



KNOWLEDGE AND FREQUENCY OF USE OF SUNSCREEN IN MEDICAL STUDENTS FROM A PERUVIAN UNIVERSITY

CONOCIMIENTOS Y FRECUENCIA DE USO DEL PROTECTOR SOLAR EN ESTUDIANTES DE MEDICINA DE UNA UNIVERSIDAD PERUANA

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ABSTRACT

Introduction: Determine the level of knowledge and frequency of use of sunscreen in medical students from a Peruvian university. **Methods:** Cross-sectional descriptive research in 302 students, of both genders and different study cycles. An expert-validated virtual survey was applied. A convenience sampling was used. **Results:** Knowledge level was 56%, use of sunscreen 28,7%. The level of knowledge increased in higher study cycles. Use of sunscreen was higher among women (34,5%), and significantly associated with the level of knowledge ($p=0,001$). Mixed skin type (55%) and skin phototype III (58,3%) prevailed. The question with highest correct answer rate was that solar radiation causes skin cancer (97%). **Conclusions:** Among medical students of a peruvian university, the level of knowledge about the use of sunscreen was high, particularly in women, higher study cycles and favors the use of sunscreen. Medical students always used sunscreen infrequently and was associated with female gender, skin phototype and the level of knowledge.

Keywords: Sunscreening agent, medical students, knowledge, skin, skin cancer. (Source: MESH-NLM)

RESUMEN

Introducción: Determinar el nivel de conocimiento y la frecuencia de uso de protector solar en estudiantes de medicina de una universidad peruana. **Métodos:** Investigación descriptiva de corte transversal en 302 estudiantes de medicina, de ambos géneros y diversos ciclos. Se aplicó una encuesta virtual validada por expertos. El muestreo fue por conveniencia. **Resultados:** Nivel de conocimiento 56 %, uso del protector solar 28,7%. El nivel de conocimientos aumentó en los ciclos superiores. El uso del protector fue mayor en las mujeres (34,5%), se asoció significativamente con el nivel de conocimiento ($p=0,001$). El tipo de piel mixta fue la de mayor frecuencia (55 %); asimismo, el fototipo de piel III (58,3 %). La pregunta de mayor acierto fue que la radiación solar es causa de cáncer de piel (97 %). **Conclusión:** En los estudiantes de una universidad peruana, el nivel de conocimiento sobre el uso del protector solar fue alto, mayor en las mujeres; en los ciclos de estudios superiores y favorece el uso del protector solar. El protector solar fue usado siempre con baja frecuencia y se asocia al género femenino, fototipo y nivel de conocimientos.

Palabras clave: Protector solar; Estudiantes de medicina; Conocimiento; Piel; Cáncer de piel. (Fuente: DeCS-BIREME)

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Cite as: Huamán-Saavedra JJ, Yep-Romero LX, Sal y Rosas-Vargas MA, Quito-Calua BA, Uriol-Pinillos OS, Sanchez-Vargas MN, Bartolo-Cuba LA, Yengle-Del Castillo SC. Knowledge and Frequency of Use of Sunscreen in Medical Students from a Peruvian University. Rev Fac Med Hum. 2024;24(4):52-62. doi 10.25176/RFMH.v24i4.6401

Journal home page: <http://revistas.urp.edu.pe/index.php/RFMH>

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INTRODUCTION

Skin cancer has a high global incidence; in 2020, there were 201 new cases per 100,000 inhabitants⁽¹⁾. In Peru, it is the second most frequent type of cancer (13.7%)⁽²⁾. It can be classified as melanoma or non-melanoma. Among the factors associated with the development of skin cancer, exposure to solar radiation, use of tanning beds, and other individual determinants such as skin phototype, number of moles or freckles, and family or personal history of cancer have been described. Exposure to ultraviolet (UV) radiation from the sun, classified into UVA (315 to 400 nm), UVB (280 to 315 nm), and UVC (100 to 280 nm) according to wavelength, is one of the main causes of skin cancer. It significantly influences the clinical-pathological variety of melanoma due to sun exposure⁽³⁻⁷⁾, especially UVB, which directly damages DNA and increases mutation frequency related to burns and the etiology of various skin cancers⁽⁸⁾.

Photoprotection refers to measures that prevent UV radiation damage to the skin; these can be intrinsic, such as skin phototype, or involve external resources: shade, limiting sun exposure time, clothing, sunglasses, hats, and daily use of sunscreen⁽⁹⁾. Sunscreens work by containing an active ingredient that absorbs, reflects, or disperses solar radiation in the range of 290 to 400 nm⁽⁹⁻¹⁰⁾. They are effective in preventing actinic keratosis and squamous cell carcinoma, while for basal cell carcinoma, their effectiveness is less clear.

It is important to assess the level of knowledge about the use of sunscreens, as it leads to increased usage and prevention of skin cancer. In Mexico, most medical students (66%) report using sunscreen, especially at the beach (76.1%), but only 26.4% use it daily⁽¹¹⁾. Similarly, in Colombia, usage was inadequate, more so among women, and knowledge levels were low⁽¹²⁾. In Peru, varying levels of knowledge about sunscreen have been reported among medical students in Lima, depending on the type of question, with usage reaching 38.1%. Associated factors include being male and recent training⁽¹³⁾. Medical students, due to the nature of their studies and their potential role in promoting the use of sunscreens and preventing skin cancer, are the focus of this research, whose main objective is to study the level of knowledge and frequency of sunscreen use and subsequently assess the influence of factors such as gender, age, and level of

studies.

METHODS

Design

The study follows a quantitative approach, with an observational, descriptive, and cross-sectional design. It was conducted with medical students from the II, VI, VII, VIII, IX, X, XI, or XII cycles at the Universidad Privada Antenor Orrego in Trujillo, Peru. Data collection took place from June to July 2022. Participants received an email with a form, which they completed after providing informed consent.

As a selection criterion, students had to reside in Trujillo and be enrolled in the 2022 academic cycle. Students were grouped into cycle II (early level), VI (middle and final basic courses), and VII to XII (clinical courses).

Sample Size Calculation

The sample size was calculated using the formula for estimating a proportion, working with a finite population of 2,090 medical students. An expected frequency of 25%, based on a pilot study, was used with 95% confidence intervals and a precision of 5%. The total sample size was 287 participants, and a 5% increase was applied to account for potential losses, leading to a final sample size of 302.

Variables and Instruments

The considered variables were: Sunscreen use, with three levels of indicators: always, sometimes, and never. Knowledge of sunscreens, assessed through an eight-question survey: low (1-4 correct answers), medium (5-6 correct answers), and high (7-8 correct answers). Gender: male and female. Study cycle: Based on enrollment, three groups were considered: cycle II, cycle VI, and cycles VII to XII. Skin types: Oily, with excessive sebum accumulation; dry, with low oil levels; combination, intermediate between oily and dry; sensitive, with itching and/or pain, potentially causing facial redness^(14,15). Phototypes based on the Fitzpatrick scale and images included in the survey: I (white skin, always burns, never tans), II (white skin, always burns, tans with difficulty), III (medium skin color, sometimes mild burns, average tanning), IV (light brown skin, rarely burns, tans easily), V (brown skin, never burns, tans very easily), VI (dark skin, highly pigmented, never burns, tans very easily)⁽¹⁶⁾.

For the study, a survey titled “Knowledge and Frequency of Sunscreen Use among Medical Students” was developed, consisting of a 16-question validated and expert-reviewed questionnaire. The first eight questions addressed generalities and frequency of use,

while the remaining eight assessed knowledge. These were based on a survey applied in Peru⁽¹³⁾ and another at a Colombian university⁽¹²⁾. Skin type was self-evaluated as per Rodríguez-Gambetta⁽¹³⁾ and Durán-Ávila⁽¹⁷⁾. The format is described in Table 1.

Table 1. Other Characteristics of Medical Students from a University in Trujillo, Peru – 2022.

Characteristics	N°(%)
SKIN TYPE	
Combination	166 (55%)
Oily	63(20.9%)
Sensitive	33 (10.9%)
Dry	18 (6%)
Don't know	22 (7.3%)
SKIN PHOTOTYPE	
I	26 (8.6%)
II	43 (14.2%)
III	177 (58.6%)
IV	52 (17.2%)
V	3 (1%)
VI	1 (0.3%)
FREQUENCY OF USE	
Every 2 hours	5 (1.7%)
Every 4 hours	21 (7%)
Morning and night	6 (2%)
Once a day	89 (29.5%)
Occasionally	181 (59.9%)



REASON FOR NOT USING SUNSCREEN	
It is oily	164 (54.3%)
It is expensive	86 (28.5%)
It is unnecessary	33 (10.9%)
It is ineffective	3 (1%)
Allergic reaction	16 (5.3%)
REASONS FOR CHOOSING SUNSCREEN	
SPF	125(41.4%)
Skin type	127 (42.1%)
Brand	24 (7.9%)
Other	13 (4.3%)
Price	13 (4.3%)
CONDITIONS FOR SUNSCREEN USE	
Outdoor activities on a sunny day	78 (25.8%)
Outdoor activities on a cloudy day	3 (1%)
For swimming, pool, or waterfall visits	24 (7.9%)
Attending activities inside the hospital, reading rooms, or other activities	5 (1.7%)
Attending any event at night	0 (0%)
All of the above	192 (63.6%)

Data Analysis

The collected data were tabulated using SPSS 23, which generated frequency tables on sunscreen use according to gender, skin type, phototype, study cycle, and level of knowledge by gender and study cycle. The association between the level of knowledge and sunscreen use, as well as with gender and study cycle, was determined. Additionally, the association of sunscreen use with skin type, phototype, and family history of skin cancer was analyzed using the Chi-square test, with a significance level of $p < 0.05$.

Ethical Considerations

The study adhered to the Declaration of Helsinki⁽¹⁸⁾ and followed the International Ethical Guidelines for Biomedical Research and Human Experimentation by the World Health Organization. All participants gave informed consent prior to participation. The study received approval from the Bioethics Research Committee of the Universidad Privada Antenor Orrego, with Resolution N° 0264-2022-UPAO. Data confidentiality was maintained by coding the responses.

Table 2. Knowledge and Frequency of Sunscreen Use Questionnaire for Medical Students.

Question	Response Options
GENERAL INFORMATION	
1.What type of skin do you have?	a) Oily b) Combination c) Dry d) Sensitive e) Reddened f) Acne-prone g) Mature h) Don't know
2.Skin phototype*	a) I b) II c) III d) IV e) V f) VI
3.Do you use sunscreen?	a) Always b) Sometimes c) Never
4.How often do you use sunscreen?	a) Every 2 hours b) Every 4 hours c) Once a day d) Morning and night e) Occasionally
5.What reason makes you avoid using sunscreen?	a) It's oily b) It's ineffective c) Allergic reaction d) It's expensive e) It's unnecessary
6.Do you have any first-degree relatives with skin cancer?	a) Yes b) No
7.Based on what criteria would you choose a sunscreen?	a) Skin type b) SPF c) Price d) Brand e) Other
8.Under what conditions should sunscreen be applied?	a) Outdoor activities on a sunny day b) Outdoor activities on a cloudy day c) For swimming in pools, beaches, or waterfalls d) Attending activities inside hospitals, reading rooms, or indoor facilities e) Attending any event at night f) All of the above
KNOWLEDGE	
1.Is sunscreen effective in preventing sunburn?	a) Yes** b) No
2.Is solar radiation the main cause of skin cancer?	a) Yes** b) No
3.Does a person of color also need to use sunscreen?	a) Yes** b) No
4.Is SPF 15 sunscreen better than SPF 30 sunscreen?	a) Yes b) No**
5.Is it necessary to use sunscreen on a cloudy day?	a) Yes** b) No
6.What does SPF stand for in sunscreen??	a) Sun protection factor ** b) Sun's protection factor c) Filter protection factor d) Burn protection factor e) Tanning protection factor
7.On a sunny day, when should sunscreen be applied before going outdoors?	a) 5 minutes before b) 15 minutes before c) 30 minutes before ** d) 45 minutes before e) It does not matter when f) Lack of information
8.How often should sunscreen be reapplied when outdoors?	a) Every hour b) Every two hours ** c) Every six hours d) Follow product instructions e) Lack of information

* Images of skin phototypes were provided to the respondents.

** Correct answers.



RESULTS

In the population of medical students studied, 64.2% were female, with an average age of 21 for men and 20.6 for women (Table 2). To assess the level of knowledge, students were divided into three groups: cycle II, VI, and advanced cycles (VII-XII), and by gender.

The highest percentage (57.5%) had a high level of knowledge, particularly among students in advanced cycles. Sunscreen use, according to cycles and gender, showed that 28.8% always use sunscreen, with higher use among women (Table 3).

Table 3. Population of Medical Students at a University in Trujillo, Peru – 2022.

Cycle	Total number	Males		Females	
		(%) Number	Average age	Number	Average age
II	75 (24.8 %)	27	18.7	48	18.6
VI	108 (35.8 %)	33	20.5	75	20.5
VII	33 (10.9 %)	13	21.5	20	20.5
VIII	15 (5 %)	6	21.3	9	21.8
IX	25 (8.3 %)	11	23.6	14	22.9
X	16 (5.3%)	7	23.9	9	22.4
XI	20 (6.6 %)	7	23	13	22.9
XII	10 (3.3 %)	4	23.5	6	23.2
TOTAL	302 (100 %)	108 (35.8 %)		194 (64.2 %)	
Average			21		20.6

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Table 4. Level of Knowledge and Use of Sunscreen by Gender and Academic Cycle among Medical Students at a University in Trujillo, Peru – 2022.

Knowledge level	Academic cycle			Total
	II	VI	VII-XII	
MALES				
Low	3 (11.1%)	6 (17.6%)	2 (4.3%)	11 (10.2%)
Medium	15 (55.6%)	12 (35.3%)	18 (38.3%)	45 (41.7%)
High	9 (33.3%)	16 (47.1%)	27 (57.4%)	52 (48.1%)
FEMALES				
Low	1 (2.1%)	5 (6.8%)	1 (1.4%)	7 (3.6%)
Medium	25 (52.1%)	24 (32.4%)	21 (29.2%)	70 (36.1%)
High	22 (45.8%)	45 (60.8%)	50 (69.4%)	117 (60.3%)
TOTAL				
Low	4 (5.3%)	11 (10.2%)	3 (2.5%)	18 (6%)
Medium	40 (53.3%)	36 (33.3%)	39 (32.8%)	115 (38%)
High	31 (41.3%)	61 (56.5%)	77 (64.7%)	169 (56%)

SUNSCREEN USAGE LEVEL				
MALES				
Always	5 (18.5%)	8 (23.5%)	7 (14.9%)	20 (18.5%)
Sometimes	9 (33.3%)	10 (29.4%)	28 (59.6%)	47 (43.5%)
Never	13 (48.2%)	16 (47.1%)	12 (25.5%)	41 (38%)
FEMALES				
Always	15 (31.2%)	30 (40.5%)	22 (30.6%)	67 (34.5%)
Sometimes	26 (54.2%)	29 (39.2%)	38 (52.7%)	93 (48%)
Never	7 (14.6%)	15(20.3%)	12 (16.7%)	34 (17.5%)
TOTAL				
Always	20 (26.7%)	38 (35.2%)	29 (24.4%)	87 (28.8%)
Sometimes	35 (46.6%)	39 (36.1%)	66 (55.4%)	140 (46.4%)
Never	20 (26.7%)	31(28.7%)	24 (20.2%)	75 (24.8%)

Knowledge level: Association with gender $p=0.041$, Association with academic cycle $p=0.006$.

Usage Level: Association with gender $p=0.001$, Association with academic cycle $p=0.065$.

Regarding the frequency of correct answers, question 2 had the highest percentage of correct responses, while question 8 had the lowest (Table 4). The association between the level of knowledge and sunscreen use was significant across the total

population, as well as among men and women, using the Chi-square test. Additionally, phototype significantly influenced sunscreen use, with the lightest phototype (I) showing the highest usage (Table 5).

Tabla 5. Knowledge about Sunscreen among Medical Students at a University in Trujillo, Peru – 2022.

Question	Correct	Incorrect
1. Effective in preventing burns	287 (95%)	15 (5%)
2. Solar radiation causes cancer	293 (97%)	9 (3%)
3. People of color require sunscreen	291 (96,4%)	11 (3,9%)
4. SPF comparison	259 (85,8%)	43 (14,2%)
5. Use of sunscreen on cloudy days	269 (89,1%)	33 (10,9%)
6. Meaning of SPF	26 (86,4%)	41 (13,6%)
7. Time of application on a sunny day	169 (56%)	133 (44%)
8. Frequency of reapplication outdoors	122 (40,4%)	180 (59,6%)

SPF: Sun Protection Factor



Table 6. Other Factors and Sunscreen Use among Medical Students at a University in Trujillo, Peru – 2022.

Sunscreen use	Always	Sometimes	Never	Total	P
SKIN TYPE					
Combination	40 (24.1%)	86 (51.8%)	40 (24.1%)	166 (100%)	0.054
Oily	21 (33.3%)	24 (38.1%)	18 (28.6%)	63 (100%)	
Sensitive	15 (45.5%)	14 (42.4%)	4 (12.1%)	33 (100%)	
Dry	6 (33.33%)	9 (50%)	3 (16.67%)	18 (100%)	
Don't know	5 (22.73%)	7 (31.82%)	10 (45.45%)	22 (100%)	
SKIN PHOTOTYPE					
I	12 (46.15%)	7 (26.92%)	7 (26.92%)	26 (100%)	0.005
II	18 (41.86%)	21 (48.84%)	4 (9.30%)	43 (100%)	
III	42 (27.73%)	93 (52.54%)	42 (23.73%)	177 (100%)	
IV	14 (26.92%)	18 (34.62%)	20 (38.46%)	52 (100%)	
V	1 (33.33%)	1 (33.33%)	1 (33.33%)	3 (100%)	
VI	0	0	1 (100%)	1 (100%)	
FAMILY HISTORY OF SKIN CANCER					
Yes	5 (38.46%)	5 (38.46%)	3 (23.08%)	13 (100%)	0.726
No	82 (28.38%)	135 (46.71%)	72 (24.91%)	289 (100%)	
KNOWLEDGE LEVEL					
MALES					
High	13 (25.5%)	22 (43.1%)	16 (31.4%)	51	0.033
Medium	4 (8.7%)	24 (52.2%)	18 (39.1%)	46	
Low	3 (27.3%)	1 (9.1%)	7 (63.6%)	11	
Total	20	47	41	108	
FEMALES					
High	48 (40.7%)	57 (48.3%)	13 (11%)	118	0.021
Medium	17 (24.6%)	32 (46.4%)	20 (30%)	69	
Low	2 (28.6%)	4 (57.1%)	1 (14.3%)	7	
Total	67	93	34	194	
TOTAL					
High	61 (36.1%)	79 (46.7%)	29 (17.2%)	169	0.001
Medium	21 (18.3%)	56 (48.7%)	38 (33%)	115	
Low	5 (27.8%)	5 (27.8%)	8 (44.4%)	18	
Total	87	140	75	302	

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Some complementary aspects of the surveys were also highlighted. The most frequent skin type (55%) was combination skin, and the most common skin phototype was type III, with 58.6%. Only 4.3% reported a family history of skin cancer. The most common reason for not using sunscreen (54.3%) was its oily consistency. The primary factors for choosing sunscreens were skin type and the sun protection factor (SPF). The most frequent condition for applying sunscreen was outdoor activities on sunny days (Table 6).

DISCUSSION

Population and Sample

This study involved 302 medical students from a private university in Trujillo, with a predominance of females (64.2%), reflecting the gender distribution in the medical school. Students from early, mid, and advanced cycles were represented, and the average age increased with each cycle. Most respondents were 20 years old, accounting for 22.2% of the sample. The students participated voluntarily by answering the questionnaire that was sent to them virtually. The level of knowledge among medical students at this private university in Trujillo was similar to that reported for medical students in Santo Domingo⁽¹⁹⁾ and the population of Chiclayo, Peru (57%)⁽²⁰⁾. However, it was higher in the advanced knowledge level compared to Ica, Peru (18%)⁽²¹⁾, where medium-level knowledge was predominant. The acceptable quality of knowledge may be attributed to medical students' interest and the good information on photoexposure and photoprotection provided by current media outlets.

This study shows a higher level of knowledge among female students (60.3%) compared to males (48.1%), in contrast to university students in Santo Domingo⁽¹⁹⁾, where males had higher knowledge levels (31.0%) compared to females (17.0%). These results suggest that knowledge levels may vary by gender depending on different contexts. Only 28.8% of students always use sunscreen, 46.4% sometimes use it, and 24.4% never use it. This percentage is lower than that reported in Santo Domingo (47%)⁽¹⁹⁾, Pakistan (33.1%)⁽²²⁾, and the United States (33%)⁽²³⁾ and is similar to the rates observed among Venezuelan athletes⁽²⁴⁾. Sunscreen use was higher among females, similar to findings in

Pakistan. These results highlight the need for greater awareness among medical students about the importance of sunscreen use.

Sunscreen use was significantly associated with the level of knowledge, and knowledge levels were related to study cycles. However, sunscreen use was not associated with advanced study cycles, which may indicate the influence of other factors requiring further investigation. In Ica, Peru⁽²¹⁾, no relationship was found between knowledge levels and attitudes. A systematic review involving 10,400 athletes found that despite knowing the risks of skin cancer from UV exposure, they did not adequately use sunscreens⁽²⁵⁾. This suggests that knowledge alone is insufficient; attitudes must also be addressed.

The most frequent skin type in this study was combination skin, similar to findings among Colombian students⁽¹²⁾. The most common skin phototype, according to Fitzpatrick, was type III (58.6%), similar to reports from Chiclayo, Peru (43.7%)⁽²⁰⁾, Ica, Peru (40.5%)⁽²¹⁾, and Pakistan⁽²²⁾. In another study of merchants in Chiclayo, Peru, phototype IV (48.8%) was the most common, followed by phototype III (24.7%)⁽²⁶⁾. In Spain and Italy, phototype II (36.7%) was most common, followed by phototype III (27%) in medical students, as indicated by a survey⁽¹⁷⁾. Phototype significantly influences sunscreen use, with phototype I (the lightest) having the highest usage rate, which aligns with reports from Venezuelan athletes⁽²⁴⁾. The Fitzpatrick scale, based on skin color and sun sensitivity, predicts the risk of photosensitivity, with types I to III being at higher risk for skin cancer⁽²³⁾. Further research on skin phototypes is needed to recommend sunscreens that protect not only against UVB but also UVA and visible light⁽²⁷⁾. Family history of skin cancer was very low, similar to reports from Lima, Peru⁽¹³⁾, Chiclayo, Peru⁽²⁰⁾, Pakistan⁽²²⁾, the United States⁽²³⁾, and Europe⁽²⁷⁾, suggesting that this is not a significant factor.

Finally, regarding the questions on photoprotection knowledge, based on a Colombian university model⁽¹²⁾, the question with the highest correct response rate was whether solar radiation causes skin cancer, similar to findings at that university.





The question with the lowest accuracy was about the frequency of sunscreen reapplication outdoors, similar to results in Colombia. This highlights the importance of implementing photoprotection training programs not only for university students but also for the community to promote skin cancer prevention, aligning with findings at a Peruvian university^(13,27,28). One limitation of this study was the convenience sampling method. The survey was only validated by expert judgment. The determination of skin phototype was self-reported by the participants in the survey, as it was not feasible to

conduct dermatological examinations, a method also used by other authors^(13,17).

In conclusion, among medical students at a Peruvian university, 56% had a high level of knowledge about sunscreen use, with higher knowledge among women, which increased significantly with study cycles and promoted sunscreen use. 28.7% of medical students always used sunscreen. Factors associated with sunscreen use included female gender, phototype, and level of knowledge.

Authorship contribution: All authors have participated in the various stages of the research and approved the final version of the article.

Conflict of interest: The authors declare no conflict of interest.

Funding: Self-funded.

Received: February 11, 2024.

Approved: September 12, 2024.

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