

Clinical Study

The use of sunscreen products among final year medicine and pharmacy students: A cross-sectional study of knowledge, attitude, practice, and perception

Ammar Ihsan Awadh¹, Shazia Jamshed¹, Ramadan M. Elkalmi¹, Hazrina Hadi²

¹Department of Pharmacy Practice, International Islamic University Malaysia, Pahang, Malaysia

²Department of Pharmaceutical Technology, International Islamic University Malaysia, Pahang, Malaysia

ABSTRACT

Objective: To evaluate the knowledge, attitude, perception, and practice of medical and pharmacy students toward the usage of sunscreen as protection for the skin against ultraviolet (UV) radiation.

Methods: This cross-sectional study was conducted among final year medical and pharmacy undergraduates at the International Islamic University Malaysia. Validated questionnaires were distributed to 134 medical students and 100 pharmacy students. Descriptive and inferential statistics were used where appropriate.

Findings: One hundred and sixty-one out of 234 participants completed the questionnaires. The participants comprised 101 medical students (75.4%) and sixty pharmacy students (60.0%). The majority of the respondents were females (102; 63.4%), and 59 (36.6%) were males. The median of the knowledge scores of the final year medical students was significantly lower than that of the final year pharmacy students ($P < 0.001$). The female students showed significantly higher knowledge scores than the male students ($P = 0.027$). This study reported that 24 (39.3%) pharmacy students were influenced by the media to use sunscreen, whereas 35 (34.7%) medical students were influenced the most by friends to use sunscreen. The final year pharmacy students had a better perception compared to the medical students, with the total perception score of the final year pharmacy students being significantly higher than that of the final year medical students ($P = 0.020$). Most of the participants were also aware of the harmful effects of UV radiation and had a positive reaction toward the usage of sunscreen to prevent those harmful effects.

Conclusion: The knowledge and perception of final year pharmacy students were significantly higher than the knowledge and perception of final year medical students with regard to the usage of sunscreen.

Keywords: Attitude; knowledge; perception; practice; sunscreen

Received: November 2015

Accepted: March 2016

Corresponding author:

Dr. Hazrina Hadi,

E-mail: hazrina@iium.edu.my

INTRODUCTION

Sunburn caused mainly by ultraviolet B (UVB) radiation (280–320 nm) is highly related to the induction of melanoma.^[1,2] Although, the relationship between

UVA and the cause of DNA damage need more investigation for stronger evidence, UVA (320–400 nm) has been proven to form cyclobutane pyrimidine dimers (CPDs), which induce mutation *in vivo*.^[3]

This is an open access article distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 3.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as the author is credited and the new creations are licensed under the identical terms.

For reprints contact: reprints@medknow.com

How to cite this article: Awadh AI, Jamshed S, Elkalmi RM, Hadi H. The use of sunscreen products among final year medicine and pharmacy students: A cross-sectional study of knowledge, attitude, practice, and perception. J Res Pharm Pract 2016;5:193-9.

Access this article online



Website: www.jrpp.net

DOI: 10.4103/2279-042X.185731

Direct DNA damage is caused mainly by UVB. The mechanism of UVA production of CPD differs from the formation of UVB-induced CPD, with lower rates of removal of the CPD formed by UVA compared to UVB irradiation. UVA radiation can be said to contribute to skin carcinogenesis by causing DNA damage to the skin, indicating that measures should be taken to protect the skin against UVA as well as UVB radiation to prevent skin carcinoma.^[4]

Sunscreen contains active ingredients that protect the skin from UV light penetration by absorbing and/or reflecting the UV light. The active ingredients vary from organic chemicals to mineral compounds. Sunscreen was first used following the discovery that salicylates reduce the effect of sunburn.^[5]

According to the National Hydraulic Research Institute of Malaysia, as cited by Al-Amin *et al.*,^[6] the increasing average surface temperature in Malaysia is very evident, and this will affect the routine of Malaysians. As for the International Islamic University Malaysia (IIUM) students, they are exposed to these harmful UV-rays while walking to classes and participating in outdoor activities. This study was aimed at exploring the actions of students in facing climate changes and the way they perform their routine in the midst of these changes. In addition, there are no established data on the knowledge and practice of sunscreen usage among health professionals in Malaysia. Hence, this study was expected to provide data on the usage of sunscreen among medical and pharmacy students in IIUM, Kuantan, which might trigger more studies on the knowledge and practice of sunscreen usage in Malaysia.

The objective of this study was to explore the knowledge, attitude, practice, and perception of medical and pharmacy students toward the usage of sunscreen.

METHODS

This cross-sectional study was conducted among undergraduate university students at the IIUM, Kuantan campus. The target group for the study was final year students from the Kulliyyah of Pharmacy (KOP) and the Kulliyyah of Medicine (KOM) during the 2013/2014 academic year.

The data for the research were gathered through a questionnaire. The questionnaire was developed based on the previous studies.^[7-10] The designed questionnaire contained 41 questions that were divided into five sections. The questionnaire was approved by the Research Ethics Committee of the Department of

Pharmacy Practice, the KOP, IIUM. The first section consisted of the demographic profile such as gender, Kulliyyah, and current Cumulative Grade Point Average. The other four sections were (1) knowledge regarding the usage of sunscreen, (2) attitude toward the usage of sunscreen, (3) practice of sunscreen usage, and (4) perception of the usage of sunscreen.

The face and content of the questionnaire were first validated by three experts in the field of pharmaceutical practice, whose comments and suggestions were taken into consideration, and the necessary changes were made accordingly. In order to ensure the reliability of the questionnaire, a pilot study was conducted among 12 students who were randomly selected from the target group, and these 12 students were excluded from the main study.

The questionnaires were distributed to 134 KOM and 100 KOP students. Thus, the total sample size was 234 students. The respondents for the research were selected at random from among the final year students of the KOP and KOM at the IIUM, Kuantan campus. The questionnaires were distributed at their respective lecture halls. All the participants were given an explanation about the purpose of the study and an assurance of confidentiality. The participants also gave their informed consent in writing, and they were assured that their participation in the study was voluntary and that they could withdraw at any time during the survey.

The data obtained were analyzed using the SPSS software version 21.0 for Windows (IBM Corp., Armonk, NY). The Mann-Whitney's analysis technique was used on the knowledge and perception parts of the questionnaire to obtain the relationship between the variables measured with a $P = 0.05$ being considered as significant. The frequencies, as well as the percentage, of the participants were recorded for all parts of the knowledge, attitude, perception, and practice sections. All the data were tabulated in their respective tables.

RESULTS

On completion of the pilot study, a reliability test was conducted using the SPSS version 21.0. From the results of the reliability test conducted on the ten questions designed to measure the perception toward the usage of sunscreen, the values of Cronbach's alpha for two questions were <0.7 . Thus, both these questions, which were considered as less reliable, had to be omitted in order to achieve a Cronbach's alpha value of more than 0.7 for all the questions.

Overall, 161 participants out of a total of 234 completed the questionnaire, with 101 of them being

medical students (75.4% response rate), and sixty of them being pharmacy students (60.0% response rate). For the KOM students, 64 (63.4%) were women, while 37 (36.6%) were men. Thirty-eight (63.3%) female and 22 (36.7%) male final year KOP students answered the questionnaire. The combined number of female participants ($n = 102$, 63.4%) from both Kulliyahs was higher compared to the male participants ($n = 59$, 36.6%), thus showing a higher participation of women in the study.

Table 1 shows the response frequencies of the participants with regard to their knowledge of sunscreen use. The median score for the final year medical students was significantly lower than that of the final year pharmacy students ($P < 0.001$). In addition, the female students showed significantly higher knowledge scores than the male students ($P = 0.027$). The highest correct response on knowledge was achieved for question 8(i), while the lowest correct response was obtained for question 11. Over 90% (KOM: $n = 93$, 92.1%; KOP: $n = 57$,

95%) of the participants from each Kulliyah knew that sunscreen should be applied when performing outdoor activities under the sun. Less than 10% of the participants from both the KOM and KOP, respectively, (KOM: $n = 9$, 8.9%; KOP: $n = 5$, 8.3%) answered correctly regarding the amount of sunscreen needed to cover an average adult's body.

The final year medical and pharmacy students' attitude toward the usage of sunscreen was measured by their response frequencies to three items, as presented in Table 2. This study reported that 24 (39.3%) of the pharmacy students had the highest influence from the media on the usage of sunscreen, whereas 35 (34.7%) of the medical students had the highest influence from friends on sunscreen use. The results showed that more than half of the final year pharmacy ($n = 46$, 75.4%) and medical ($n = 54$, 53.5%) students recommended the use of sunscreen to others. Finally, as future doctors/pharmacists, there were about 47 participants (77.0%) from the KOP and 58 participants (57.4%) from the KOM that would

Table 1: Pharmacy and Medicine final year students' knowledge on sunscreen use

Number	Question	Correct answer	
		Pharmacy	Medicine
1	Sunscreen is effective at preventing sunburn	50 (83.3)	79 (78.2)
2	Sunscreen is effective at enhancing a tan	38 (63.3)	36 (35.6)
3	Sunscreen is effective at preventing skin cancer	37 (61.7)	52 (51.5)
4	Sunscreen is effective at preventing signs of aging	35 (58.3)	28 (27.7)
5	Sunscreen is effective at reversing the signs of aging	40 (66.7)	52 (51.5)
6	Sunscreen provides better protection when the protection order is higher	47 (78.3)	63 (62.4)
7	Sunscreen is needed on a cloudy/rainy day	16 (26.7)	18 (17.8)
8	Sunscreen should be applied for the conditions listed below		
	a. Going for outdoor activities during sunny day	57 (95.0)	93 (92.1)
	b. Going for outdoor activities during cloudy day	25 (41.7)	32 (31.7)
	c. Swimming at the pool, beach, waterfall, etc.	45 (75.0)	71 (70.3)
	d. Attending lectures, attachments at the hospital, or other indoor activities	16 (26.7)	33 (32.7)
	e. Attending any occasions at night	55 (91.7)	83 (82.2)
9	Before going out on a sunny day, when should you apply sunscreen?	14 (23.3)	18 (17.8)
10	How often should you reapply sunscreen when you are outdoors?	15 (25.0)	43 (42.6)
11	For an adult, to cover the entire body with sunscreen, how much sunscreen do you think is needed?	5 (8.3)	9 (8.9)
12	What do you think SPF stands for?	26 (43.3)	37 (36.6)
13	Product A has an SPF of 30 while product B has SPF of 15. Which product is more effective as protection against UVB radiation?	43 (71.7)	65 (64.4)
14	Product A has an SPF of 15 while product B has SPF of 30. Which product is more effective as protection against UVA radiation?	11 (18.3)	8 (7.9)
15	Sunscreen provides better protection when the protection order is		
	a. Higher	49 (81.7)	68 (67.3)
	b. Lower		
	c. Don't know		
16	Which of these has more risk of causing skin cancer?		
	a. UVA	22 (36.7)	25 (24.8)
	b. UVB		
	c. Don't know		

Data are presented as number (%) of participants. UVA=Ultraviolet A, UVB=Ultraviolet B, SPF=Sun protection factor

not encourage parents to start applying sunscreen to babies <6 months old.

Table 3 shows the practice of sunscreen use among the respondents. The percentage of KOP students who were using sunscreen (47.5%) was higher compared to the medical students (36.6%). Among those that used sunscreen, most of them were occasional users, both for the pharmacy students ($n = 14$, 23%) and the medical students ($n = 21$, 20.8%). People tend to use sunscreen when they are highly exposed to sunlight. This was true for both groups, where both preferred to use sunscreen at the beach (pharmacy students: $n = 22$, 36.1%; medical students: $n = 26$, 35.7%) and while exercising (pharmacy students: $n = 19$, 31.1%; medical students: $n = 15$, 14.9%). Most of the sunscreen users among the pharmacy students applied sunscreen 30 min before exposure to sunlight ($n = 22$, 36.1%), while the medical students preferred to use sunscreen immediately before exposure to sunlight ($n = 24$, 23.8%). In answer to the part of the body that they apply sunscreen to, both groups chose to only apply the sunscreen on the exposed parts of the body, with $n = 16$ (26.2%) for pharmacy students and $n = 25$ (24.8%) for medical students. Furthermore, this study found that the majority of the respondents chose a sunscreen based on the sun protection factor (SPF) value, with 28 of the pharmacy students (45.9%) and 33 of the medical students (32.7%) doing so.

The vast majority of the KOP final year students knew that sunscreen is effective in preventing sunburn (83.3%), skin cancer (61.7%), and skin aging (58.3%) compared to the KOM students, where 78.2%, 51.5%, and 27.7% of whom answered correctly

Table 2: Attitude among final year Pharmacy and Medicine students towards the use of sunscreen

Questionnaire item	Pharmacy	Medicine
Influence to use sunscreen		
Family	2 (3.3)	11 (10.9)
Friends	16 (26.2)	35 (34.7)
Media	24 (39.3)	33 (32.7)
Health care professionals	21 (34.4)	20 (19.8)
Others	11 (18.0)	8 (7.9)
Recommend the usage of sunscreen to others		
Yes	46 (75.4)	54 (53.5)
No	9 (14.8)	16 (15.8)
Others	5 (8.2)	33 (32.7)
Encourage parents to start applying sunscreen to their <6 months old baby		
Yes	2 (3.3)	10 (9.9)
No	47 (77.0)	58 (57.4)
Others	11 (18.0)	32 (31.7)

Data are presented as number (%) of participants

to the knowledge question numbers 1, 2, and 3, respectively.

Among the respondents who did not use sunscreen, 16 pharmacy students (26.2%) and thirty medical students (29.7%) thought it was unnecessary to do so.

Table 3: Practice of sunscreen usage among final year Pharmacy and Medicine students

Questionnaire item	Pharmacy	Medicine
Do you use sunscreen?		
Yes	29 (47.5)	37 (36.6)
No	30 (49.2)	59 (58.4)
How frequent do you use sunscreen?		
Every 2 h	1 (1.6)	0 (0)
Every 4 h	1 (1.6)	1 (1.0)
Once a day	10 (16.4)	11 (10.9)
Every morning and evening	6 (9.8)	6 (5.9)
Occasionally	14 (23)	21 (20.8)
Which activity would need you to apply sunscreen?		
Exercise	19 (31.1)	15 (14.9)
Shopping	8 (13.1)	4 (4.0)
Attending lectures	8 (13.1)	4 (4.0)
At the beach	22 (36.1)	26 (25.7)
Others	6 (9.8)	3 (3.0)
When do you apply the sunscreen?		
Immediately before exposure to sunlight	8 (13.1)	24 (23.8)
30 min before exposure to sunlight	22 (36.1)	14 (13.9)
1 h before exposure to sunlight	1 (1.6)	1 (1.0)
2 h before exposure to sunlight	2 (3.3)	0 (0)
How do you apply the sunscreen?		
On the whole body	2 (3.3)	0 (0)
On the face only	13 (21.3)	15 (14.9)
On the hands only	4 (6.6)	2 (2.0)
On the exposed part only	16 (26.2)	25 (24.8)
You would choose your sunscreen based on		
Type of skin	8 (13.1)	3 (3.0)
SPF value	28 (45.9)	33 (32.7)
Price	3 (4.9)	6 (5.9)
Brand	4 (6.6)	5 (5.0)
What make/makes you not want to use sunscreen?		
Oily	8 (13.1)	19 (18.8)
Not effective for the skin	2 (3.3)	1 (1.0)
Allergic	2 (3.3)	4 (4.0)
Costly	6 (9.8)	17 (16.8)
Not necessary	16 (26.2)	30 (29.7)
How do you protect your skin from sunlight?		
Using moisturizer/lotion/powder	11 (18.0)	17 (16.8)
Wearing hat/cap/umbrella	10 (16.4)	24 (23.8)
No protection at all	15 (24.6)	26 (25.7)
Others	0 (0%)	0 (0)
Do people around you use sunscreen?		
Yes	15 (24.6)	28 (27.7)
No	6 (9.8)	16 (15.8)
Don't know	15 (24.6)	25 (24.8)

Data are presented as number (%) of participants. SPF=Sun protection factor

In addition, most of the nonusers of sunscreen, either from among the pharmacy students ($n = 15$, 24.6%) or the medical students ($n = 26$, 25.7%) did not use any kind of protection from sunlight. However, some of the medical students chose to wear a cap, hat, or use an umbrella ($n = 24$, 23.8%) for protection from sunlight. Other than that, the study also discovered that the use of sunscreen by the people around the participants did not influence the participants to use sunscreen. The frequency of people around the pharmacy students that used sunscreen was 15 (24.6%), and this was almost equally as low as the percentage for the medical students ($n = 28$; 27.7%).

The responses of the pharmacy and medical students to the eight items on perception in the questionnaire are presented in Table 4. It was reported that 57 (95%) pharmacy students strongly agreed or agreed that the application of sunscreen is necessary to avoid the harmful effects of exposure to sunlight. On the other hand, eighty (79.2%) medical students strongly agreed or agreed that the application of sunscreen is necessary to avoid the harmful effects of exposure to sunlight.

The study showed that there was a significant difference in the total perception score ($P = 0.020$), where the pharmacy students had a more positive perception than the medical students.

Meanwhile, among the pharmacy and medical students, the perception scores were significantly different based on gender, where the female students had higher perception scores compared to the male students, with a $P = 0.002$.

DISCUSSION

On assessment of the knowledge of the students concerning the usage of sunscreen, almost all the answers by the KOP final year students had a higher percentage of correct answers compared to the KOM final year students. This shows that there was a significant difference between the knowledge of the KOP and the KOM final year students ($P < 0.001$). This was correlated with the fact that the former had been exposed to information about sunscreen during their second year of study under the subject nutraceuticals and cosmeceuticals,^[11] while the latter did not have a particular subject on sunscreen. This was also confirmed by the evidence from the results of the knowledge scores, as the KOP final year students had a median score of 11, while the KOM final year students only had a median score of nine out of twenty points.

There was a significant difference in knowledge between the male and female students. This might have been because women are more concerned about the usage of sunscreen and tend to use it more regularly than men.

Based on the research, most of the students did not know the correct time to apply sunscreen before going out on a sunny day. The correct time that is needed to apply sunscreen before going out is about 30 min. According to the results that were obtained, 80.1% of the participants answered incorrectly, and only 19.9% of the combined total of both KOP and KOM participants managed to give the correct

Table 4: Final year Pharmacy and Medicine students' perception towards the usage of sunscreen

Statement	Strongly agree		Agree		Neither agree nor disagree		Disagree		Strongly disagree	
	P	M	P	M	P	M	P	M	P	M
It is necessary to use sunscreen to avoid the harmful effects of sun exposure	28 (46.7)	29 (28.7)	29 (48.3)	51 (50.5)	2 (3.3)	20 (19.8)	1 (1.7)	1 (1)	0 (0)	0 (0)
Applying sunscreen is the most effective way to protect the skin from ultraviolet light	11 (18.3)	22 (21.8)	33 (55)	43 (42.6)	10 (16.7)	31 (30.7)	5 (8.3)	4 (4)	1 (1.7)	1 (1)
Protective clothing is enough to give secure protection from light	3 (5)	10 (9.9)	21 (35)	45 (44.6)	13 (21.7)	28 (27.7)	22 (36.7)	15 (14.9)	1 (1.7)	3 (3)
Sunscreen is one of the must-have skin care products	18 (30)	13 (12.9)	19 (31.7)	28 (27.7)	12 (20)	43 (42.6)	8 (13.3)	17 (16.8)	3 (5)	0 (0)
Sunscreen should be part of the daily skin care routine	14 (23.3)	10 (9.9)	22 (36.7)	34 (33.7)	12 (20)	36 (35.6)	9 (15)	20 (19.8)	3 (5)	1 (1)
Applying sunscreen would make me feel confident	7 (11.7)	5 (5)	15 (25)	21 (20.8)	17 (28.3)	36 (35.6)	17 (28.3)	35 (34.7)	4 (6.7)	4 (4)
Applying sunscreen would make me feel happy	5 (8.3)	4 (4)	15 (25)	14 (13.9)	13 (21.7)	44 (43.6)	16 (26.7)	26 (25.7)	11 (18.3)	13 (12.9)
Skin would have enough protection if one SPF containing product is applied	1 (1.7)	3 (3)	14 (23.3)	29 (28.7)	27 (45)	51 (50.5)	17 (28.3)	13 (12.9)	1 (1.7)	5 (5)

Data are presented as number (%) of participants. P=Pharmacy, M=Medicine, SPF=Sun protection factor

answer. Majority of the KOP final year students knew that sunscreen is effective in preventing sunburn, skin cancer, and skin aging compared to the KOM students. This was possibly due to the effect of the academic exposure of the KOP students, which influenced their sunscreen knowledge.

Next, the correct responses to the questions about specific sunscreen-related knowledge displayed a very low percentage. Regarding the application of sunscreen before going outside, only 17.8% and 23.3% for KOM and KOP students, respectively, managed to answer correctly. This low correct response rate was parallel to that of other studies by Wang and Dusza^[7] in New Jersey and Al-Mutairi *et al.*^[12] in Kuwait. For optimum protection from UV radiation from the sun, a person must apply sunscreen at least 30 min before going outdoors. The consequence of not following the proper guidelines may reduce the efficiency of the application of the sunscreen.^[13] A low correct answer rate was also obtained for question 11, as only 8.9% and 8.3% of the KOM and KOP students, respectively, knew the correct answer about covering the entire body with sunscreen. This information is paramount for a person to achieve the desired protection level, as stated on the product label.^[7]

Furthermore, most of the respondents in this study chose their sunscreen based on the SPF value. However, less than half of the students from both the KOM (36.6%) and KOP (43.3%) managed to give the actual meaning of SPF, which stands for "SPF." A similar finding was also reported by Wang and Dusza.^[7] However, in a study by Cheng *et al.*^[14] conducted among the Chinese population in Beijing, 61.2% of respondents were informed of the meaning of SPF. Most of the students also correctly answered that a higher SPF value will give more protection. However, this did not indicate that the students understood the relationship between SPF and UVA/UVB, as shown by their answers to questions 13 and 14. For UVB protection, most of the students believed in the use of products with a higher SPF value, while for UVA protection, the students were unaware that there was not enough information on which higher SPF value products were effective. This meant that the students were unable to differentiate and recognize between the protection against UVA and UVB radiation.

For the attitude section, the results obtained from the final year pharmacy students showed that the media had the largest influence on sunscreen usage (39.3%). A study conducted on sunscreen exposure showed that the media was a source of information on sunscreen usage, and thus they had an effect on the attitude of the pharmacy students.^[15] However, for

the medical students, the largest influence came from friends, with 34.7%. In a large Norwegian sample, the use of sunscreen in adolescents was strongly affected by the use of sunscreen by their peers.^[16]

There was a high possibility of the medical and pharmacy students recommending the use of sunscreen to other people, with over half of the sample opting to do so. The many benefits of sunscreen use on the health of an individual, in particular the health of the skin, influenced them to do so.

About 77% of the KOP and 57.4% the KOM final year students would not encourage parents to use sunscreen on babies <6 months old. The students perhaps had the same subconscious view that the use of unknown medications or pharmaceutical substances, especially on infants, should be avoided.

For the practice section, a study conducted by Turrisi *et al.*^[8] showed that a strong relationship exists between the behavior of individuals toward the usage of sunscreen and the efficacy of sunscreen use. According to the results, the pharmacy students were higher users of sunscreen compared to the medical students (47.5% and 36.6%, respectively). This could be because the pharmacy students had been taught about sunscreen in their syllabus, while the medical students had not been taught this topic. This point is related to the level of education associated with a better knowledge, which then leads to a better attitude and behavior toward the usage of sunscreen.^[17]

According to Barrattj *et al.*,^[10] SPF is a measure of the effectiveness of sunscreen in preventing UVB rays from reaching the skin. Based on the results, 45.9% and 32.7% of the pharmacy and medical students, respectively, chose a sunscreen based on its SPF value as they believed that a higher SPF value gave greater protection, especially for long exposure times.

In the last section, the perception scores of the pharmacy students were significantly higher, and the female students of both Kulliyahs had significantly higher scores than the male students. The majority of the students from both the KOM and KOP strongly agreed and agreed that the usage of sunscreen was necessary to avoid the adverse effects of sun exposure and to protect the skin from UV light [Table 4]. This showed that the students had a positive reaction toward the usage of sunscreen and were aware of the importance of using sunscreen as a preventive measure against UV radiation. This finding was consistent with those of other studies.^[9,18] According to Thompson *et al.*,^[18] the development of solar keratosis can be prevented with the regular use of sunscreen, and the risk of skin cancer can be reduced in the long-term. A study conducted by Al-Naggar *et al.*^[9] found that the

majority of the respondents said that sunscreen was the best alternative for preventing the risk of skin cancer.

Furthermore, most of the medical students (54.5%) who participated strongly agreed or agreed that protective clothing was enough to give secure protection from sunlight. However, less than half of the pharmacy students strongly agreed or agreed with the statement. According to Diaz *et al.*,^[19] the skin can be protected from the sun by wearing protective clothing, wearing a hat, and avoiding the sun as primary prevention against sun exposure.

AUTHORS' CONTRIBUTION

The research was designed by AA and HH. SJ and RE developed and validated the questionnaire. Data collection was done by AA and HH. Statistical analysis was carried by AA. All authors have read and approved the final manuscript.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

- Noonan FP, Recio JA, Takayama H, Duray P, Anver MR, Rush WL, *et al.* Neonatal sunburn and melanoma in mice. *Nature* 2001;413:271-2.
- Veierød MB, Weiderpass E, Thörn M, Hansson J, Lund E, Armstrong B, *et al.* A prospective study of pigmentation, sun exposure, and risk of cutaneous malignant melanoma in women. *J Natl Cancer Inst* 2003;95:1530-8.
- Ikehata H, Ono T. The mechanisms of UV mutagenesis. *J Radiat Res* 2011;52:115-25.
- Mouret S, Baudouin C, Charveron M, Favier A, Cadet J, Douki T. Cyclobutane pyrimidine dimers are predominant DNA lesions in whole human skin exposed to UVA radiation. *Proc Natl Acad Sci U S A* 2006;103:13765-70.
- Murphy GM. Sunblocks: Mechanisms of action. *Photodermatol Photoimmunol Photomed* 1999;15:34-6.
- Al-Amin AQ, Jaafar AH, Azam MN, Kari F, Agil SO. Climate change issues and Malaysian initiatives. In: *Climate Change Governance*. Berlin, Heidelberg: Springer; 2013. p. 141-51.
- Wang SQ, Dusza SW. Assessment of sunscreen knowledge: A pilot survey. *Br J Dermatol* 2009;161 Suppl 3:28-32.
- Turrisi R, Hillhouse J, Gebert C, Grimes J. Examination of cognitive variables relevant to sunscreen use. *J Behav Med* 1999;22:493-509.
- Al-Naggar RA, Al-Naggar TH, Bobryshev YV. Perceptions and opinions towards skin cancer prevention in Malaysia: A qualitative approach. *Asian Pac J Cancer Prev* 2011;12:995-9.
- Barrattj A, Davies C, Jenkins M, Lewis I, West Rh W. The effect of behaviour and beliefs on the effective use of sunscreen. *J Environ Health Res* 2010;10:65.
- International Islamic University Malaysia I. Kuliyyah of Pharmacy, Course Structure, Elective Courses, Year 2 Semester 2nd. Available from: <http://www.iiu.edu.my/pharmacy/programmes-courses/undergraduate/bachelor-pharmacy/course-structure/elective-course>. [Last accessed on 2014 Jan 14].
- Al-Mutairi N, Issa BI, Nair V. Photoprotection and Vitamin D status: A study on awareness, knowledge and attitude towards sun protection in general population from Kuwait, and its relation with Vitamin D levels. *Indian J Dermatol Venereol Leprol* 2012;78:342-9.
- Faurschou A, Wulf HC. The relation between sun protection factor and amount of sunscreen applied *in vivo*. *Br J Dermatol* 2007;156:716-9.
- Cheng S, Lian S, Hao Y, Kang N, Li S, Nie Y, *et al.* Sun-exposure knowledge and protection behavior in a North Chinese population: A questionnaire-based study. *Photodermatol Photoimmunol Photomed* 2010;26:177-81.
- Robinson JK, Rademaker AW, Sylvester JA, Cook B. Summer sun exposure: Knowledge, attitudes, and behaviors of Midwest adolescents. *Prev Med* 1997;26:364-72.
- Wichstrøm L. Predictors of Norwegian adolescents' sunbathing and use of sunscreen. *Health Psychol* 1994;13:412-20.
- Ramezanpour A, Ali N, Rad SG. Knowledge, attitude and behavior (practice) toward sunscreen use among hospital personnel in comparison with laypeople in Zanjan, Iran. *World Appl Sci J* 2013;22:683-89.
- Thompson SC, Jolley D, Marks R. Reduction of solar keratoses by regular sunscreen use. *N Engl J Med* 1993;329:1147-51.
- Diaz A, Neale RE, Kimlin MG, Jones L, Janda M. The children and sunscreen study: A crossover trial investigating children's sunscreen application thickness and the influence of age and dispenser type. *Arch Dermatol* 2012;148:606-12.