Knowledge, Attitude, and Practice toward Skin Cancer Prevention and Detection among Jordanian Medical Students: A Cross-Sectional Study

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Introduction. Skin cancer is one of the most growing types of cancer, especially in the Mediterranean, even though it is a preventable disease. The purpose of this study is to assess medical students’ knowledge, attitude, and practice about skin cancer prevention and detection. Methods. A cross-sectional study was conducted using a validated structured questionnaire covering the areas of knowledge, attitude, and practice of the study participants. Results. The study involved 1530 students; 55.3% were females. Most of the students possessed proper knowledge about skin cancer (81%). The most prevalent skin cancer risk factors were sun exposure during the day (83.5%) and immunosuppression (71.2%). More than half of the students did not have any habits of skin examination (61.5%). 20% of the students never used sunscreen, while only 20% of them avoided sun exposure during day hours. Conclusion. The general level of the medical students’ knowledge of skin cancer and its risk factors appeared to be higher than what is found in other studies; it is reasonable as the study participants were medical students. However, the protective behavior from the sun was inadequate when compared to the level of knowledge reported. Additional education about the behavior toward sun exposure and protection against skin cancer may be needed to be implemented in the dermatology curriculum.

1. Introduction

Skin cancer is the most common cancer in the United States, with an estimated lifetime risk of 1 in every two people [1, 2]. The two most common types of skin cancer are basal cell carcinoma and squamous cell carcinoma, respectively, while malignant melanoma is less common, with an incidence of 1 in every 40 [3, 4]. However, despite the lower prevalence, malignant melanoma remains the most common cause of skin-related cancer [3, 5]. In the United States, it is estimated that skin cancer’s average annual economic cost is $8.1 billion, with a dramatic rise in the total cost compared with other cancers [6].

Research has shown that the average annual cost of skin cancer from 2002–2006 to 2007–2011 increased by 126.2%, and the average annual cost of all other cancers increased by 25.1% [6]. Hence, the importance of interventions and strategies that aim to reduce the health and economic burden of skin cancer. One such strategy is improving patient health education that promotes sun-protective behaviors. Primary sun-protective behaviors involve the reduction of natural and artificial UV light exposure, the application of sunscreen with a good sun protection factor (SPF), wearing hats with adequate protection to the entire head, along with tightly woven clothing that covers the arms, torso, and legs [7]. At the same time, secondary sun-protective behaviors include the regular conduct of self-skin and total body skin examinations by physicians [4]. Reports suggest that avoidance of exposure to natural and artificial UV light could prevent more than 5 million cases of skin cancer annually in the United States [7].
cancer yearly [8], and daily application of a sunscreen with SPF 15 or more could decrease the risk of squamous cell carcinoma by 40% and melanoma by 50% [9].

Researchers worldwide have continuously tried to address the problem behind the rising incidence of skin cancer, and many environmental and genetic causes have been discovered [10].

A study with nursing students revealed that only 8% of students performed the sun-protection recommendations, and this was the least correctly performed activity [11]. Accordingly, training the students in the medical-related fields, mainly those directed towards primary care, about the importance of sun-protective behaviors is crucial to decreasing skin cancer incidence. Primary care physicians possess more chances to conduct skin examinations and educate patients on sun-protective behaviors [12]; recent reports pointed out the importance of health education of medical students about the effect of sun exposure on human health [13–16].

The purpose of this study is to assess medical students’ knowledge, attitude, and practice about skin cancer prevention and detection.

2. Methodology

This descriptive cross-sectional survey-based study was conducted in Jordanian medical schools between July and October 2021. The survey was conducted using a validated structured questionnaire developed by researchers with help from the literature review of similar published studies to cover critical areas. Moreover, the survey was validated by three experts from the departments of dermatology, general surgery, and public health at the same affiliated university, Yarmouk University, Faculty of Medicine. We have included the questionnaire in the revised manuscript.

The questionnaire consisted of 51 questions categorized to cover all survey targets. The first six questions were about the student’s demographic data; the following 19 questions were meant to test the knowledge of the students about the risk factors of skin cancer in general, adding 26 questions about the impact of sun exposure on the skin and the behaviors of participants toward sun protection and early skin cancer signs. Participation in the study was voluntary, and consent was taken from each participant after explaining the purpose of the research. All medical students from all Jordanian medical schools who gave consent to participate in this study were included. The study was approved by the institutional board review at Yarmouk University, number RD/119/12/1870.

A structured online Google form was created to aid in data collection as a study tool. The online survey link was distributed through social media platforms, through universities’ representatives, and universities’ official emails. After that, data were collected and organized into an Excel document then imported to The Statistical Package for Social Sciences (SPSS) version 25, where coding and data analysis were performed. Descriptive statistical methods were used to evaluate the data using mean ± SD for continuous variables and frequencies and percentages for categorical variables. Inferential statistics in the form of a Chi-Square test were done to evaluate the significance of the association between participants’ gender and knowledge about skin cancer. P values of less than 0.05 were considered to be statistically significant.

3. Results

A total of 1530 subjects were recruited for the study, representing around 10% of the entire student population at the time of the study. Females constituted 55.3% of the study participants (846), while 684 males were selected. The majority of the study population was found within the age group 20–23 (67.5%). The study involved participants from the first year to the sixth year, with the fifth-year students representing the majority (28.1%). Most of the students (44.4%) scored very good degrees as their average academic rank, followed by excellent (32%), good (22.5), and weak (1%). Table 1.

Regarding their knowledge about skin cancer, most of the students have encountered a family history of skin cancer (97.9%), and the majority of them considered themselves to possess proper knowledge (81%). At the same time, the same percentage selected medical school as their source of information regarding skin cancer. About 46.9% of the participants correctly identified basal cell carcinoma as the most common type of skin cancer. The majority of them identified melanoma characteristics as a mole with an asymmetrical border (63%), while more than half of the students selected it as changes in color (59.9%). Table 2.

When testing the general knowledge about the risk factors of the disease, most of the participants (83.5%) acknowledged going out during the hours of 10 am to 4 pm without sun protection as a risk factor for the disease. More than half (58.7) considered the effect of smoking and alcohol in increasing the risk. Having fair skin was a risk in the opinion of 64%, and exposure to ultraviolet radiation was identified by 95.2% of the participants as a risk. More than half (59.5%, 57.8%, and 57.4%) considered having lots of nevi, freckles, and moles in the body, tanning, and acquiring painful sunburn before 20 years old to be risk factors, respectively. Immunosuppressive agents were a risk in the responses of 71.2%, while those not using sunscreens were correctly identified by 63%. Other responses to general knowledge and risk factors are shown in Table 3.

Regarding the attitude toward the disease, most of the study subjects (61.5%) claimed that they did not have any habit of doing a self-skin examination. Most of those who did not perform a self-skin examination (91%) had never even thought of it, among the others who usually perform self-skin examinations. Most of them do the exam to look for new lesions (72%), and early skin cancer detection (53.7%). Half of the participants learned about skin self-examination from medical courses and lectures; others heard it from social media (28.9%) and dermatologists (19.4%). The rest of the attitude responses are shown in Table 4.

Only 20.3% stated that they always avoid the sun from 10 am to 4 pm, while only 9.4% and 19.1% wear hats or sunglasses when going out, respectively. Other responses to practice questions are demonstrated in Table 5.
No statistically significant association between study variables has been found.

4. Discussion

Skin cancer is among the most prevalent skin cancers worldwide and is a growing health concern in the Mediterranean region. Generally, cancers constitute the second most common cause of death, outnumbered only by cardiovascular diseases [17]. Since skin cancer can be prevented, given that many risk factors have been identified, the WHO has implemented strategies to control skin cancer by raising people’s knowledge about skin cancer through health education [17], improving attitudes and performance. However, Romero-Collado A et al., who conducted their study among primary care nurses in Spain, found that only 11 out of 137 nursing students (8.0%) performed sun protection recommendations. This was the least activity performed and reflects poor skills in health prevention according to skin cancer [11]. This highlights an additional point about the importance of health education about skin cancer: it is reasonable to work on improving primary and secondary prevention rather than the management of the disease, which, as an example, costs more than 400 million dollars every year in Australia [18].

The statistical analysis showed that the level of knowledge about skin cancer and its risk factors is generally reasonable. Nearly half of our participants correctly identified basal cell carcinoma as the most common type of skin cancer. A similar study among medical students showed a better percentage (67.8%) [19]. Third of the participants correctly disagreed about the fact that tanning salons offer a safer alternative to tanning outdoor, although less than what is found by Ivanov (98.3%), while only 20% agreed that having many moles increased the risk of having skin cancer, again the percentage is high compared to the American study (71.9%) [19].

Sun exposure is a risk factor for skin cancer, especially in a region with rich sunlight like Jordan. The participants in the current study showed a considerable variability when asked about the risk factors that could lead to the occurrence of skin cancer, and most of them agreed that genetic factors play a role (93.3%), a higher level than the study conducted in Italy (44.3%). However, it is worth mentioning that it was done in secondary school rather than medical students, where proper knowledge about the disease might have already been conducted [20]. In addition, sun exposure during the day with high sunrays within protection was also a popular risk factor (83.5%), slightly higher than a study done in Saudi Arabia where 77% agreed [21].

More than half of the students stated that they did not have the habit of doing skin examinations, which is an unsatisfactory result given that the population under study was medical students. A similar issue was found among nurse practitioners, as only 22% feel confident in performing skin examinations on their patients, and 67% of them feel less confident in counseling their patients about it [10].

Regarding the practice of our study participants, it was average and unsatisfactory at some points. It is well known that ultraviolet radiation, particularly that of the wavelength 290–320 nm, is a risk factor for skin cancer due to its DNA-damaging and immunosuppressive effects [22]. Although the association between UV light exposure and skin cancer was highly reported by our study participants (95.2%), the results showed that only 20% of the students respected the time restrictions and avoided the sun during the day where maximum radiation levels are present.

Although 39.3% of them always use sunscreen, which is surprisingly lower compared to a similar study by MahmoudAbad, as 60% of the students under the study used sunscreen and lower than the 73% found in the Martin study and Suppa (78.7%) [20, 23]. Although a higher level of
practice was identified, there was still an area of ignorance toward sun exposure as a risk factor. In addition, the same percentage was found in a similar study among medical students in the USA [19]. As sun exposure is one of the risk factors of skin cancer, wearing long pants and long-sleeved clothes can be protective; this method of protection was utilized by 47.3% of the students, which is higher than the Italian study where only 7% of the participants used protective clothes [20].

In our study, the general knowledge and attitude toward skin cancer were generally good, given that the participants were medical students; their level of knowledge about the disease may already be good, and the sources of information were the most reliable ones. Conversely, the results of a similar study conducted among other students from different fields, including medical students, showed that the level of knowledge and attitude among the nonmedical students was lower than that of medical students [17].

### Table 2: General knowledge of participants about skin cancer mainly melanoma.

| Gender | Female | Male | Total | \( p (\chi^2) \) |
|--------|--------|------|-------|----------------|
|        | \( N \) | \( N \ (%) \) | \( N \) | \( N \ (%) \) |              |
| **Do you have knowledge about skin cancer** |        |       |       |               |
| No     | 138    | 16.3 | 152   | 22.2 | 290           | 19.0 | 0.003* (8.6) |
| Yes    | 708    | 83.7 | 532   | 77.8 | 1240          | 81.0 |
| Books  | 186    | 24.0 | 230   | 36.9 | 416           | 29.8 | <0.001* (38.9) |
| Medical school | 626 | 80.9 | 506   | 81.1 | 1132 | 81.0 |
| Course outside medical school | 36 | 4.7 | 36 | 5.8 | 72 | 5.2 |
| Health professional | 120 | 15.5 | 108 | 17.3 | 228 | 16.3 |
| Friend/relative | 31 | 4.0 | 33 | 5.3 | 64 | 4.6 |
| Internet | 294 | 38.0 | 264 | 42.3 | 558 | 39.9 |
| Media  | 150    | 19.4 | 90    | 14.4 | 240           | 17.2 |
| Angiosarcoma | 2 | 0.2 | 12 | 1.8 | 14 | 0.9 |
| Basal cell carcinoma | 408 | 48.2 | 310 | 45.3 | 718 | 46.9 |
| Melanoma | 148 | 17.5 | 114 | 16.7 | 262 | 17.1 |
| Squamous cell carcinoma | 158 | 18.7 | 160 | 23.4 | 318 | 20.8 |
| T Cell lymphoma | 10 | 1.2 | 2 | 0.3 | 12 | 0.8 |
| Don’t know | 120 | 14.2 | 86 | 12.6 | 206 | 13.5 |

| What is your major source of information about skin cancer |        |       |       |               |
|----------------------------------------------------------|--------|------|-------|----------------|
| Books | 186 | 24.0 | 230 | 36.9 | 416 | 29.8 | 0.002* (18.9) |
| Medical school | 626 | 80.9 | 506 | 81.1 | 1132 | 81.0 |
| Course outside medical school | 36 | 4.7 | 36 | 5.8 | 72 | 5.2 |
| Health professional | 120 | 15.5 | 108 | 17.3 | 228 | 16.3 |
| Friend/relative | 31 | 4.0 | 33 | 5.3 | 64 | 4.6 |
| Internet | 294 | 38.0 | 264 | 42.3 | 558 | 39.9 |
| Media  | 150    | 19.4 | 90    | 14.4 | 240           | 17.2 |
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| Melanoma | 148 | 17.5 | 114 | 16.7 | 262 | 17.1 |
| Squamous cell carcinoma | 158 | 18.7 | 160 | 23.4 | 318 | 20.8 |
| T Cell lymphoma | 10 | 1.2 | 2 | 0.3 | 12 | 0.8 |
| Don’t know | 120 | 14.2 | 86 | 12.6 | 206 | 13.5 |

| How many moles (melanocytic nevi) does the average person have? | 5 | 88 | 23.5 | 60 | 23.6 | 148 | 23.6 | 0.003* (16.1) |
|-------------------------------------------------------------|---|---|------|---|------|-----|-------|----------------|
| 10 | 88 | 23.5 | 90 | 35.4 | 178 | 28.3 |
| 25 | 142 | 38.0 | 76 | 29.9 | 218 | 34.7 |
| 50 | 50 | 13.4 | 20 | 7.9 | 70 | 11.1 |
| 100 | 6 | 1.6 | 8 | 3.1 | 14 | 2.2 |

| What is the most common melanoma location? | 146 | 17.3 | 126 | 18.4 | 272 | 17.8 | 0.025* (14.4) |
|-------------------------------------------|---|------|-----|-------|-----|-------|----------------|
| Head | 42 | 5.0 | 44 | 6.4 | 86 | 5.6 |
| Palm and sole | 201 | 23.8 | 140 | 20.5 | 341 | 22.3 |
| Trunk | 60 | 7.1 | 34 | 5.0 | 94 | 6.1 |
| Legs | 22 | 2.6 | 34 | 5.0 | 56 | 3.7 |
| Mucosa | 84 | 9.9 | 84 | 12.3 | 168 | 11.0 |
| Arms | 290 | 34.3 | 222 | 32.5 | 512 | 33.5 |

| Change of color/several colors | 554 | 65.5 | 362 | 52.9 | 916 | 59.9 | <0.001* (44.8) |
|--------------------------------|---|------|-----|-------|-----|-------|----------------|
| Wound that does not heal | 128 | 15.1 | 74 | 10.8 | 202 | 13.2 |
| Mole with asymmetric borders | 562 | 66.4 | 402 | 58.8 | 964 | 63.0 |
| Pigmented lesion | 552 | 65.2 | 420 | 61.4 | 972 | 63.5 |
| Don’t know | 154 | 18.2 | 144 | 21.1 | 298 | 19.5 |

| What are the melanoma characteristics |        |       |       |               |
|---------------------------------------|--------|------|-------|----------------|
| Change of color/several colors | 554 | 65.5 | 362 | 52.9 | 916 | 59.9 | <0.001* (44.8) |
| Wound that does not heal | 128 | 15.1 | 74 | 10.8 | 202 | 13.2 |
| Mole with asymmetric borders | 562 | 66.4 | 402 | 58.8 | 964 | 63.0 |
| Pigmented lesion | 552 | 65.2 | 420 | 61.4 | 972 | 63.5 |
| Don’t know | 154 | 18.2 | 144 | 21.1 | 298 | 19.5 |
Table 3: General knowledge about risk factors for skin cancer.

|                                    | Disagree | Don't know/neutral | Agree |
|------------------------------------|----------|--------------------|-------|
| Going out during the hours of 10.00 am to 4.00 pm without sun protection | 98 6.4%  | 154 10.1%  | 1278 83.5% |
| Smoking/alcohol use                 | 328 21.4%| 304 19.9%  | 898 58.7%  |
| Having fair skin                    | 224 14.6%| 318 20.8%  | 988 64.6%  |
| Exposure to ultraviolet radiation  | 38 2.5%  | 36 2.4%     | 1456 95.2% |
| Lots of nevus, freckles, and moles on the body | 294 19.2%  | 326 21.3%  | 910 59.5%  |
| Having never tanning skin type      | 604 39.5%| 526 34.4%  | 400 26.1%  |
| Solarium/tanning salons             | 208 13.6%| 438 28.6%  | 884 57.8%  |
| Having light-colored eyes           | 626 40.9%| 424 27.7%  | 480 31.4%  |
| Having red or blonde hair           | 614 40.1%| 418 27.3%  | 498 32.5%  |
| Having sun burns which are painful and bubbly before 20 years of age | 300 19.6%| 352 23.0%  | 878 57.4%  |
| Exposure to petroleum, coal, or arsenic | 162 10.6%  | 302 19.7%  | 1066 69.7% |
| Family history of skin cancer       | 58 3.8%  | 44 2.9%     | 1428 93.3% |
| Taking immunosuppressive treatment | 150 9.8%  | 990 19.0%  | 1099 71.2% |
| Not using sunscreen                 | 174 11.4%| 392 25.6%  | 964 63.0%  |
| You are adequately protected from UV rays with thin cloud cover | 588 38.4%| 362 23.7%  | 580 37.9%  |
| Tanning salons offer a safe alternative to sun tanning outdoors | 598 39.1%| 598 39.1%  | 334 21.8%  |
| People with many moles are at an increased risk of developing melanoma | 292 19.1%| 300 19.6%  | 938 61.3%  |
| Wet clothing offers less protection against the sun than dry clothing | 452 29.5%| 746 48.8%  | 332 21.7%  |
| When you are swimming in a pool, the part underwater is protected from the sun since water reflects most of the UV light | 426 27.8%| 492 32.2%  | 612 40.0%  |
| Using self-tanning lotions or cream is an effective method for sun protection | 542 35.4%| 390 25.5%  | 598 39.1%  |
| The ozone layer filters most of the ultraviolet type B but little of the A type | 144 9.4%  | 734 48.0%  | 652 42.6%  |
| A suntan offers adequate protection to prevent sunburn | 556 36.3%| 524 34.2%  | 450 29.4%  |
| Chemical sunscreens give optimal protection as soon as they contact the skin | 534 34.9%| 396 25.9%  | 600 39.2%  |
| Sunblock SPF mean (sun protective factor) | 82 5.4%  | 430 28.1%  | 1018 66.5% |

Table 4: Attitudes toward skin self-examination.

|                                    | N  %     |
|------------------------------------|----------|
| Your attitude toward skin protective behaviors and self-skin exam: do you have the habit of doing the skin self-examination? |         |
| No                                  | 942 100% |
| Yes                                 | 588 100% |
| I have learned about it but being scared of finding something | 46 100% |
| It is not necessary                 | 38 100% |
| Never thought about it              | 858 100% |
| What do you look for in the skin self-examination |         |
| Changing mole                       | 406 69.0%|
| New mole                            | 350 59.5%|
| Nodule                              | 272 46.3%|
| New lesion                          | 426 72.4%|
| Reasons for performing skin self-examination |         |
| Early detection of skin cancer      | 316 53.7%|
| Fear of skin cancer                 | 184 31.3%|
| Friend/relative had skin cancer     | 68 11.6% |
| Peace of mind                       | 290 49.3%|
| Recommendation from doctor          | 130 22.1%|
| Where did you learn about skin self-examination |         |
| Books                               | 88 15.0% |
| Dermatologist/health care professional | 114 19.4%|
| Friends/relatives                   | 42 7.1%  |
| Medical courses and lectures        | 294 50.0%|
| Internet                            | 210 35.7%|
| Social media                        | 170 28.9%|
### Table 5: Practices of students toward sun exposure.

| Item                                                                 | Never | Rarely | Sometimes | Often | Always |
|----------------------------------------------------------------------|-------|--------|-----------|-------|--------|
|                                                                      | N     | %      | N         | %     | N      | %      | N         | %     | N      | %      |
| I avoid the sun during the hours of 10 am to 4 pm                    | 44    | 2.9    | 122       | 8.0   | 436    | 28.5   | 618       | 40.4  | 310    | 20.3   |
| When I go out, I wear a hat                                          | 476   | 31.1   | 380       | 24.8  | 304    | 19.9   | 226       | 14.8  | 144    | 9.4    |
| I wear sunglasses                                                     | 322   | 21.0   | 330       | 21.6  | 352    | 23.0   | 234       | 15.3  | 292    | 19.1   |
| When I go out, I use sunscreen at least with an SPF of 15             | 324   | 21.2   | 182       | 11.9  | 200    | 13.1   | 222       | 14.5  | 602    | 39.3   |
| Wear sunscreen at least with an SPF of 15 while at the beach or swimming | 310   | 20.3   | 166       | 10.8  | 238    | 15.6   | 218       | 14.2  | 598    | 39.1   |
| I do not go to swim                                                  | 204   | 13.3   | 202       | 13.2  | 386    | 25.2   | 338       | 22.1  | 400    | 26.1   |
| I drink water minimum 8-10 glasses                                    | 18    | 1.2    | 124       | 8.1   | 336    | 22.0   | 428       | 28.0  | 624    | 40.8   |
| I wear long pants and long-sleeved shirt at summer time              | 94    | 6.1    | 136       | 8.9   | 302    | 19.7   | 274       | 17.9  | 724    | 47.3   |
| I go for body tanning regularly                                       | 816   | 53.3   | 266       | 17.4  | 200    | 13.1   | 108       | 7.1   | 140    | 9.2    |
5. Conclusion

The general level of the medical students’ knowledge of skin cancer and its risk factors appeared to be higher than what is found in other studies; it is reasonable as the study participants were medical students. However, the protective behavior from the sun was inadequate when compared to the level of knowledge reported. Additional education about the behavior toward sun exposure and protection against skin cancer may be needed to be implemented in their dermatology curriculum.

5.1. Limitations. The main limitation of this study is using an online questionnaire, which can lead to the possibility of self-reporting bias. However, we avoid this problem by using a large representative sample of medical students.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Ethical Approval

The present study was designed in accordance with the ethical principles of the Declaration of Helsinki. The study protocol and design were approved by the institutional board review at Yarmouk University number (RD/119/12/1870).

Consent

All participants signed an informed consent form.

Conflicts of Interest

The authors report that they have no conflicts of interest with this study.

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