes are located.[8,9]

No single compound can satisfy all the desired aims and hence most commercial formulations contain a mixture of active constituents. These can be classified into two broad categories: physical sunscreens that act by reflecting and scattering UV light, and chemical agents that absorb UV light.[10, 11, 12]

Sunscreens sometimes contain agents that may be associated with irritant, allergic, phototoxic or photoallergic reactions. Benzophenones are some of the commonest sensitizers, whilst dibenzoylmethanes, para-

aminobenzoic acid (PABA) and cinnamate may cause photoallergic dermatitis.[13, 14]

In a placebo-controlled trial in a high-risk population, appropriate strength sunscreens were shown to be effective in reducing the incidence of actinic keratoses.[15]

In an Australian prospective controlled study, regular use of sunscreen reduced the incidence of new squamous cell but not basal cell carcinomas.[16] A study of BCCs indicated that those who used sunscreens had much lower p53 mutations. This may be due to effective protection against UV-induced DNA mutations but multiple other factors are also involved in the development of BCCs.[17]

Reduction of risk of developing melanoma by the use of sunscreens is also a perplexing question to answer with two case-control studies having linked sunscreen usage to an increased incidence of melanoma.[18, 19] This could possibly be explained by the probability that the subjects studied had previously used sunscreens that provided UVB protection alone and were thus able to expose themselves to higher doses of solar radiation and UVA than those who did not use sunscreen.

In addition to the protection of healthy skin, sunscreens have an important role in the management of patients with photodermatoses. The commonest of these, polymorphic light eruption, has been seen to have rather limited benefit from sunscreens but may respond well to formulations that block a broad spectrum of UVA including longer wavelengths.[20] Sunscreens effective in blocking the offending wavelengths of UV light can also be helpful in the management of less common photodermatoses including actinic prurigo, chronic actinic dermatitis, hydroa vacciniforme, lupus erythematosus, porphyrias and solar urticaria.

This study revealed noteworthy insights into sunscreen awareness and knowledge among medical interns, shedding light on their crucial role in combating UV radiation-related conditions. Despite the recognized efficacy of sunscreens in reducing sunburns and preventing skin cancer in humans, our findings indicate a significant gap in awareness among medical interns.[1,2] The prevalence of inadequate sunscreen use, with only 21% applying it more than once a day, underscores a critical need for targeted education interventions. Furthermore, the high percentage of interns experiencing sunburn in the past year suggests a potential lack of understanding regarding optimal sunscreen application.[3]

Our results align with global trends of rising skin cancer cases attributed to increased UV exposure and cultural perceptions favoring tanned skin. The study emphasizes the importance of addressing this knowledge gap among medical interns, who are often the first point of contact for patients. Raising awareness can empower interns to provide informed guidance to patients regarding sun protection, potentially improving treatment outcomes for UV radiation-related conditions.

Assessing knowledge about sunscreens, participants displayed significant misconceptions, with a mean knowledge score of 4.38, indicating room for improvement in education and awareness programs. Surprisingly, while no significant knowledge disparity existed between genders, a stark difference emerged in sunscreen usage, with males exhibiting significantly lower application rates ($p<0.001$). This underscores the importance of targeted interventions tailored to specific sunscreen-use challenges faced by male medical interns.

In our study, we observed that both sexes exhibited similar Sun Protection Behavior Practices as signified by the SPBS; however, a notable discrepancy emerged in

the actual utilization of sunscreen, with a significantly lower frequency of usage in males. Interestingly, the SPBS displayed no correlation with skin type, indicating that individuals with lower Fitzpatrick scores, who theoretically require heightened sun protection, were not necessarily adhering to recommended sun protection behaviors. Furthermore, a compelling finding emerged from the analysis, revealing a substantial correlation between SPF and SPBS. This suggests that individuals with higher SPBS scores are more inclined to use sunscreen consistently compared to their counterparts with lower scores. Surprisingly, there was no significant correlation between SPF and the frequency of sunscreen application per day, challenging the assumption that individuals using higher SPF sunscreens would apply them less frequently. Additionally, our findings highlighted a significant association between skin type and the occurrence of sunburns in the past year, aligning with expectations. However, no discernible link was found between skin type and the level of knowledge individuals possessed about sunscreen. These insights contribute to a nuanced understanding of sun protection behaviors and emphasize the need for targeted interventions tailored to specific demographics.

The finding that only 6.4% achieved a score of 8 or more out of 11 in the knowledge assessment underscores the necessity for focused educational initiatives. The study also reveals the multifaceted nature of factors influencing sunscreen behavior, including attitudes, knowledge gaps, and gender-specific patterns.

Triana Novitasari et al. conducted a similar study among medical students in Indonesia and the knowledge scores were much higher than the one we deducted from our study conducted in India.[21] Hence this topic should be incorporated compulsorily into the curriculum given the wide implication of the same. P. Rodriguéz-Gambetta et al. also found a significant difference in the use of sunscreens between males and females.[22] Similar findings were found in the study by Mohd Rafiq TilwanI et al.[23]

A similar study was conducted by Kumud Chapagain et al. who found similar differences in percentage of sunscreen use between males and females (M: 61.68%; F: 90.90%).[24] They found the main reason for non usage of sunscreens was forgetfulness where our study points to being lazy towards application. They found that the usage of sunscreen more than twice a day was slightly higher (31.71%) in comparison to ours study (21.4%). So overall the usage of sunscreen in the participants of their study was higher than the participants of our study.

While our study focused on interns at a tertiary care institute, the findings can be indicative of a broader trend, given the global nature of the skin cancer epidemic. However, regional variations and cultural influences must be considered when developing educational interventions. This aligns with previous research highlighting the need for region-specific approaches in promoting sun protection behaviors.

The discrepancy between knowledge levels and actual sunscreen use emphasizes the importance of not only education but also strategies to promote behavioral change. Healthcare institutions should consider incorporating sunscreen education into medical training programs to enhance the preparedness of future healthcare professionals in tackling UV radiation-related conditions.

Limitations

Despite the study's contributions, there are limitations. The cross-sectional design provides a snapshot of sunscreen awareness among medical interns, but

longitudinal studies could offer insights into knowledge retention and the impact of educational interventions over time. Additionally, self-reported data may introduce response bias, warranting caution in interpreting the findings. The study also has a higher female population and may be a confounding factor. Further studies with bigger sample size incorporating multiple medical colleges and their medical interns with additional use of random sampling would help establish these findings of this study.

Conclusion

In conclusion, our study underscores the urgent need for targeted educational interventions to bridge the gap in sunscreen awareness among medical interns. Addressing this knowledge deficit can empower healthcare professionals to play a more proactive role in preventing and managing UV radiation-related conditions, contributing to improved public health outcomes.

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