

HEALTH PROMOTION

Comparison of Photoprotection Knowledge, Attitudes, and Practices among Medical and Non-Medical Students at a Peruvian University

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Keywords

Medical students • Radiation Exposure • Health Knowledge, Attitudes, Practice • Skin cancer • Sunscreens

Summary

Introduction. Skin cancer is one of the most prevalent malignancies worldwide, particularly in countries with high ultraviolet (UV) radiation exposure. Thus, to reduce sun exposure, the early adoption of protection behaviours is essential. In this task, future medical professionals must demonstrate competencies in skin cancer prevention. This study aimed to describe and compare photoprotection knowledge, attitudes, and practices (KAP) among medical and non-medical students.

Methods. A cross-sectional study was conducted at a private university in Lima, Peru, involving 624 students from five programs: medicine, industrial and systems engineering, law, psychology, and business administration. Participants were divided into two groups: medical and non-medical students. The Questionnaire on Habits, Attitudes, and Knowledge about Sun Exposure in Adolescence and Adulthood (CHACES), a validated tool to assess sun

exposure and protection KAP, was used. Group comparisons were performed using Chi-squared and Mann-Whitney U tests.

Results. Participants' average age was 21.09 years old, with 56.1% being female. Medical students scored higher in photoprotection knowledge ($U = 35,853.5$; $p = 0.003$) and reported lower sun exposure ($U = 37,263.5$; $p = 0.028$) than non-medical students. However, no significant differences were observed in photoprotection behaviours ($p = 0.807$) or photoprotection attitudes ($p = 0.238$).

Conclusion. Medical students demonstrated greater knowledge and fewer sun exposure habits; however, their photoprotection behaviours did not differ significantly from non-medical students. These findings highlight the need for enhanced educational strategies for skin cancer prevention across all university programs.

Introduction

Skin cancer is a global public health concern [1], particularly in countries with high ultraviolet (UV) radiation, such as Peru [2]. UV exposure is the primary risk factor for skin cancer, including basal cell carcinoma, the most common [3]; and melanoma, the most aggressive [4]. According to the World Health Organization (WHO), the global incidence of melanoma among adults aged 20-44 was 1.3 cases per 100,000 in 2022, corresponding to 39,126 new cases, with projections rising to 44,600 cases annually by 2025 [5]. In 2012, 75.7% of the 168,000 new melanoma cases worldwide in individuals aged ≥ 30 were linked to excessive UV exposure, which often begins earlier in life [6]. In Canada, 36% of melanoma cases in individuals aged 20 to 29 were attributable to UV exposure between 16 and 24 years old [7]. Furthermore, this age group also shows the highest prevalence of sunburns and sunbathing, with 53.0% of women reporting sunbathing and 35.5% of men experiencing sunburn in the past year [7]. Despite the availability of photoprotection strategies [8], skin cancer incidence continues to rise, underscoring the need for early preventive interventions [9].

University students represent a young population with

varying levels of knowledge, attitudes, and practices regarding sun protection, which do not always translate into effective preventive behaviours [10-13]. Students in health-related programs, such as medicine, are expected to adopt better photoprotection practices, as their training includes education on the risks of UV exposure and the importance of prevention [14]. As future healthcare providers, medical students are expected to play a central role in patient education and the promotion of preventive behaviours at the primary care level [15-18].

Contrary to prior expectations, studies comparing medical and non-medical students have yielded inconsistent findings. In Poland, medical students demonstrated better photoprotection behaviours and attitudes, but no significant differences in knowledge were observed [19]. Similarly, a study in India found no differences in knowledge regarding sun exposure and photoprotection behaviours. Although sunscreen use was slightly higher among medical students (51.3%) than among non-medical students (41.6%), this difference was not statistically significant [20]. In contrast, a study in Malaysia reported that pharmacy students demonstrated greater knowledge, behaviours, and perceptions regarding sunscreen use than medical students [21]. In Peru, several studies have assessed

photoprotection knowledge, attitudes and practices (KAP) among medical students [10, 22-24]; however, most present some risk bias or did not include direct comparisons with non-medical students. Limitations included non-validated instruments [10] or biased validation processes [22, 23], absence of cut-off points to categorize levels of knowledge or practices [22], and assessments restricted to first-year medical students [23]. The hypothesis of this study, grounded in social cognitive theory [25], is that medical students would exhibit better photoprotection behaviours than non-medical students due to their acquired knowledge, awareness of sun exposure risks, and greater self-efficacy in adopting protective behaviours. This research aimed to describe and compare sun protection KAP among students from different programs at a private university in Lima, offering insights to enhance educational and preventive strategies.

Materials and Methods

STUDY DESIGN AND SETTING

This cross-sectional study was conducted at a private university in Lima, Peru. Lima is located along the central coast of the country, where summer UV index (UVI) range from 7 to 12, classified as high to extremely high risk for health. Data was collected between October and December 2023.

STUDY POPULATION

Participants included students enrolled in the second semester of the 2023 academic year, from the second to fifth years of five academic programs. They were categorized into two groups: medical students and non-medical students. The non-medical group included students from industrial and systems engineering, law, psychology, and business administration programs. Eligible students were required to be 18 years or older and provide informed consent. Those who consented but did not complete the demographic information section or the KAP-related questions were excluded.

SAMPLE SIZE

To accomplish our descriptive goal, sample size estimates were calculated separately for medical and non-medical students. Given a population of 259 medical students and 1,309 non-medical students, the reference percentage for wearing long-sleeved shirts and pants (60%) was derived from the Questionnaire on Habits, Attitudes, and Knowledge about Sun Exposure in Adolescence and Adulthood (CHACES) conducted to health science students in Ecuador [11]. This estimate reflects the average percentage of responses regarding photoprotection behaviours and knowledge. A 5% margin of error and a 95% confidence level resulted in sample sizes of 207 for medical students and 575 for non-medical students. The sample selection was non-probabilistic, and participation was voluntary following a detailed briefing about the study.

To assess the significantly different median scores between two independent groups, we estimated the *post hoc* statistical power for the variables sun exposure practices, photoprotection behaviours, photoprotection knowledge, and attitudes toward sun protection. The analysis was conducted using G*Power version 3.1.9.7.

DATA COLLECTION TOOL

The CHACES questionnaire for adults validated in Spanish [26] was conducted online through SurveyMonkey platform. A pilot test with 26 students aimed to assess response time, question clarity, and internal consistency. Cronbach's α for the 10 attitude items was 0.859, indicating good reliability. However, the 10 knowledge items initially yielded a Cronbach's α of 0.334, prompting the removal of three items, which improved reliability to 0.477. For sun exposure habits and photoprotection behaviours, the existing items of the original instrument were applied.

Following the pilot test, the instrument was organized into two sections: general information and the CHACES questionnaire. The first section collected data on undergraduate program, age, gender, academic year (second to fifth) and city of origin (Lima – other Peruvian cities). The CHACES questionnaire comprised two items on skin phototype, six on sun exposure habits, six on photoprotection behaviours, ten on attitudes towards photoprotection, and seven on photoprotection knowledge.

VARIABLES OF INTEREST

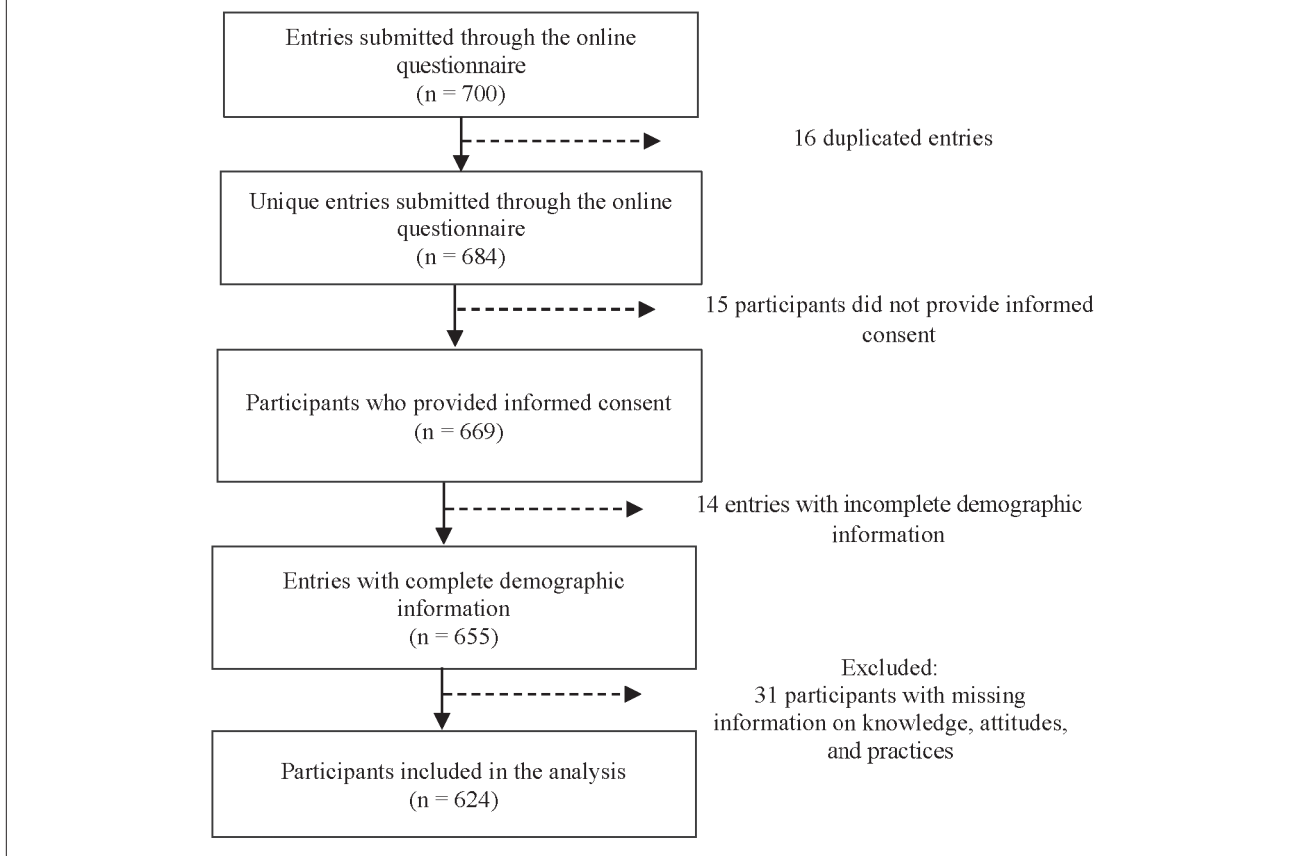
Sun exposure habits were measured through six items: three on the number of days of exposure per year with five ordinal response categories (none = 0, 1-5 days = 1, 6-30 days = 2, 31-90 days = 3, > 90 days = 4) and three on the number of hours per day (none = 0, 1-2 h/day = 1, 3-4 h/day = 2, 5-6 h/day = 3, > 6 h/day = 4). The sum of these items yielded a scale from 0 to 24.

Photoprotection behaviours were evaluated using six Likert-scale items (never = 1, rarely = 2, sometimes = 3, often = 4 and always = 5), with total scores ranging from 6 to 30. Higher scores indicated better behaviours. Attitudes toward photoprotection were assessed using items with five-point Likert scale responses (strongly disagree = 1, disagree = 2, neither agree nor disagree = 3, agree = 4, strongly agree = 5). There were four reverse-scored items, with the sum of scores generating a range of 10 to 50 points. The higher the score, the better attitudes towards photoprotection. Knowledge was assessed with seven true-or-false items, with correct answers receiving a score of 1. The total knowledge score ranged from 0 to 7.

Undergraduate programs were categorized into medicine and other majors (business administration, psychology, industrial and systems engineering, and law).

SURVEY PROCEDURE

Permissions were obtained from each program and the survey was conducted online through SurveyMonkey platform. Participants accessed the survey using a QR code projected in classrooms and a link shared via institutional

Fig. 1. Participant Selection Flowchart.

email. Upon entering the classrooms, the study's purpose was explained and information about the process for informed consent was given. After data collection, results were exported to Excel for exploratory analysis in SPSS version 25 to identify missing or invalid data. No imputation methods were applied for missing data.

STATISTICAL ANALYSIS

Categorical variables were described using frequencies and percentages. Pearson's Chi-squared test was used with a two-tailed hypothesis to compare results between medical and non-medical students for items on sun exposure habits, photoprotection behaviours, attitudes towards photoprotection, and photoprotection knowledge. Likewise, the Mann-Whitney U test was applied to compare the scores for these discrete variables between the two groups. Further comparisons were conducted by academic year within each group using the Kruskal-Wallis test, followed by Dunn's multiple comparisons test when appropriate. Moreover, statistical analysis was performed using SPSS version 25, and GraphPad Prism 10.2.0 was used for graph generation. All statistical tests were performed with a 5% significance level.

ETHICAL CONSIDERATIONS

The study was approved by the Institutional Ethics Committee of the Universidad de Piura (Record No.

06/2023). Data were collected anonymously, and participants provided informed consent before taking part in the survey.

Results

A total of 700 students participated in the online survey. After excluding 16 duplicate entries and applying other selection criteria, the final sample consisted of 624 participants (Fig. 1). Included and excluded students were similar in terms of gender, academic year, major or residence (Tab. I).

SAMPLE CHARACTERISTICS

Industrial and systems engineering, and medical students accounted for 62.2% ($n = 388$) of the sample. The mean age of participants was 21.09 years, with no significant difference between medical (21.24) and non-medical students (21.02) ($p = 0.18$). Women represented 56.1% of the sample. 69.7% of participants were from Lima, with a higher percentage among non-medical students (73.7%) compared to medical students (61.0%) ($p = 0.001$). Regarding skin types, 35.7% of participants reported having Fitzpatrick skin type II. In addition, 46.5% indicated experiencing painful sunburns the day after exposure without developing a tan within a week. No significant differences were

Tab. I. Comparison of general information between included and excluded students.

Variable	Included		Excluded ^a		p-value ^a
	n	% ^b	n	% ^b	
Gender					
Male	274	43.9	11	35.5	0.356
Female	350	56.1	20	64.5	
Academic Year					
Second	138	22.1	6	19.4	0.404
Third	164	26.3	12	38.7	
Fourth	160	25.6	8	25.8	
Fifth	162	26.0	5	16.1	
Major					
Medicine	195	31.3	10	32.3	0.906
Other Majors	429	68.8	21	67.7	
Residence					
Lima	435	69.7	22	71.0	0.882
Other Peruvian Cities	189	30.3	9	29.0	

^a Participants with incomplete responses on knowledge, attitudes, or photoprotection behaviours were excluded. ^b Percentages calculated for each column (proportion within the included or excluded group). ^c p-value corresponds to Pearson's Chi-squared test with two-tailed asymptotic estimation.

found in skin types between medical and non-medical students (Tab. II).

SCORE COMPARISON FOR KEY VARIABLES

Medical students had lower scores for sun exposure habits compared to non-medical students (median rank: 289.09 vs 323.14; $p = 0.028$). This comparison reached a statistical power of 37.3%. Conversely, medical students demonstrated higher scores in photoprotection knowledge (median rank: 343.14 vs 298.57; $p = 0.003$). The pos hoc power was 82.6%. No significant differences were observed in photoprotection behaviours ($p = 0.807$) or attitudes towards photoprotection ($p = 0.238$). Among non-medical students, no significant differences were observed across academic years in sun exposure habits ($p = 0.119$), photoprotection behaviours ($p = 0.793$), attitudes ($p = 0.323$), or knowledge ($p = 0.436$). In contrast, significant differences were identified among medical students in sun exposure habits ($p = 0.032$) and photoprotection behaviours ($p = 0.041$) (Fig. 2).

SUN EXPOSURE HABITS AND PHOTOPROTECTION BEHAVIOURS

Medical and non-medical students did not differ significantly in specific sun exposure habits or photoprotection behaviours. Outdoor sports and leisure activities were the main sources of exposure, with 25.6% of medical students and 30.0% of non-medical students reporting more than 30 days of exposure per year. The most frequent photoprotection behaviours, reported as 'always' or 'often', were seeking shade (64.6% of medical students vs 51.3% of non-medical students) and using sunscreen (49.2% vs 57.3%). Notably, a higher

proportion of non-medical students reported rarely or never avoiding midday sun compared with medical students (34.0% vs 28.2%, $p = 0.044$) (Tab. III).

ATTITUDES TOWARDS PHOTOPROTECTION

Medical and non-medical students showed differences in attitudes towards photoprotection. A higher percentage of non-medical students *agreed* or *strongly agreed* with the statements "I like sunbathing" (51.1% vs 39.0%, $p = 0.019$) and "I do not like using sunscreen" (27.0% vs 24.6%, $p = 0.007$). They also *agreed* or *strongly agreed* with the statement "I am concerned about spots and wrinkles from sun exposure" (74.4% vs 70.8%, $p = 0.028$). Additional comparisons of attitudes towards photoprotection are shown in Table IV.

PHOTOPROTECTION KNOWLEDGE

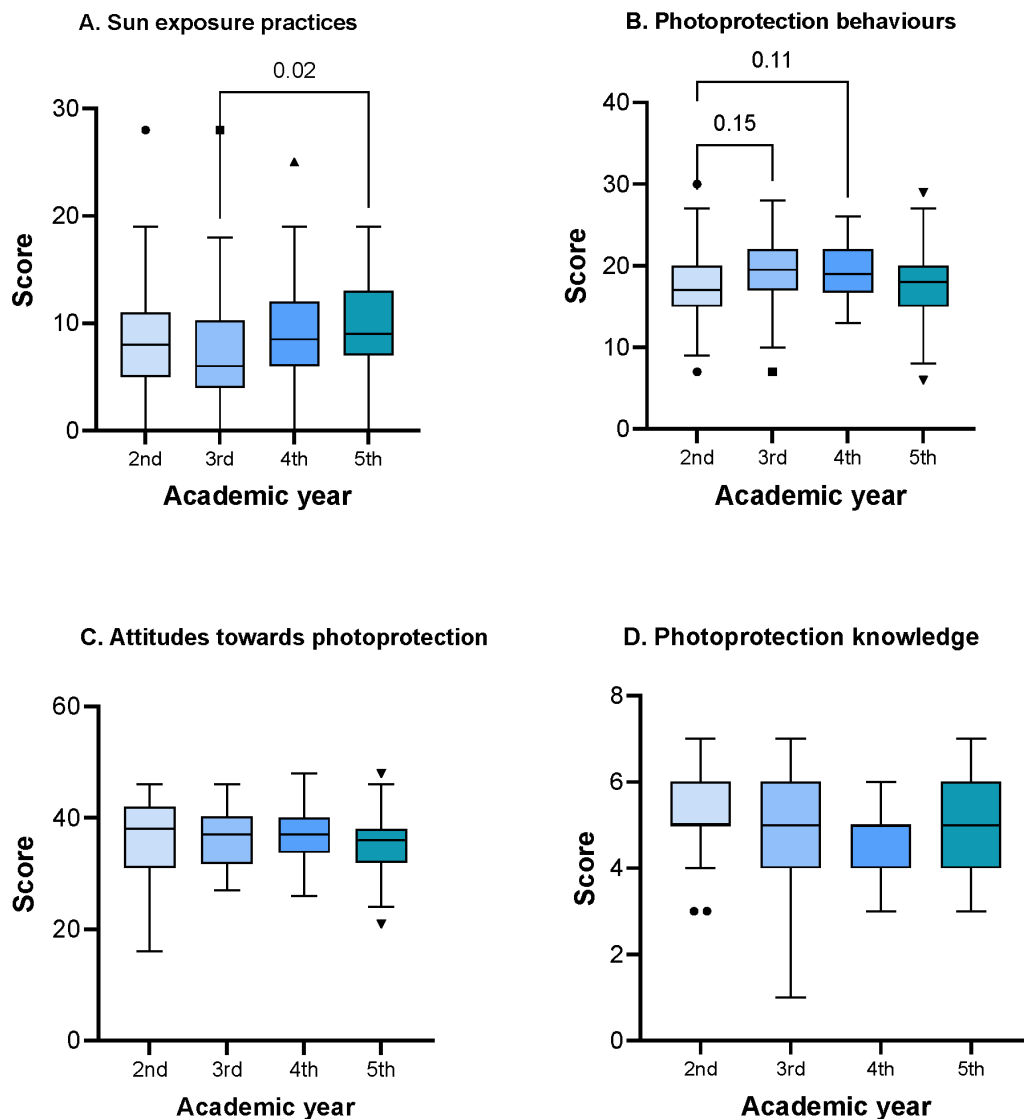
Medical students had a higher percentage of correct answers in photoprotection knowledge, achieving better results on six out of seven questions compared to non-medical students. The exception was the item regarding direct sun exposure for babies under one year old (73.8% vs 79.7%), although this difference was not statistically significant. A significant difference was observed in the item about using UV booths before age 30 and the increased risk of melanoma (86.7% vs 78.6%, $p = 0.016$) (Fig. 3). In addition, the median knowledge score in both groups was 5 correct answers, however, the interquartile ranges were 4 to 6 in medical students, and 4 to 5 in non-medical students.

Discussion

Medical students demonstrated greater knowledge of photoprotection and reported fewer sun exposure habits compared with non-medical students. However, no significant differences were observed in photoprotection behaviours or attitudes between the groups. These findings highlight persistent gaps in knowledge and sun exposure habits among university students, which appear to be influenced by their major. Providing non-medical students with more preventive information on the risks of sun exposure and skin cancer is essential to enhance awareness and preventive actions from the university setting.

These findings align with studies conducted among medical students in Turkey [27], Arab countries [28], Indonesia [29], Perú [24] which report a better understanding of the risks of sun exposure and related skin diseases among medical students. Nevertheless, despite being exposed to this information during their training, there is still a need to strengthen curriculum content on skin cancer prevention [17]. The relevance of including specific photoprotection topics in curricula is highlighted by a study showing that pharmacy students – who received specific courses on sunscreens as nutraceuticals and cosmeceuticals – demonstrated better knowledge of sunscreen use compared to medical students, who lacked such targeted instruction [21].

Fig. 2. Comparison of scores (Median and Interquartile Range) by academic year among medical students.



A. Sun exposure practices (Kruskal-Wallis $H = 8.80$, $p = 0.032$), B. Photoprotection behaviours (Kruskal-Wallis $H = 8.25$, $p = 0.041$), C. Attitudes towards photoprotection (Kruskal-Wallis $H = 4.37$, $p = 0.224$), D. Photoprotection knowledge (Kruskal-Wallis $H = 2.53$, $p = 0.470$). The bars represent Dunn's multiple comparisons test with p -values below 0.20.

Regarding sun protection knowledge, medical students achieved a higher percentage of correct answers on six out of seven questions compared with non-medical students. Non-medical students were more likely to correctly identify that babies under one year should avoid direct sun exposure, although the difference was not statistically significant. This finding suggests that awareness of sun exposure risks in infants is widely disseminated. A similar study in Ecuador, which applied the same research instrument, reported comparable results, with more than 59% of medical students and faculty answering correctly [11].

The only significant difference in sun protection knowledge between the two groups concerned the use of UV tanning booths before age of 30 and their association with an increased risk of melanoma, with

a higher proportion of non-medical students unaware of this risk. Cultural factors may partly explain these differences [29, 30]. For instance, tanning is seen as attractive among young people in Arizona [31 and Peru [10]. In contrast, in Saudi Arabia, Almuqati et al. reported that tanning is not considered as a beauty standard, reflecting greater awareness of its harmful effects [13], a perception also common in Eastern populations [32]. Similarly, France has enforced stricter regulations on tanning booth advertising, particularly by restricting access for minor [33].

Although our findings, consistent with a study from Indonesia [29], showed higher photoprotection knowledge among medical students, prior research has been inconsistent. For instance, a study in India using a five-item knowledge questionnaire found no significant difference

Tab. II. General and skin type information of university students by major.

Variable	Total		Medicine		Other Majors		p-value ^a
	n	%	n	%	n	%	
Sociodemographic Data							
Major							
Psychology	124	19.9	-	-	-	-	
Medicine	195	31.3	-	-	-	-	
Industrial and Systems Engineering	193	30.9	-	-	-	-	
Law	101	16.2	-	-	-	-	
Business Administration	11	1.8	-	-	-	-	
Age ^c							
Mean (Standard Deviation)	21.09	1.93	21.2	1.79	21.02	1.98	0.180
Gender							
Male	274	43.9	92	47.2	182	42.4	0.267
Female	350	56.1	103	52.8	247	57.6	
Academic Year							
Second	138	22.1	43	22.1	95	22.1	0.287
Third	164	26.3	46	23.6	118	27.5	
Fourth	160	25.6	46	23.6	114	26.6	
Fifth	162	26.0	60	30.8	102	23.8	
City of Origin							
Lima	435	69.7	119	61.0	316	73.7	0.001
Other Peruvian Cities	189	30.3	76	39.0	113	26.3	
Skin Type							
Fitzpatrick Skin Type							
I	82	13.1	21	10.8	61	14.2	0.411
II	223	35.7	66	33.8	157	36.6	
III	191	30.6	71	36.4	120	28	
IV	99	15.9	28	14.4	71	16.6	
V	23	3.7	7	3.6	16	3.7	
VI	6	1	2	1	4	0.9	
Skin Reaction to Sunburn							
I don't get sunburned the following day, but I develop a deep tan within a week	226	36.2	75	38.5	151	35.2	0.863
I get mildly sunburned the following day, and I develop a moderate tan within a week	79	12.7	25	12.8	54	12.6	
I get painfully sunburned the following day, and I develop a slight tan within a week	29	4.6	9	4.6	20	4.7	
I get painfully sunburned the following day, but I develop a tan after a week	290	46.5	86	44.1	204	47.6	
Sunburns							
How many times have you gotten sunburned (redness and pain) in the last year?							
None	148	23.7	58	29.7	90	21	0.065
1-2	292	46.8	92	47.2	200	46.6	
3-5	131	21	33	16.9	98	22.8	
6-10	27	4.3	5	2.6	22	5.1	
More than 10	26	4.2	7	3.6	19	4.4	

^a The *p*-value corresponds to Pearson's Chi-squared test with two-tailed asymptotic estimation. ^b *p*-value corresponds to Student's T-test. ^c 17 missing data points.

between groups, with medical students answering a mean of 3.1 questions correctly compared to 2.9 among non-medical students [20]. In contrast, a study in Malaysia comparing final-year medical and pharmacy students with a 16-item questionnaire found that pharmacy students achieved a higher proportion of correct responses in 15 of the questions [21]. These discrepancies may be explained by differences in the questionnaires used and the

characteristics of the comparison groups across studies. In our study, both medical and non-medical students reported moderate photoprotection behaviours, mainly sunscreen use and seeking shade. Sunscreen use was reported by 49.2% of medical students and 57.3% of non-medical students, closely aligning with findings from Indonesia (50.5% vs 53.3%) [29]. In Malaysian, however, pharmacy students reported higher use than

Tab. III. Comparison of sun exposure habits and photoprotection behaviours by major..					
Variable	Medicine		Other majors		p-value ^a
	n	%	n	%	
Sun exposure habits					
How many days per year are you exposed to the sun during outdoor activities?					
Swimming at the pool, beach, or other sunbathing spots.					
None	30	15.4	42	9.8	0.298
1-5	71	36.4	152	35.4	
6-30	62	31.8	150	35.0	
31-90	21	10.8	56	13.1	
More than 90	11	5.6	29	6.8	
Outdoor sports and leisure activities					
None	23	11.8	52	12.1	0.620
1-5	51	26.2	111	25.9	
6-30	71	36.4	137	31.9	
31-90	27	13.8	80	18.6	
More than 90	23	11.8	49	11.4	
Outdoor work					
None	94	48.2	177	41.3	0.530
1-5	42	21.5	110	25.6	
6-30	35	17.9	91	21.2	
31-90	16	8.2	33	7.7	
More than 90	8	4.1	18	4.2	
How many hours per day are you exposed to the sun during outdoor activities?					
Swimming at the pool, beach, or other sunbathing spots.					
None	32	16.4	66	15.4	0.938
1-2	80	41	174	40.6	
3-4	63	32.3	139	32.4	
5-6	14	7.2	39	9.1	
More than 6	6	3.1	11	2.6	
Outdoor sports and leisure activities					
None	35	17.9	58	13.5	0.487
1-2	97	49.7	231	53.8	
3-4	50	25.6	112	26.1	
5-6	7	3.6	20	4.7	
More than 6	6	3.1	8	1.9	
Outdoor work					
None	100	51.3	193	45	0.364
1-2	60	30.8	160	37.3	
3-4	28	14.4	58	13.5	
5-6	2	1	10	2.3	
More than 6	5	2.6	8	1.9	
Photoprotection behaviours					
I seek shade (e.g., by using an umbrella)					
Always	39	20.0	66	15.4	0.133
Often	83	42.6	154	35.9	
Sometimes	39	20.0	111	25.9	
Rarely	22	11.3	62	14.5	
Never	12	6.2	36	8.4	
I wear sunglasses					
Always	24	12.3	54	12.6	0.894
Often	40	20.5	80	18.6	
Sometimes	35	17.9	89	20.7	
Rarely	43	22.1	99	23.1	
Never	53	27.2	107	24.9	
I wear a hat or cap					
Always	20	10.3	49	11.4	0.861
Often	41	21.0	102	23.8	



Tab. III (follows). Comparison of sun exposure habits and photoprotection behaviours by major.

Variable	Medicine		Other majors		p-value ^a
	n	%	n	%	
Sometimes	50	25.6	102	23.8	0.861
Rarely	42	21.5	95	22.1	
Never	42	21.5	81	18.9	
I wear a long-sleeve T-shirt and pants					
Always	15	7.7	49	11.4	0.624
Often	49	25.1	96	22.4	
Sometimes	55	28.2	120	28.0	
Rarely	41	21.0	95	22.1	
Never	35	17.9	69	16.1	
I avoid the midday sun (12:00-16:00)					
Always	22	11.3	31	7.2	0.044
Often	47	24.1	123	28.7	
Sometimes	71	36.4	129	30.1	
Rarely	33	16.9	107	24.9	
Never	22	11.3	39	9.1	
I use sunscreen					
Always	50	25.6	118	27.5	0.223
Often	46	23.6	128	29.8	
Sometimes	54	27.7	98	22.8	
Rarely	28	14.4	62	14.5	
Never	17	8.7	23	5.4	

^a The p-value corresponds to Pearson's Chi-squared test with two-tailed asymptotic estimation.

medical students (47.5% vs 36.6%) [21]. These results contrast with studies from India [20] and Poland [19], where medical students showed slightly higher sunscreen use than their non-medical peers.

Both groups reported a low frequency of using additional protection measures, such as hats or caps, sunglasses, and long-sleeved clothing. No significant differences were found between medical [16] and non-medical students [13]. Almuqati et al. observed that 43.1% of non-medical students wore long sleeves and 33.9% used sunglasses [13], while Seetan et al. reported that 9.4% of Jordanian medical students wore hats, 47.3% long sleeves, and 19.1% sunglasses [16]. In India, 38.8% of medical students used hats, umbrellas, or shades for sun protection, compared to 44.1% of students in other majors. Similarly, protective clothing was more frequent among non-medical students (15.3%) than medical students (8.5%), although the difference was not statistically significant [20], consistent with findings Indonesia [29] and Poland [19]. These variations may reflect cultural norms influencing clothing choices and differing levels of sun exposure across countries [13, 16]. A higher percentage of non-medical students reported sun exposure during peak hours (12:00-16:00), the period of greatest radiation. These findings contrast with studies in France [34] and Saudi Arabia [13], where students generally avoided exposure at these times. In Jordan, however, medical students showed high levels of sun exposure despite their knowledge of sun protection [16], revealing a gap between awareness and actual behaviour among both medical and non-medical students. Overall, our results indicate that outdoor sports

and leisure activities were the main contributors to sun exposure, particularly among non-medical students, consistent with patterns commonly observed in young adults [35].

Significant differences emerged in three statements related to attitudes towards photoprotection. Over half of the non-medical students preferred sunbathing and expressed reluctance to use sunscreen, despite acknowledging concerns about spots and wrinkles caused by sun exposure. Such rejection of photoprotection practices has been commonly reported [10, 31, 36] and may linked to the discomfort of greasy textures or simply forgetting to apply sunscreen [37]. In contrast, medical students showed more favourable attitudes towards sunscreen use and sun avoidance, likely reflecting their understanding of photoprotection mechanisms, which facilitates greater acceptance of these practices [17]. Economic factors also influence these behaviours, as students from higher-income families or countries tend to use sun protection more consistently [36].

Photoprotection behaviours and sun exposure patterns were broadly comparable between medical and non-medical students. However, the slightly higher exposure observed among non-medical students may account for their greater prevalence of sunburn. Specifically, 22.1% of medical students reported experiencing three or more sunburns in the past year, compared with 32.3% of non-medical students. This difference is consistent with non-medical students' more favourable attitudes toward sunbathing and their less favourable attitudes toward sunscreen use.

A comparison by academic year among medical

Tab. IV. Comparisons of attitudes towards photoprotection by major.

Attitudes	Medicine		Other Majors		p-value ^a
	n	%	n	%	
Statement					
<i>I like sunbathing</i>					
Strongly agree	33	16.9	68	15.9	0.019
Agree	43	22.1	151	35.2	
Neither agree nor disagree	50	25.6	87	20.3	
Disagree	34	17.4	67	15.6	
Strongly disagree	35	17.9	56	13.1	
<i>I like being tanned</i>					
Strongly agree	19	9.7	37	8.6	0.776
Agree	28	14.4	77	17.9	
Neither agree nor disagree	62	31.8	132	30.8	
Disagree	39	20.0	91	21.2	
Strongly disagree	47	24.1	92	21.4	
<i>Sunbathing makes me feel good</i>					
Strongly agree	23	11.8	54	12.6	0.127
Agree	57	19.2	160	37.3	
Neither agree nor disagree	52	26.7	104	24.2	
Disagree	32	16.4	69	16.1	
Strongly disagree	31	15.9	42	9.8	
<i>I do not like using sunscreen</i>					
Strongly agree	19	9.7	16	3.7	0.007
Agree	29	14.9	100	23.3	
Neither agree nor disagree	47	24.1	87	20.3	
Disagree	54	27.7	121	28.2	
Strongly disagree	46	23.6	105	24.5	
<i>It is worth using sunscreen</i>					
Agree	178	91.3	396	92.3	0.192
Neither agree nor disagree	10	5.1	28	6.5	
Disagree	2	1.0	2	0.5	
Strongly disagree	5	2.6	3	0.7	
<i>At midday, I prefer seeking shade rather than sun</i>					
Agree	146	74.9	316	73.7	0.481
Neither agree nor disagree	31	15.9	85	19.8	
Disagree	13	6.7	20	4.7	
Strongly disagree	5	2.6	8	1.9	
<i>I am concerned about getting sunburned</i>					
Strongly agree	79	40.5	140	32.6	0.446
Agree	59	30.3	148	34.5	
Neither agree nor disagree	37	19	94	21.9	
Disagree	15	7.7	35	8.2	
Strongly disagree	5	2.6	12	2.8	
<i>I am concerned about spots and wrinkles from sun exposure</i>					
Strongly agree	94	48.2	190	44.3	0.028
Agree	44	22.6	129	30.1	
Neither agree nor disagree	43	22.1	78	18.2	
Disagree	6	3.1	26	6.1	
Strongly disagree	8	4.1	6	1.4	
<i>I am concerned about the risk of skin cancer from sun exposure</i>					
Strongly agree	96	49.2	223	52.0	0.919
Agree	64	32.8	134	31.2	
Neither agree nor disagree	25	12.8	55	12.8	
Disagree	5	2.6	10	2.3	
Strongly disagree	5	2.6	7	1.6	

Tab. IV (follows). Comparisons of attitudes towards photoprotection by major.

Attitudes	Medicine		Other Majors		p-value ^a
	n	%	n	%	
<i>It is easy to protect myself from the sun by wearing a hat and clothes that cover my skin</i>					
Strongly agree	36	18.5	65	15.2	0.714
Agree	92	47.2	201	46.9	
Neither agree nor disagree	37	19.0	88	20.5	
Disagree	24	12.3	65	15.2	
Strongly disagree	6	3.1	10	2.3	

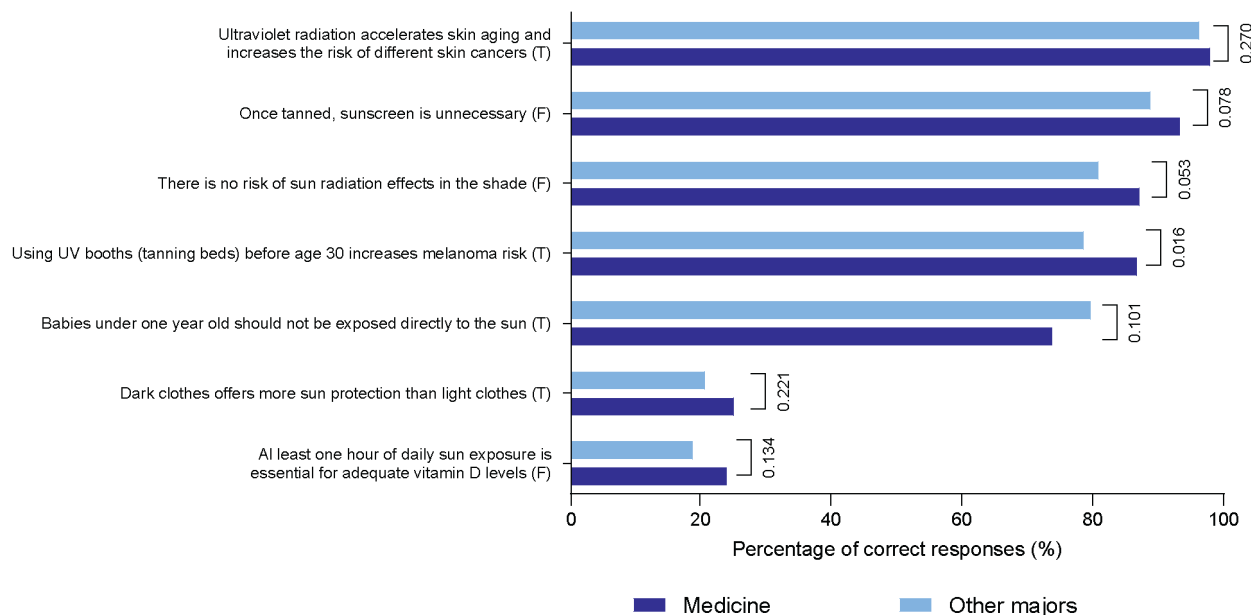
^a The *p*-value corresponds to Pearson's Chi-squared test with two-tailed asymptotic estimation.

students revealed an increase in sun exposure and a decrease in photoprotection behaviours beginning in the third year. This paradox may reflect the demands of clinical rotations and coursework, which divert attention from self-care despite a certain level of photoprotection knowledge [38]. Similar findings were reported in Indonesia, where 51.7% of medical students cited forgetfulness as the main reason for not using sunscreen, compared to only 29.9% of non-medical students [29]. Attitudes and knowledge did not vary significantly across academic years in either group. Dermatology courses often provide only superficial coverage of sun exposure and cancer prevention, with less than 13 hours allocated in the first four years of medical school in countries such as Spain, England, Canada, United States [15], and Peru. As a result, medical students report low confidence in sun prevention counselling [14], with awareness of sun exposure comparable to the general population [34]. This gap also affects non-medical students, who not only lack formal education on preventing dermatological diseases

related to sun exposure but also receive information from health professionals who may not be adequately trained in sun protection counselling.

This study has several limitations. First, the use of a non-probabilistic sampling method and the inability to reach the proposed sample size for non-medical students may limit representativeness. Second, the analysis focused exclusively on one health-related major (medicine), restricting the findings to this subgroup. Third, the research instrument may be subject to biases such as social desirability, recall errors, and reduced engagement due to its length. Moreover, the study did not assess additional factors that could influence behaviour, including barriers and facilitators of sun protection, beliefs about its benefits, and students' self-efficacy. Finally, the study was conducted in a single urban university in Peru, which may limit the generalizability of the results to rural settings or other cities with similar UV radiation levels.

Despite the limitations, this study used a validated

Fig. 3. Comparison of the percentage of correct responses to questions on sun protection knowledge.

The values above the brackets indicate *p*-values derived from Pearson's Chi-squared test with two-tailed asymptotic estimation. The statements are arranged by the percentage of correct answers. T indicates a correct answer as True, and F indicates a correct answer as False.

research instrument in Spanish, enabling comparability with similar studies. Moreover, by analysing differences across academic years within each group, it provides new insights into the development of sun protection capacities among medical and non-medical students.

In conclusion, medical students demonstrated greater knowledge and lower sun exposure compared to non-medical students, although no significant differences were observed in attitudes or protective behaviours. Among medical students, sun exposure and photoprotection behaviours varied across academic years, whereas no such variation was found among non-medical students. These findings reveal persistent gaps in awareness of the harmful effects of sun radiation on young adults' health and emphasize the need for strengthened photoprotection campaigns to standardize knowledge and practices across university programs.

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Conflict of Interest statement

The authors have no conflict of interests related to this study.

Authors' contributions

MC, PC, FF: Conceptualization, investigation, data curation, writing-original draft, writing-review and editing, approval of final version, and responsibility for the paper. FRR: Conceptualization, data curation, formal analysis, supervision, writing-original draft, writing-review and editing, approval of final version, and responsibility for the paper.

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