Journal of Pakistan Association of Dermatologists.2023;**33(1)**:165-171.

Original Article

Awareness regarding sun exposure and use of sunscreen amongst general population in a local hospital setting

Syeda Muzna Gillani, Attiya Tareen*, Mehreen Baig, Nimrah Bukhari, Rabia Mehreen, Anum Zafar**

Fourth Year MBBS student, Foundation University, Rawalpindi.
* Department of Dermatology, Fauji Foundation Hospital, Rawalpindi.
** Department of Surgery, Fauji Foundation Hospital, Rawalpindi.

Abstract

Objective To assess the awareness level of the general population regarding sun exposure and use of sunscreen in a local hospital setting.

Methods A descriptive cross-sectional research was conducted in the Dermatology outpatient department (OPD) of Fauji Foundation Hospital in Rawalpindi, Pakistan from 10th March to 18th August 2022. The sample size was calculated via Epi Info 7 with a Confidence interval of 95% (margin of error 5%) final size being 528. We took the sample via non-probability convenient sampling. 528 patients were recruited after taking their consent. They were asked to fill out a self-constructed questionnaire which had three sections. The first section was about demographics, second about awareness regarding harmful effects of excessive sun exposure and sunscreens whereas third section was about the use of sunscreen. Data analysis was done using SPSS 21. Calculation of frequencies was done and calculation of percentage was also performed while the Chi-square test was used to measure association among categorical variables.

Results The result shows that majority of the respondents (79% male, 91% female) claimed to be know the harmful effects of exposure to sun exposure and use of sunscreen as a photoprotective agent, however, compared to awareness, the percentage of participants practicing sunscreen application as a photoprotective agent was relatively lower (45% in males, 81% in females). After statistical analysis, three factors were found to be associated with low awareness and use of sunscreens: (a) Male gender ($p<0.001$) (b) Lower education level ($p=0.001$ for awareness, $p<0.001$ for sunscreen use) (c) Darker skin tones that is Fitzpatrick scale 4, 5, 6 ($p<0.001$).

Conclusion The awareness regarding dangers of excessive exposure to sun in population at large is lacking with male preponderance and lower education level, skin type IV, V, VI being more associated. There is a difference in knowledge of sun exposure and sun protective behaviors predominantly in application of sunscreen. Even amongst regular sunblock users, an evident lack of appropriate sunscreen application and knowledge was observed.

Key words
Sunscreen, sun exposure, UVB, UVA awareness.

Introduction

The spectrum of sunlight is composed of infrared, visible, and ultraviolet radiations, which are further divided into UVA, UVB, and UVC radiation. Only UVA and UVB rays reach the earth's surface because stratospheric gases block UVC light.[1] In human skin, solar radiation causes acute and chronic responses and benign

Address for correspondence
Dr. Attiya Tareen
Assistant Professor,
Dermatology Department,
Fauji Foundation Hospital, Rawalpindi.
Email: attiyatareen@yahoo.com

or malignant skin cancers, including malignant melanoma, are primarily caused by chronic, recurrent exposures. In comparison to ultraviolet A light which has a spectrum of 320-400 nm, ultraviolet B light (290-320 nm) is not only more carcinogenic but is also mutagenic. According to epidemiological research, exposure to Ultraviolet rays can lead to gene mutations, immunosuppression, photoaging, and the development of skin tumors.[2] Exogenous stimuli, primarily ultraviolet (UV) radiation from the sun, can have an impact on the skin's barrier function. Inflammation and pigmentation are caused by the production of different cytokines from keratinocytes at the epidermal level, which is stimulated by UV exposure. At the dermal level, UV damage causes collagen fibers to break down through the creation of deteriorating enzymes by fibroblasts. Acute inflammation (commonly known as sunburn) and subsequent pigmentation, known as a suntan, are the outcomes of short-term excessive UV exposure. Despite the lack of an inflammatory reaction, low-dose UV radiation can nevertheless have photoaging consequences, including the development of spots and wrinkles and skin cancer if the exposure is prolonged and repeated.[11] Human skin ages prematurely due to photoaging, which is characterized by clinical, histological, and biochemical changes that are distinct from those that would occur in skin that has aged naturally but had been sheltered from the sun. The understanding of the fundamental mechanisms of photoaging has made significant progress in recent years. Recently, it has been discovered that nuclear factor (NF)-B and activator protein (AP)-1 activation result in induction of matrix metalloproteinase, as well as mitochondrial DNA alterations.[3] The definition of a sunscreen preparation is a substance that, when applied topically, shields the treated region from sunburn. The usage of sunscreens helps the body's defensive mechanisms ward off dangerous UV rays from the sun. Its effectiveness is determined by its ability to either absorb, reflect or scatter solar radiation.[4] Products with chemicals that absorb or scatter ultraviolet (UV) radiation give differing level of protection from sunrays (or similar UV sources), decreasing incidence of its detrimental effects on our skin. The "sun protection factor" or SPF of sunblock lotions has proven to be a dependable sign of resistance against reaction to sunlight i.e. sunburn, which is primarily caused by ultraviolet B radiation.[5] There is strong support for the idea that application of sunscreen and sun avoidance are both crucial in preventing sun induced aging.[6] In a latest research involving 46 patients who were chosen at random to use sunscreens with Ultraviolet A and B protection on daily basis for 24 months, a substantial histological difference in solar elastosis was found between the control and treatment groups.[7] The skin which is exposed to excessive sunrays also showed considerable melanization, hypercornification and hyper granulosus, enhanced tenascin expression, reduced quantity of type I procollagen, and modestly increased lysozyme in a research of twelve people where every individual was subjected to one minimal erythemal dose of simulated solar radiation to different areas of skin. These were skin of buttock (bare skin, vehicle, and day cream with UVA and UVB protection) while second was control group with no exposure.[8] Sunscreens have been proven to not only stop photoaging, but evidence also points to their potential significance of extrinsic aging reversal. Around 32 recruited individuals were requested to use broad-spectrum photo sunscreen (SPF 30) on daily basis for upto 52 weeks in a prospective trial. After the trial, it was found that the mottled and distinct pigmentation, as well as the skin's texture and clarity, had all significantly improved.[9] Despite the beneficial effects of sunscreen to protect skin from harmful UV rays, there is not much awareness about its usage.[10] Literature shows a lack of awareness and

sunscreen usage in populations with maximum exposure and eventually at risk of sun damage. A study to assess Saudi citizens' understanding of sun exposure and the danger of developing skin cancer, as well as their behaviors related to sun protection. The results demonstrate that although 56.3% of respondents knew the link between sun exposure and risk of skin cancer, only 8.3% of them reported using sunscreen. Women, people from higher social classes, those with higher levels of education, those with type 4 skin, and those who are married were the sociodemographic groups more likely to use sunscreen.[11] The level of awareness is similar in other geographical regions as well.[12] However, there is limited literature available regarding awareness of sunscreen use in our geographical region. Therefore, the purpose of our current study is to identify the awareness level of exposure to sunlight and the use of sunscreen in the general population.

Methodology

A descriptive Cross-sectional was conducted in Dermatology outpatient department (OPD) of Fauji Foundation Hospital in Rawalpindi, Pakistan from 10th March to 18th August 2022. The study was accepted from ethical committee of hospital. Sample size was calculated via Epi Info 7 with a confidence interval of 95% (margin of error- 5%) with final size of 528 The sample was selected through non-probability convenient sampling were recruited after consent. They were asked to fill a self-constructed questionnaire. The questionnaire had three sections. First section is demographics, second section is about awareness about sun exposure and sunscreens and third section is about use of sunscreen. Data analysis was done using SPSS 21. We calculated percentages and frequencies and applied Chi square test in order to measure association among categorical variables.

Results

The result show that majority of the respondents (79% male, 91% female) claimed to be aware of the dangerous effects of excessive exposure to sunlight and use of sunscreen as a photoprotective agent. However, compared to awareness, the percentages of participants practicing sunscreen application as photoprotective agents was relatively lower (45% males, 81% females). Even amongst regular sunblock users, a clear lack of appropriate sunscreen application and knowledge was observed: 38% did not know the type of sunscreen they were using, 55% did not check ingredients before buying sunscreens, only 15% applied sunscreen on all exposed parts of their body whereas 69% did not reapply sunscreen every 2-4 hours. Regarding the amount of sunscreen, 50% used only a pea-size amount of sunscreen while the rest would apply more to double protect skin which would give white cast on skin of face. After statistical analysis, three factors were found to be associated with lower awareness as well as use of sunscreens:

i. Male gender ($p < 0.001$).
ii. Low education level ($p=0.001$ for awareness, $p < 0.001$ for sunscreen use).
iii. Darker skin tones that is Fitzpatrick scale IV, V, VI. ($p<0.001$)

Figure 1 shows that although 87.5% population is aware about dangers of sun exposure, factual use of sunscreen is prevalent in only 72% population as shown in **Figure 2**.

Regarding gender-based distribution of level of awareness to dangers of excessive sun exposure and use of sunscreen, graph in **Figure 3** shows that out of 528 participants, 91% females were aware of dangers to sun exposure but 82% females were actually using sunscreen. Whereas

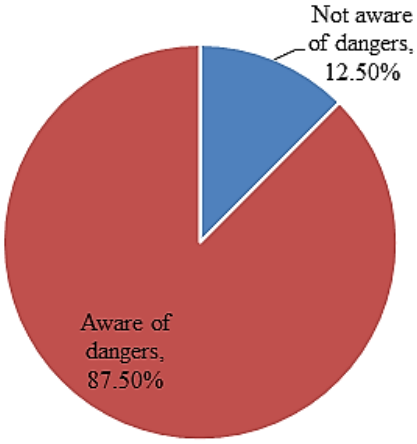

Figure 1 awareness about dangers of sun exposure.

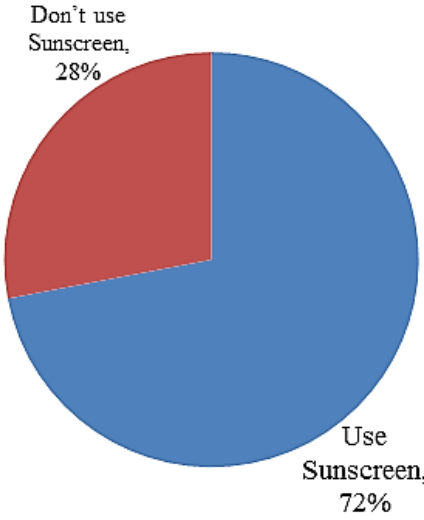

Figure 2 Sunscreen use by participants.

79% males were aware of dangers of sun exposure but 45% males were practically using sunscreen ($p < 0.001$).

Figure 4 shows that there is an overall higher level of awareness regarding protective role of sunscreen and its usage from matric through Phd level but practical use was comparatively lesser, difference being more in younger population of 9th and 10th grade.

Figure 5 above shows use of sunscreen in different skin types based on Fitzpatrick skin color scale. Maximum use of sunscreen is seen in people with type III skin i.e. 82% followed by 66% with type II; 64% with type IV; and 50% with type V; while least use of sunscreen is noted in type VI i.e. 33.3%.

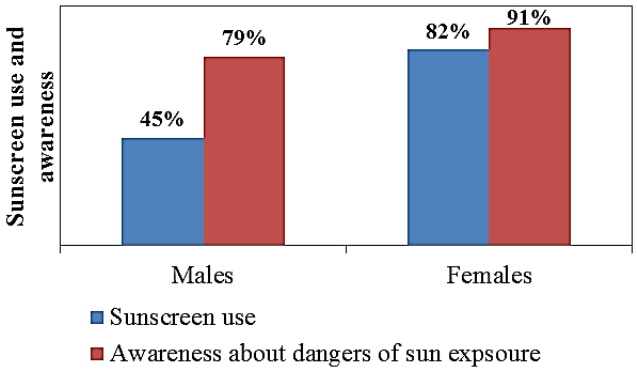

Figure 3 Gender wise distribution of sunscreen use and awareness.

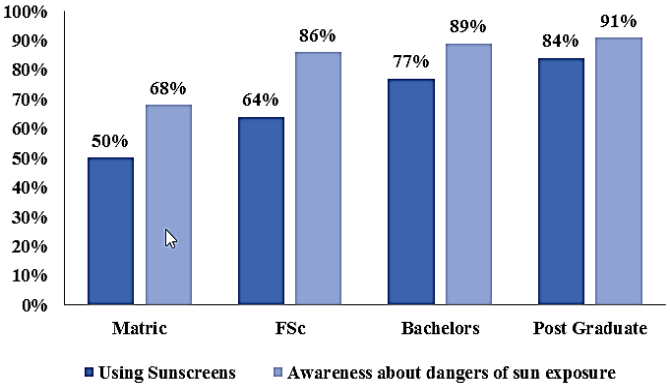

Figure 4 Education wise distribution of sunscreen use and awareness

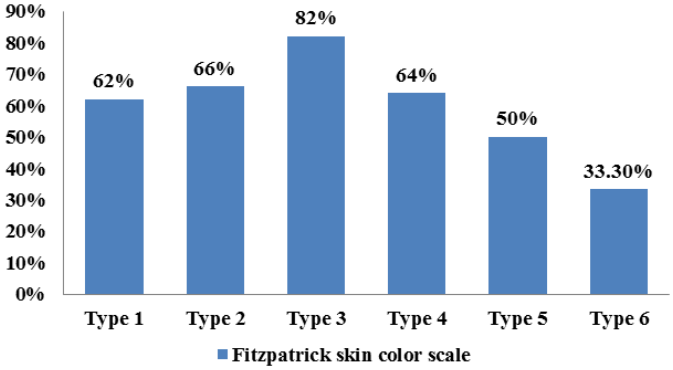

Figure 5 Skin color wise distribution of sunscreen use.

Discussion

The results of our research show that there is a

significant difference in degree of awareness about dangers of sun exposure as well as the frequency of the use of sunscreen practically. Similar findings were found in a study surveying 2036 participants to determine their knowledge and attitudes regarding the effects of sun exposure and practical use of sunscreen. The findings were that 84% of participants knew that sun exposure is hazardous and can darken skin, they were not aware of wrinkles, melasma, allergies, or photo-induced cancer thus only 58% of volunteers reported using sunscreen.[13] The result of our study also shows that lack of sun exposure and decrease use of sunscreen is more prominent in males which is supported by another analysis to estimate the degree of sun protection practices where only 34% of the 830 total respondents used sunscreen and the majority of sunscreen users were female.[14] Based on the results of our study, another factor contributing to sunscreen use and awareness about sun exposure is the level of education of participants i.e. higher the level of education, higher the awareness about use of sunscreen. Similar results were seen in a study to explore guidelines for addressing college students about sun safety and preventing skin cancer. Following instructions, there was a statistically significant improvement in their overall good knowledge (71.4%), positive attitude (89.5%), and overall sufficient practices (91.6%). In comparison to pre-educational guidelines, there was an increase in the mean total scores of knowledge, attitude, and practice about sun protection and preventing skin cancer (p 0.001)[15] in another study, 220 out of 450 (48.88%) medical students participated in a survey to examine their knowledge of and use of sunscreen. The results show that female medical students used sunscreen more frequently (66.66%) than male students (28.57%).[16] In our study, lack of awareness of sun exposure and lack of use of sunscreen was also associated with Darker skin tones i.e. Fitzpatrick type IV, V, VI which is due to various underlying psychological and aesthetic factors. Recent studies have increasingly shown the detrimental effect of visible light on skin in depth, particularly in people with darker tones of skin i.e. (Fitzpatrick skin types IV-VI), including the induction of pigmentary disorders like melasma, freckles, sunburn and post-inflammatory hyperpigmentation. Among patients with skin of color, disorders of hyperpigmentation and other consequences from sun exposure have been associated with impaired skin health and a negative burden on quality of life.[17] Results of our study show that there is a lack of awareness regarding the harmful effects of sun exposure and the use of sunscreen. It is seen in our study even amongst regular sunblock users, an evident lack of appropriate sunscreen application and knowledge was observed: in form of a lack of knowledge about the type of sunscreen used. Ingredient of sunscreen. Re-application of sunscreen in 2-4 hours. And using a pea-sized amount of sunscreen. These issues can be easily solved by educating the patient regarding the use of sunscreen and its impact to prevent sun damage. Literature shows improvement in attitude towards sun protection practices following awareness programs. A research done by Jenifer Lavina *et al.* to determine the knowledge, practices and attitude of traffic controllers on exposure to sun and sun avoidance shows that 94.4% had enough knowledge while 93.8% had desirable attitude in contrast to 46.1% who practiced adequate sun protective measures. Adequate knowledge was significantly absorbed from television (51.19% at p=0.018), whereas respondents were least knowledgeable about the use of sunscreen on everyday basis. Very less number of individuals i.e. 39.89% had desired positive attitude about the sunsblock cream being not an added expense. Adequacy of knowledge when compared to actual practice noted that there were more respondents with poor knowledge translating to poor practice (9.38% at

p=0.019).[18] As seen in our study there is a difference in awareness of the detrimental effects of sun exposure and the use of sunscreen. This is seen in another study that determines the relationship among skin cancer and knowledge about harmful effect of excessive sunlight and sun protection behavior of adults. The 'Skin cancer and sun knowledge scale' of recruited individuals was determined being 12.88±2.51 (min:7.0 to max:21.0). The mean score of respondents in the 'Sun protection behavior scale' was 23.67±6.84 (min:8.0; max:40.0). A statistically significant relationship was realized between the respondents overall score of the 'Skin Cancer and Sun Information Scale' and total average score of 'Sun Protection Behavior Scale' ($p<0.05$).[19]

Conclusion

There is lack of awareness about dangers of sun exposure in general population. With males, low education level and skin type 4, 5, 6 being more associated. There is a difference in knowledge of sun exposure and sun protective behaviors. Mainly application of sunscreen, even amongst regular sunblock users, an evident lack of appropriate sunscreen application and knowledge was observed. Hence it is important to create awareness among general population about certain aspects of sunscreens to enable informed purchase and better sun protection habits.

Recommendations

Public awareness campaigns should be organized on physical and online platforms to effectively increase the level of sun protection and decrease the incidence of UV induced sun damage. A similar study should be conducted in general population instead of dermatology OPD via hospital setting to get unbiased results.

References

1. Gorman S, Lucas R, Allen-Hall A, Fleury N, Feelisch M. Ultraviolet radiation, vitamin D and the development of obesity, metabolic syndrome and type-2 diabetes. *Photochem Photobiol Sci*. 2017;**16(3)**:362-73.
2. Ichihashi M, Ueda M, Budiyanto A, Bito T, Oka M, Fukunaga M *et al*. UV-induced skin damage. *Toxicology*. 2003;**189(1-2)**:21-39.
3. Berneburg M, Plettenberg H, Krutmann J. Photoaging of human skin. *Photodermatol Photoimmunol Photomed*. 2000;**16(6)**:239-244.
4. Gasparro F. Sunscreens, skin photobiology, and skin cancer: the need for UVA protection and evaluation of efficacy. *Environ Health Perspect*. 2000;**108(suppl 1)**:71-8.
5. Cole C, Silverman J, Bonitatibus M. Evaluating sunscreen ultraviolet protection using a polychromatic diffuse reflectance device. *Photodermatol Photoimmunol Photomed*. 2019;**35(6)**:436-41.
6. Hughes M, Williams G, Baker P, Green A. Sunscreen and Prevention of Skin Aging. *Ann Intern Med*. 2013;**158(11)**:781.
7. Boyd A, Naylor M, Cameron G, Pearse A, Gaskell S, Neldner K. The effects of chronic sunscreen use on the histologic changes of dermatoheliosis. *J Am Acad Dermatol*. 1995;**33(6)**:941-6.
8. Seité S, Fourtanier A. The benefit of daily photoprotection. *J Am Acad Dermatol*. 2008;**58(5)**:S160-S166.
9. Randhawa M, Wang S, Leyden J, Cula G, Pagnoni A, Southall M. Daily Use of a Facial Broad Spectrum Sunscreen Over One-Year Significantly Improves Clinical Evaluation of Photoaging. *Dermatol Surg*. 2016;**42(12)**:1354-61.
10. Brenner M, Hearing V. The Protective Role of Melanin Against UV Damage in Human Skin. *Photochem Photobiol*. 2007;**84(3)**:539-49.
11. Al Robaee A. Awareness to sun exposure and use of sunscreen by the general population. *Bosnian J Basic Med Sci*. 2010;**10(4)**:314-8.
12. Agarwal S, Godse K, Patil S, Nadkarni N. Knowledge and attitude of general population toward effects of sun exposure and use of sunscreens. *Indian J Dermatol*. 2018;**63(4)**:285.

13. Sultana N. Sun Awareness and Sun Protection Practices. *Clin Cosmet Investig Dermatol*. 2020;**13**:717-30.
14. Skin cancer awareness and sun protection behaviors in college students. *J Am Acad Dermatol*. 2005;**52(3)**:P107.
15. Tilwani M, Sameen F, Manzoor S, Nabi N, Hassan A, Qazi I. Sunscreen Awareness in Medical Undergraduates. *Int J Contemp Med Res [IJCMR]*. 2018;**5(10)**:J1-J3.
16. Taylor S, Alexis A, Armstrong A, Chiesa Fuxench Z, Lim H. Misconceptions of photoprotection in skin of color. *J Am Acad Dermatol*. 2022;**86(3)**:S9-S17
17. Ngo JL, Rivera FD. Knowledge, attitude and practices of traffic enforcers on sun exposure and sun protection: A cross-sectional study. *Acta Medica Philippina*. 2022;**13**;56.
18. Necipoğlu D. , Elyeli K. , Bebiş H. Determining the Relationship Between Skin Cancer and Sun Knowledge and Behavior in Adults Living in an Region with Four Seasons of Sun. *J Basic Clin Health Sci*. 2022; 6: 784-790
19. Day A, Wilson C, Roberts R, Hutchinson A. The Skin Cancer and Sun Knowledge (SCSK) Scale. *Health Edu Behav*. 2014;**41(4)**:440-8.