ORIGINAL ARTICLE

Melanoma Knowledge and Awareness Assessment among Adult Population in Saudi Arabia and their Ability to Recognize Suspicious Lesions

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Abstract

Introduction: Although less frequent than other varieties, melanoma is an aggressive form of skin cancer that is responsible for most deaths from skin cancer. Since the prognosis is heavily influenced by the stage of diagnosis, early detection is crucial. Reducing morbidity and mortality requires raising public knowledge of melanoma risk factors, which include fair skin, ultraviolet radiation exposure, family history, and sunburn history. The population's capacity to identify worrisome skin lesions is equally significant, especially if they show signs of asymmetry, irregular boundaries, color fluctuation, diameter increase, or progression over time. However, there is still a knowledge and lesion recognition gap in many populations, particularly in areas with limited access to dermatological education. **Objectives:** The study is aimed to assess the population's awareness and knowledge regarding the risk factors of melanoma in Saudi Arabia and whether they are able to identify lesions requiring dermatological intervention. **Materials and Methods:** A cross-sectional study was conducted using a structured, self-administered online questionnaire distributed to adults aged 18–65 years across Saudi Arabia, including both males and females. The questionnaire was disseminated via online platforms such as WhatsApp, Instagram, Telegram, and X. It assessed knowledge of melanoma risk factors, awareness of preventive behaviors, and the ability to identify suspicious skin lesions using validated image-based scenarios. Demographic data were also collected. Descriptive statistics were used to summarize the responses, and chi-square tests were used to examine associations between knowledge levels and demographic variables. The survey tool was piloted to ensure clarity and reliability. Ethical approval was obtained, and informed consent was required from all participants before data collection. The minimum target sample size was 385, calculated using a standard formula based on prevalence estimation, a 95% confidence level, and a 5% margin of error. **Results:** Among 445 participants (mean age 28.9, 70.6% females), 86.3% had heard of skin cancer; however, only 56.4% demonstrated high-level knowledge, and 65.4% showed favorable attitudes. Preventive practice scores were low, with just 9.2% exhibiting high-level behaviors, 63.6% reported sunscreen use, and 71.9% would consult a healthcare professional for suspicious lesions. Recognition ability for suspicious lesions was limited: only 49.2% correctly identified the non-melanoma case. Significant predictors of higher knowledge and practice were female gender, younger age (22–24), higher secondary

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education, and student status ($P < 0.05$). **Conclusion:** Despite relatively high awareness, major gaps remain in knowledge depth, preventive practices, and lesion recognition. There is a marked knowledge–practice gap and uncertainty about the role of sunscreen in cancer prevention. Targeted educational campaigns are needed to improve public understanding and foster behavioral change, with special attention to young adults and females.

Key words: Awareness, knowledge, lesions, melanoma, risk factors, Saudi Arabia, skin cancer, sun exposure

INTRODUCTION

Melanoma is a malignant tumor of melanocytes, most frequently arising in the skin but also occurring in extracutaneous sites. It is the 5th most common cancer and accounts for over 80% of skin cancer–related mortality.[1] Although less common in darker-skinned populations, delayed diagnosis contributes to poorer prognoses in these groups.[2] Major risk factors include family history of skin cancer, fair skin, and severe sunburns, particularly during childhood.[3]

Cutaneous melanoma is characterized by rapid proliferation, high mortality, and a significant impact on quality-adjusted life years.[4] Despite constituting only 1.7% of all cancers globally, it causes approximately 57,000 deaths annually, with projections indicating a 57% increase in incidence and 68% rise in mortality by 2040.[5] The four main subtypes – superficial spreading, nodular, lentigo maligna, and acral lentiginous melanoma – exhibit distinct clinical and histopathological patterns.[5]

Incidence is rising worldwide, largely due to increased ultraviolet (UV) exposure, inadequate photoprotection, demographic changes, and environmental factors such as ozone depletion and climate change.[5,6] Given that 5-year survival decreases from 99% at stage IA to 15–20% at stage IV, early detection remains the most critical determinant of outcome.[5]

Although melanoma is widely studied in fair-skinned populations, its epidemiology in darker-skinned regions like Saudi Arabia remains underreported. According to the 2020 Saudi Cancer Incidence Report, melanoma represented only 0.1% of cancer cases in women (8 cases) and 0.2% in men (13 cases). Other skin cancers were more common, with 122 cases (2.0%) in men and 88 cases (1.1%) in women. Notably, Saudi men exhibited a higher cumulative lifetime risk of developing skin cancer (4.20%) compared to women (2.70%).[7]

Despite a high level of knowledge of melanoma, almost 97% of participants in a Saudi Arabian study reported never having their skin examined to check for abnormalities. Therefore, the study highlighted the necessity of improving public health campaigns that emphasize the significance of routine self-examination and early detection for melanoma.[8] There were 438 individuals selected at random in a cross-sectional survey that was carried out in Riyadh, Saudi Arabia. According to the results, 68.9% of the participants had a favorable attitude on skin cancer awareness, whilst 31.1% had a negative or unconcerned attitude.[9] A 2023 Swiss study investigated the relationship between melanoma awareness and sun protection behavior. It found that individuals with higher education were more likely to use high-sun protection factor (SPF) sunscreen and demonstrated greater awareness, yet they also reported higher levels of sun exposure. The study emphasized the importance of launching awareness campaigns targeting those with lower educational levels.[10] According to a cross-sectional study of 1530 medical students at Yarmouk University in Jordan, 81% of them knew a lot about skin cancer. There is a glaring discrepancy between awareness and sun-protective behavior, though, since 20% never applied sunscreen and 61.5% did not perform skin self-examination.[11]

There is limited research about melanoma awareness among adults in Saudi Arabia. Previous studies had small sample sizes and showed inconsistent results. Understanding population-level awareness and behaviors regarding melanoma risk and recognition is essential for shaping public health strategies, especially in countries like Saudi Arabia, where the condition is rare but potentially underdiagnosed. Therefore, this study aimed to fill this gap by assessing melanoma knowledge in a larger and more diverse Saudi adult population. Specifically, it evaluated knowledge of melanoma risk factors and the ability to recognize dermatological lesions that require medical attention. Understanding these knowledge gaps was important for improving public health awareness and prevention strategies.

Objectives

This study is aimed to assess the knowledge and awareness level of melanoma risk factors among adults aged 18–65 years old in Saudi Arabia and their ability to recognize skin lesions that require dermatological evaluation.

MATERIALS AND METHODS

Study design and setting

This study used a cross-sectional questionnaire survey that was carried out in the Kingdom of Saudi Arabia, conducted between July 2025 and December 2025.

Subject: Participants, recruitment, and sampling procedure

The study's population consisted of adults aged 18–65 living in Saudi Arabia. Participants from across Saudi Arabia were recruited using social media platforms, including Twitter, Snapchat, Instagram, WhatsApp, and Facebook.

Sample size

The time period July 2025 to December 2025 was the beginning of data collection. With a 50% response distribution, a 5% margin of error, and a 95% confidence level, the Raosoft sample size calculator (Raosoft, Inc., Seattle, WA) was used to determine the necessary sample size, which came out to be a minimum of 384 participants. The sample size was estimated using the formula:

$$n = P(1-P) \times Z\alpha^2/d^2 \text{ with a 95\% confidence level.}$$

n: Calculated sample size.
Z: The z-value for the selected level of confidence (1−a) = 1.96.
P: An estimated prevalence of knowledge.
Q: (1 – 0.50) = 50%, i.e., 0.50.
D: The maximum acceptable error = 0.05.

Therefore, the calculated minimum sample size was: $n = (1.96)^2 \times 0.50 \times 0.50/(0.05)^2 = 384$.

Inclusion and exclusion criteria

The study included both male and female adults aged 18–65 years who were Saudi citizens or long-term residents living in Saudi Arabia for at least 5 years. Participants provided informed consent and were able to read and understand either English or Arabic to ensure accurate comprehension of the survey. Excluded from the study were individuals younger than 18 or older than 65 years, as well as healthcare professionals specializing in dermatology or oncology, as their medical background could bias the assessment of public knowledge. Individuals with a personal history of skin cancer, including melanoma or non-melanoma types, were also excluded due to their likely heightened awareness and experience. Non-residents or those who had lived in Saudi Arabia for <5 years were excluded to maintain population homogeneity and ensure adequate exposure to local health information environments.

Method for data collection, instrument

Data collection was done in the form of the participants' answers to the survey questions. The questionnaire consisted of five parts and began with a brief overview of the study, followed by an informed consent statement. The first part collected demographic data, including gender, age, education level, and occupation. The second part assessed participants' knowledge of skin cancer, including general information and associated risk factors. The third part explored attitudes toward skin cancer and its perceived seriousness. The fourth part focused on participants' practices related to skin cancer prevention and early detection. Finally, the fifth part focused on participants' ability to recognize suspicious pigmented skin lesions.

With the corresponding author's permission, the survey questions were adapted from their questionnaire form.

This questionnaire was adapted from the original instrument by Baade *et al.*[12] and Aslam *et al.*[13] Pictures were obtained from online websites.

Scoring system

The questionnaire consisted of 24 items divided into five sections: 4 items for demographics, 5 for knowledge, 5 for attitude, 5 for practice, and 5 for recognition of suspicious skin lesions. Each correct answer was awarded one point, while incorrect or uncertain responses – such as "I don't know" or "Unsure" – were assigned a score of zero. Some items allowed for multiple correct responses; in such cases, each correct option selected was given one point. The scoring was based primarily on dichotomous and multiple-response formats. One item in the practice section used a four-point frequency scale (Always, Sometimes, Rarely, Never), scored from 3 to 0. The total maximum score across the four evaluative domains was 20. Participants' performance was categorized based on Bloom's original cut-off classification (high: 80–100%, moderate: 60–79%, low: below 60%).

The knowledge domain ranged from 0 to 5 points and was categorized into three levels: Low (0–2), moderate (3), and high (4–5). The attitude domain ranged from 0 to 5 points and was classified as low (0–2), moderate (3), and high (4–5). The practice domain ranged from 0 to 5 points, with scores of (0–2) considered low, (3) moderate, and (4–5) high. The recognition of suspicious skin lesions domain ranged from 0 to 5 points and was categorized as low (0–2), moderate (3), and high (4–5).

Pilot test

Twenty people were given the questionnaire and asked to complete it. This was done to test the study's viability and the questionnaire's ease of use. The pilot study's data were not included in the study's final data.

Analysis and entry method

Using the "Microsoft Office Excel Software" (2016) for Windows, data was input into the computer. For statistical

analysis, the data were then imported into the Statistical Package for the Social Science Software (SPSS) application, version 20 (IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp.). Microsoft Excel (2016) for Windows was used to enter data on the PC. After that, the data was moved to version 20 of the SPSS application for statistical analysis.

RESULTS

Table 1 displays various demographic parameters of the participants with a total number of (445). The sociodemographic characteristics of the study sample represent a young rather adult population where the mean age of the population is 28.9 years, and almost three-quarters of the sample falls within the 18–34 age range. A much greater percentage (70.6%) of the sample was females, and it could have a significant effect on health-seeking behavior and awareness rates in skin cancer studies. Most respondents lived in the western (42.5%) and southern (26.7%) regions, and fewer people lived in the northern and eastern regions, which indicate that there was an imbalance in geography, which may have compromised generalizability. Education levels were also quite high, with 56.9% with a bachelor's degree and only 0.7% having no education at all so, the cohort is highly knowledgeable and would have shown higher understanding on the preventive measures. Besides, students were the highest occupational group (44.5%) represented.

As shown in Figure 1, Participants defined their knowledge level as mostly knowing basic information regarding skin cancer (47.6%), with 25% of participants believe that they have moderate knowledge regarding skin cancer, while only 7% reported being very knowledgeable regarding skin cancer.

Table 2 shows that awareness of skin cancer among the participants was high and 86.3% of the respondents said they heard about the disease. Nonetheless, there was a modest perception of knowledge since only 47.6% of the respondents identified their knowledge as basic, and only 7.4% identified themselves as very knowledgeable. Awareness of preventative interventions was high, as the most reported strategies were the use of sunscreen (59.8 %) and not going out in the midday sun (55.7 %). On the same note, an over-exposure to the sun and a family history were recognized as a key risk factor by 66.9 % of respondents. Nevertheless, there are still loopholes in the process of defining clinical warning signs: only half of them identified unusual skin growths (50.8 %) or the changing moles (48.5 %) as something to worry about.

As shown in Figure 2, 30% of participants reported adherence to sun protection (29.9%), with most participants said that they sometimes use sun protection (39%), 19% reported rare

Table 1: Sociodemographic characteristics of participants (*n*=445)

Parameter	No.	Percent
Age (mean: 28.9, standard deviation: 9.8)		
18–21	111	24.9
22–24	107	24.0
25–34	101	22.7
35–65	126	28.3
Gender		
Female	314	70.6
Male	131	29.4
Region of residence		
Northern region	2	0.4
Southern region	119	26.7
Central region	42	9.4
Eastern region	1	0.2
Western region	189	42.5
Education		
Primary education	7	1.6
Secondary education	9	2.0
Higher secondary education	122	27.4
Bachelor's degree	253	56.9
Diploma education	31	7.0
Master's degree or higher	20	4.5
Uneducated	3	0.7
Occupation		
Employed (full-time)	141	31.7
Retired	4	0.9
Self-employed	17	3.8
Student	198	44.5
Unemployed	85	19.1

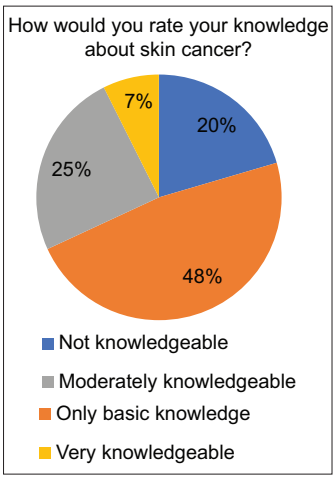

Figure 1: Illustrates how participants rate their knowledge regarding skin cancer

Table 2: Parameters related to knowledge of participants regarding skin cancer (*n*=445)

Parameter	No.	Percent
Have you ever heard of skin cancer?		
No	61	13.7
Yes	384	86.3
How would you rate your knowledge about skin cancer?		
Not knowledgeable	91	20.4
Only basic knowledge	212	47.6
Moderately knowledgeable	109	24.5
Very knowledgeable	33	7.4
Which of the following can prevent skin cancer?*		
Avoiding midday sun	248	55.7
Wearing sunscreen	266	59.8
Regular check-ups with a dermatologist	248	55.7
Don't know	53	11.9
Can you identify the common risk factors for skin cancer?*		
Excessive sun exposure	298	66.9
Smoking	91	20.4
Family history of skin cancer	298	66.9
Fair skin type	159	35.7
Don't know	74	16.6
Which of the following signs or symptoms may indicate skin cancer?*		
Persistent itching or pain in a specific area	126	28.3
Unusual growth or lump on the skin	226	50.8
New or changing moles	216	48.5
Don't know	91	20.4

*Results may overlap

usage of sun protection, and only 12% reported not using any sun protection.

Table 3 reveals that participants demonstrated a high awareness of the importance of skin cancer to the delivery of public health, with 95.1% saying it is a matter of concern and 82.7% personal concern regarding the risk factors. Although such a positive view can be made, there still is a certain level of uncertainty about the preventive effect of sunscreen, with almost half of the respondents (49.0 %) being uncertain. Prevention behavior was average; most of the participants wore sunscreens (63.6 %) and found shelter during the busiest periods (63.8 %), with others wearing protective clothing (50.4 %) and avoiding tanning equipment (50.2 %). It is noteworthy that the levels of screening and self-examination were at an incredibly low level, as only 4.7 % of the respondents underwent professional screening, and 14.4 % conducted self-examination. Most participants

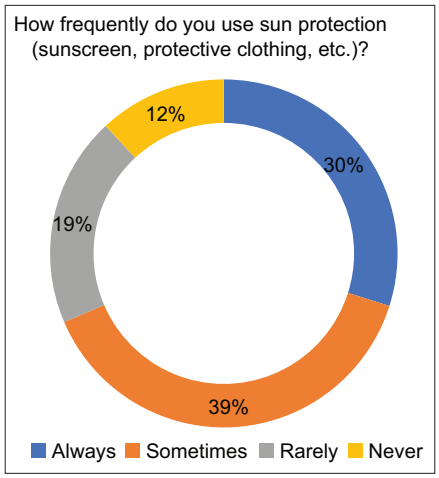

Figure 2: Rate of sun protection followed by the participants

would consult medical care with regards to suspicious lesions (71.9 %).

Table 4 shows that respondents expressed a responsible attitude toward suspicious skin lesions, and 73.7% of those who would get a specialist countercheck to a worrying mole on the back, and only 1.8% to 2.9% would neglect or self-treat such discoveries. The opinions on the severity of the lesions were different; 35.1% felt that the lesion may need to be looked at, and 11.7% felt that the lesion was of great concern. Nevertheless, there were uncertainties, with 33.3% of them feeling that it was not that serious, and 15.5% of them felt that there was no concern. In evaluating a second lesion, the desire to use specialist consultation was great (54.4 %), but an even greater percentage (25.8 %) wanted to monitor and not to act. In the melanoma recognition, almost half of the respondents (49.2 %) were able to recognize the non-melanoma lesion correctly.

Table 5 shows that more than half of the participants showed a high level of knowledge regarding skin cancer (56.4%), and 23.6% reported Moderate knowledge, while 20.0% showed a low level of knowledge.

Table 6 shows that more than half of the participants showed a high level of attitude toward skin cancer (65.4%), and 23.8% showed a moderate attitude, while 10.8% showed a low level of attitude toward skin cancer.

Table 7 shows that a few participants showed a high level of practice toward skin cancer (9.2%), and 24% showed a moderate practice level, while most participants showed a low level of practice (66.7%).

Table 8 shows that some the participants showed a high level of recognition regarding possible cases of skin cancer (27.4%). Moreover, 29.4% reported moderate recognition, while 43.1% showed a low level of recognition regarding skin cancer cases.

Table 3: Participants' attitude and practice toward skin cancer (*n*=445)

Parameter	No.	Percent
Do you believe that skin cancer is a significant health concern?		
No	22	4.9
Yes	423	95.1
Are you concerned about the potential risks of skin cancer?		
No	77	17.3
Yes	368	82.7
Do you think that skin cancer can be prevented by using sunscreen?		
No	67	15.1
Yes	160	36.0
Unsure	218	49.0
Do you believe it's important to have your skin checked regularly by a dermatologist is essential?		
No	47	10.6
Yes	297	66.7
Unsure	101	22.7
Which of the following preventive measures have you practiced to protect your skin from the sun?*		
Using sunscreen	283	63.6
Wearing protective clothing (e.g., hats, long sleeves)	225	50.6
Seeking shade during peak sun hours	284	63.8
Avoiding tanning beds or sunlamps	202	45.4
None of the above	39	8.8
Have you ever undergone a skin cancer screening or examination?		
No	424	95.3
Yes	21	4.7
Have you ever performed self-examination of your skin to check for signs of skin cancer?		
No	381	85.6
Yes	64	14.4
How frequently do you use sun protection (sunscreen, protective clothing, etc.)?		
Always	133	29.9
Sometimes	172	38.7
Rarely	87	19.6
Never	53	11.9
Have you ever had your skin checked by a doctor for signs of skin cancer?		
No	420	94.4
Yes	25	5.6
If you notice any suspicious changes on your skin, what would be your next course of action?		
Attempt self-treatment (using creams/herbs/home remedies without medical consultation)	50	11.2
Monitor the changes without seeking medical advice	25	5.6
Schedule an appointment with a healthcare professional	320	71.9
Not sure	50	11.2

*Results may overlap

Table 4: Participants' recognition of skin cancer (*n*=445)

Parameter	No.	Percent
If you noticed this spot or mole on your back, which of the following best describes the action you would take?		
Attempt self-treatment using creams or home remedies.	13	2.9
I would make a special appointment to see a doctor as soon as possible	16	3.6
Monitor the spot over time to see if any changes occur.	54	12.1
Schedule an appointment with a specialist to have it examined.	328	73.7
Search for information online or ask a non-specialist before consulting a doctor.	26	5.8
Ignore it and take no action.	8	1.8
How would you assess the likelihood that this lesion is concerning and requires medical evaluation?		
I think it is concerning and may need medical evaluation.	156	35.1
I think it is very concerning and should be checked by a doctor immediately.	52	11.7
I think it might be concerning but is probably not serious.	148	33.3
Likely to be skin cancer	20	4.5
I don't think it is concerning.	69	15.5
If you noticed this spot or mole on your back, which of the following best describes the action you would take?		
Attempt self-treatment using creams or home remedies.	21	4.7
I would make a special appointment to see a doctor as soon as possible	14	3.1
Monitor the spot over time to see if any changes occur.	115	25.8

(*Contd...*)

Table 4: (*Continued*)

Parameter	No.	Percent
Schedule an appointment with a specialist to have it examined.	242	54.4
Search for information online or ask a non-specialist before consulting a doctor.	31	7.0
Ignore it and take no action.	22	4.9
How would you assess the likelihood that this lesion is concerning and requires medical evaluation?		
I think it is concerning and may need medical evaluation.	120	27.0
I think it is very concerning and should be checked by a doctor immediately.	53	11.9
I think it might be concerning but is probably not serious.	121	27.2
Likely to be skin cancer	18	4.0
I don't think it is concerning.	132	29.7
Very unlikely to be skin cancer	1	0.2
Can you identify which one is NOT melanoma?		
A	90	20.2
B	219	49.2
C	74	16.6
D	62	13.9

Table 5: Knowledge toward skin cancer score results

Knowledge level	Frequency	Percent
High knowledge level	251	56.4
Moderate knowledge level	105	23.6
Low knowledge level	89	20.0
Total	445	100.0

Table 6: Attitudes toward skin cancer score results

Attitudes level	Frequency	Percent
High attitude level	291	65.4
Moderate attitude level	106	23.8
Low attitude level	48	10.8
Total	445	100.0

Table 9 shows that knowledge level regarding skin cancer has a statistically significant relation to gender ($P = 0.0001$), age ($P = 0.0001$), education ($P = 0.001$), and occupation ($P = 0.0001$). Participants who were of female gender, aging 22–24, with higher secondary education, and students were found to have a higher knowledge level than others.

Table 10 shows that attitude level regarding skin cancer has a statistically significant relation to gender ($P = 0.011$), age ($P = 0.027$), education ($P = 0.002$), and occupation ($P = 0.0001$).

Table 7: Practice toward skin cancer score results

Practice level	Frequency	Percent
High practice level	41	9.2
Moderate practice level	107	24.0
Low practice level	297	66.7
Total	445	100.0

Table 8: Recognition toward skin cancer score results

Recognition level	Frequency	Percent
High recognition level	122	27.4
Moderate recognition level	131	29.4
Low recognition level	192	43.1
Total	445	100.0

Table 11 shows that practice level regarding skin cancer has a statistically significant relation to gender ($P = 0.0001$), age ($P = 0.0001$), and occupation ($P = 0.008$). Participants of female gender, aging 22–24, and students were found to have a higher practice level than others.

DISCUSSION

The present study aimed to assess knowledge and awareness of melanoma risk factors among adults aged 18–65 years in Saudi Arabia and their ability to recognize skin lesions requiring dermatological evaluation. The findings reveal a complex picture of melanoma awareness in the Saudi population, characterized by moderate knowledge levels, positive attitudes, but critically low screening practices and lesion recognition abilities. Among the 445 participants, 86.3% had heard of skin cancer, yet only 56.4% demonstrated high knowledge levels, 65.4% showed favorable attitudes, and alarmingly, just 9.2% exhibited high-level preventive practices. This knowledge-practice gap represents a significant public health concern that warrants careful examination in the context of existing literature.

The awareness rate of 86.3% observed in the current study is notably higher than that reported in earlier Saudi studies. Al-Atif found that 55% of Saudi participants reported awareness of skin cancer, with 35% understanding its metastatic potential and 44% being unaware of the different types of skin cancer.[3] This upward trend in awareness may reflect increased health education efforts and the growing accessibility of health information through digital platforms. Similarly, a cross-sectional study in Riyadh by Almutlaq *et al.* reported that 61.2% of respondents had prior knowledge about skin cancer causes and effects, with 86.3% demonstrating

Table 9: Relation between knowledge level regarding skin cancer and sociodemographic characteristics

Parameters	Knowledge level		Total (*n*=445)	*P* value
	High knowledge level	Moderate or low knowledge		
Gender				
Female	198	116	314	0.0001
	78.9%	59.8%	70.6%	
Male	53	78	131	
	21.1%	40.2%	29.4%	
Age				
18–21	72	39	111	0.0001
	28.7%	20.1%	24.9%	
22–24	82	25	107	
	32.7%	12.9%	24.0%	
25–34	47	54	101	
	18.7%	27.8%	22.7%	
35–65	50	76	126	
	19.9%	39.2%	28.3%	
Education				
Primary education	1	6	7	0.001
	0.4%	3.1%	1.6%	
Secondary education	3	6	9	
	1.2%	3.1%	2.0%	
Higher secondary education	83	39	122	
	33.1%	20.1%	27.4%	
Bachelor's degree	138	115	253	
	55.0%	59.3%	56.9%	
Diploma education	12	19	31	
	4.8%	9.8%	7.0%	
Master's degree or higher	14	6	20	
	5.6%	3.1%	4.5%	
Uneducated	0	3	3	
	0.0%	1.5%	0.7%	
Occupation				
Student	142	56	198	0.0001
	56.6%	28.9%	44.5%	
Employed (full-time)	59	82	141	
	23.5%	42.3%	31.7%	
Self-employed	7	10	17	
	2.8%	5.2%	3.8%	
Unemployed	40	45	85	
	15.9%	23.2%	19.1%	
Retired	3	1	4	
	1.2%	0.5%	0.9%	

*P value was considered significant if ≤ 0.05

average knowledge levels and only 9.8% achieving high knowledge levels.[9] The present study's finding that 66.9% correctly identified excessive sun exposure as a risk factor and 66.9% recognized family history aligns with these

Table 10: Relation between attitude level regarding skin cancer and sociodemographic characteristics

Parameters	Attitude level		Total (*n*=445)	*P* value
	High attitude level	Moderate or low attitude		
Gender				
Female	217	97	314	0.011
	74.6%	63.0%	70.6%	
Male	74	57	131	
	25.4%	37.0%	29.4%	
Age				
18–21	84	27	111	0.027
	28.9%	17.5%	24.9%	
22–24	71	36	107	
	24.4%	23.4%	24.0%	
25–34	57	44	101	
	19.6%	28.6%	22.7%	
35–65	79	47	126	
	27.1%	30.5%	28.3%	
Education				
Primary education	3	4	7	0.002
	1.0%	2.6%	1.6%	
Secondary education	1	8	9	
	0.3%	5.2%	2.0%	
Higher secondary education	85	37	122	
	29.2%	24.0%	27.4%	
Bachelor's degree	170	83	253	
	58.4%	53.9%	56.9%	
Diploma education	18	13	31	
	6.2%	8.4%	7.0%	
Master's degree or higher	14	6	20	
	4.8%	3.9%	4.5%	
Uneducated	0	3	3	
	0.0%	1.9%	0.7%	
Occupation				
Student	144	54	198	0.0001
	49.5%	35.1%	44.5%	
Employed (full-time)	96	45	141	
	33.0%	29.2%	31.7%	
Self-employed	10	7	17	
	3.4%	4.5%	3.8%	
Unemployed	40	45	85	
	13.7%	29.2%	19.1%	
Retired	1	3	4	
	0.3%	1.9%	0.9%	

*P value was considered significant if ≤ 0.05

regional observations and suggests incremental improvement in basic melanoma knowledge across Saudi populations.

However, knowledge of specific warning signs and symptoms remains suboptimal. In the present study, only

Table 11: Relation between practice level regarding skin cancer and sociodemographic characteristics

Parameters	Practice level		Total (*n*=445)	*P* value
	High to moderate practice	Low practice level		
Gender				
Female	130	184	314	0.0001
	87.8%	62.0%	70.6%	
Male	18	113	131	
	12.2%	38.0%	29.4%	
Age				
18–21	51	60	111	0.0001
	34.5%	20.2%	24.9%	
22–24	43	64	107	
	29.1%	21.5%	24.0%	
25–34	29	72	101	
	19.6%	24.2%	22.7%	
35–65	25	101	126	
	16.9%	34.0%	28.3%	
Education				
Primary education	1	6	7	0.347
	0.7%	2.0%	1.6%	
Secondary education	3	6	9	
	2.0%	2.0%	2.0%	
Higher secondary education	46	76	122	
	31.1%	25.6%	27.4%	
Bachelor's degree	84	169	253	
	56.8%	56.9%	56.9%	
Diploma education	5	26	31	
	3.4%	8.8%	7.0%	
Master's degree or higher	8	12	20	
	5.4%	4.0%	4.5%	
Uneducated	1	2	3	
	0.7%	0.7%	0.7%	
Occupation				
Student	82	116	198	0.008
	55.4%	39.1%	44.5%	
Employed (full-time)	38	103	141	
	25.7%	34.7%	31.7%	
Self-employed	7	10	17	
	4.7%	3.4%	3.8%	
Unemployed	21	64	85	
	14.2%	21.5%	19.1%	
Retired	0	4	4	
	0.0%	1.3%	0.9%	

*P value was considered significant if ≤ 0.05.

48.5% identified new or changing moles, and 50.8% recognized unusual skin growths as potential warning signs. These findings are consistent with international literature demonstrating widespread gaps in melanoma symptom

recognition. A study among Jordanian medical students reported that 81% possessed proper knowledge about skin cancer, yet their protective behaviors were inadequate, with 61.5% not having habits of skin examination, 20% never using sunscreen, and only 20% avoiding sun exposure during peak daytime hours.[11] Mueller *et al.* in Switzerland found that individuals with higher education (college or university degree) used high SPF sunscreen significantly more often than those with lower education levels ($P = 0.0007$), although they paradoxically reported higher annual sun exposure ($P = 0.041$).[10] This pattern mirrors the present study's observation that knowledge does not necessarily translate into protective behaviors, as evidenced by the striking discordance between high knowledge scores (56.4%) and low practice scores (9.2%).

The most concerning finding of this study is the critically low rate of skin cancer screening practices. Only 4.7% of participants had ever undergone professional skin cancer screening, and merely 14.4% reported performing skin self-examination. These figures are substantially lower than those reported in Western populations. Robinson *et al.* demonstrated that melanoma detection via skin self-examination interventions targeting at-risk women achieved screening examination performance of 80.9% at 1-month follow-up among those who received education.[14] Watts *et al.* reported that among Australian melanoma patients, 35% had their melanoma detected during a routine skin check, 47% self-detected their melanoma, and routine skin-check detection was associated with 59% lower melanoma-specific mortality in minimally adjusted models.[15] The low screening rates in the present study echo findings from earlier investigations, highlighting a fundamental disconnect between knowledge and health-seeking behavior that requires targeted intervention.

Regarding sun protection practices, 29.9% of participants reported always using sun protection, with 63.6% reporting sunscreen use and 63.8% seeking shade during peak hours. AlJasser *et al.* found that 51% of Saudi university students used sunscreen, with female gender being independently associated with sunscreen use (odds ratio 10.038, $P < 0.001$), and 59% using SPF >30.[16] However, only 35% of students applied sunscreen in both sunny and cloudy days, and 62% did not reapply sunscreen throughout the day, indicating widespread gaps in proper sunscreen application practices.[16] Notably, 49% of participants in the present study were uncertain whether sunscreen prevents skin cancer, suggesting that educational interventions should emphasize not only the importance of sun protection but also clarify the mechanisms and efficacy of preventive measures. This aligns with findings from Bahashwan *et al.*, who documented inadequate knowledge of sun exposure risks despite awareness levels in the Aseer region of Saudi Arabia.[17]

The ability to recognize suspicious skin lesions represents a critical component of early melanoma detection. In the present study, only 49.2% correctly identified the non-melanoma lesion, and overall recognition scores showed 43.1% with low levels, 29.4% moderate, and just 27.4% high. This limited recognition capacity is particularly concerning given that 73.7% indicated they would seek specialist consultation for a suspicious mole, suggesting good health-seeking intentions but poor diagnostic capability. A study from Pakistan found that 81% of the surveyed population were unaware of melanoma, 70% admitted to never having conducted self-body examinations, 57% had moles on their bodies, yet 90% showed no concern about them, and 85% had never sought medical advice regarding skin lesions.[18] Only 57% agreed that self-examination could facilitate early detection, and 62% believed in the efficacy of regular skin checks for improving survival rates.[18] The complexity of melanoma presentation and the subtle nature of early warning signs necessitate comprehensive visual education programs that go beyond verbal descriptions to include practical image-based training.

The present study identified significant demographic associations with knowledge, attitudes, and practices. Female gender was consistently associated with higher scores across all domains (knowledge $P = 0.0001$, attitude $P = 0.011$, practice $P = 0.0001$), paralleling findings from multiple international studies. Seetan *et al.* reported that female Jordanian medical students demonstrated better sun protection behaviors than males,[11] while AlJasser *et al.* found that female gender was independently associated with sunscreen use among Saudi university students, with an odds ratio of 10.038.[16] A recent study from Jordan found that females were more likely to report always using sunscreen (51.2%) compared to males (19.1%), who more frequently reported sometimes use (51.1%).[19] The age group of 22-24 years showed the highest knowledge levels ($P = 0.0001$), and students demonstrated superior knowledge compared to other occupational groups ($P = 0.0001$). Higher educational attainment was significantly associated with better knowledge scores ($P = 0.001$), consistent with Mueller *et al.*'s findings that educational level strongly influenced melanoma awareness and sun protection knowledge, with those having college or university degrees using high SPF significantly more often ($P = 0.0007$).[10]

A particularly noteworthy finding is the substantial attitude-practice gap observed in this study. While 95.1% believed skin cancer is a significant health concern and 82.7% expressed personal concern about melanoma risks, these positive attitudes did not translate into screening behaviors or regular self-examination. This phenomenon has been well-documented in behavioral health literature and reflects the complexity of health behavior change. Baghani *et al.* conducted a comprehensive knowledge, attitudes, and practices study among dermatology clinic patients, medical students, and general practitioners in Iran, finding that while 59.4% had good knowledge, only 19.8% had good attitudes and 31.8% had good practices, with an overall

good knowledge-attitude-practice score in just 29.8% of participants.[20] The authors emphasized that knowledge and positive attitudes alone are insufficient to drive behavioral change without addressing barriers such as self-efficacy, perceived vulnerability, and access to screening services.[20] In their study, knowledge, attitudes, and practices were positively correlated among medical professionals but inversely correlated among patients, suggesting that as individuals become more informed about an illness, they may experience heightened fears and anxiety.[20] The present study's findings reinforce this understanding and suggest that future interventions must move beyond awareness campaigns to address structural and psychological barriers preventing the translation of knowledge into action.

Mueller *et al.* demonstrated that study participation in melanoma screening programs resulted in improved sun protection behavior, with 51% of melanoma patients reporting more frequent sunscreen use after study participation, and the use of SPF 50+ increasing from 47.5% to 57.6% within the follow-up group.[10] This suggests that educational interventions delivered in clinical settings can effectively modify behavior. Almutlaq *et al.* found that 68.9% of Saudi participants showed positive attitudes toward skin cancer, yet 28.5% knew that sunburn in childhood increases cancer risk later in life, indicating opportunities for targeted education about critical periods of sun exposure vulnerability.[9] The implications of these findings extend beyond individual health to public health policy and clinical practice. The marked knowledge-practice gap identified in this study underscores the need for multi-level interventions that address individual, interpersonal, organizational, and policy-level barriers to melanoma prevention and early detection.

The present study has several limitations that warrant acknowledgment. The convenience sampling method and predominance of young, educated, urban respondents may limit generalizability to the broader Saudi population, particularly older adults and rural residents who may have different knowledge levels and access to health information. The cross-sectional design precludes assessment of temporal trends or causal relationships between knowledge, attitudes, and practices. Self-reported data may be subject to social desirability bias, potentially overestimating positive attitudes and practices. The image-based lesion recognition component, while valuable, included only a limited number of images and may not fully represent the spectrum of melanoma presentations. In addition, the study was conducted primarily in the Western and Southern regions of Saudi Arabia, and regional variations in sun exposure patterns, healthcare access, and cultural practices may influence findings. Future research should employ probability sampling methods, include more diverse geographic and demographic populations, utilize longitudinal designs to assess behavioral change over time, and incorporate objective measures of sun protection and screening behaviors.

CONCLUSION

While melanoma awareness and knowledge have improved among Saudi adults, critical gaps persist in preventive practices and screening behaviors. The pronounced knowledge-practice gap represents the most significant barrier to effective melanoma prevention and early detection. Addressing this gap requires comprehensive, multi-level interventions that combine education with practical skill-building, leverage behavioral modification strategies to translate knowledge into action, engage healthcare systems in opportunistic screening, and utilize innovative digital platforms to reach target populations. As melanoma incidence continues to rise globally and UV exposure remains high in Saudi Arabia, sustained efforts to translate knowledge into protective behaviors are essential to reducing melanoma morbidity and mortality in this population.

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ETHICAL APPROVAL

The study was fully explained to all participants, and it was emphasized that participation was voluntary. Written informed consent was obtained from each participant before enrollment. All collected information was securely stored and used exclusively for research purposes.

INFORMED CONSENT

Written informed consent was obtained from all study participants.

DATA AND MATERIALS AVAILABILITY

All data generated or analyzed during this study are included in this published article.

REFERENCES

1. Nurla LA, Wafi G, Tatar R, Dorobanțu AM, Chivu M, Popa LG, *et al.* Recent-onset melanoma and the implications of the excessive use of tanning devices-case report and review of the literature. Medicina (Kaunas) 2024;60:187.
2. Vaishnavi B, Nithya P, Haseena S, Sk SS. Assessing skin cancer awareness: A survey on detection methods. ITM Web Conf 2025;74:01001.

3. Al-Atif HM. A cross-sectional survey of knowledge of skin cancer in Saudi Arabia. Dermatol Pract Concept 2021;11:e2021076.
4. Guy GP, Ekwueme DU. Years of potential life lost and indirect costs of melanoma and non-melanoma skin cancer: A systematic review of the literature. Pharmacoeconomics 2011;29:863-74.
5. Adi Albogamy S, Jaafar Alnemer M, Mahdi Aljawad H, Alanazi AS, Thabet Alharbi A, Saad Ali Al-Harbi M, *et al.* Melanoma: Risk factors, early detection, and treatment strategies-An updated review. Int J Health Sci 2023;7:3570-88.
6. Lagacé F, Noorah BN, Conte S, Mija LA, Chang J, Cattelan L, *et al.* Assessing skin cancer risk factors, sun safety behaviors and melanoma concern in Atlantic Canada: A comprehensive survey study. Cancers (Basel) 2023;15:3753.
7. Alshehri H, Alasiri RY, Alahmari MA, Daghriri LA, Badawi FA, Sultan I, *et al.* Epidemiological patterns of skin cancer in Saudi Arabia: A systematic review and meta-analysis of patient demographics, cancer types, locations, and risk factors. Int J Med Dev Ctries 2024;8:3833-43.
8. Khogeer A, Khogeer A, Alkhiary A, Almaghyadi F, Khan M. Melanoma awareness and self-examination practices in Saudi Arabia. Egypt J Hosp Med 2018;70:1808-12.
9. Almutlaq BA, AL-Gebaly AS, Al-Qahtani WS, Alfraihi RS, Alqahtani AS, Almurshedi AS, *et al.* Assessment of the knowledge, attitude, and practice towards sun-exposure and skin cancer in Riyadh city, Saudi Arabia. Int J Burns Trauma 2021;11:20-6.
10. Mueller AM, Goessinger EV, Cerminara SE, Kostner L, Amaral M, Huber SM, *et al.* Educational level-dependent melanoma awareness in a high-risk population in Switzerland. Front Oncol 2023;13:1174542.
11. Seetan K, Khamees A, Migdadi A, Abu Shqeer M, Hasan MJ, Shatnawi LA, *et al.* Knowledge, attitude, and practice toward skin cancer prevention and detection among Jordanian medical students: A cross-sectional study. J Skin Cancer 2022;2022:6989827.
12. Baade PD, Balanda KP, Stanton WR, Lowe JB, Del Mar CB. Community perceptions of suspicious pigmented skin lesions: Are they accurate when compared to general practitioners? Cancer Detect Prev 2005;29:267-75.
13. Aslam A, Jamshed S, Mustafa AG, Shanmugham S, Wazir A, Ali H, *et al.* A study of skin cancer knowledge, attitudes, and preventive practices among healthcare professionals and the general population in Pakistan: Insights for healthcare interventions and policy development. J Skin Cancer 2025;2025:3035274.
14. Robinson JK, Wahood S, Ly S, Kirk J, Yoon J, Sterritt J, *et al.* Melanoma detection by skin self-examination targeting at-risk women: A randomized controlled trial with telemedicine support for concerning moles. Prev Med Rep 2021;24:101532.
15. Watts CG, McLoughlin K, Goumas C, Van Kemenade CH, Aitken JF, Soyer HP, *et al.* Association between melanoma detected during routine skin checks and mortality. JAMA Dermatol 2021;157:1308-17.
16. AlJasser MI, Isa NM, AlGhamdi KM. Sunscreen use among a population of Saudi university students. Photodermatol Photoimmunol Photomed 2020;36:115-21.
17. Bahashwan E, Alsolami MM, Alsalmi O, Alqassab M, Alshehri HS, Abuzinadah N, *et al.* Awareness and knowledge of sun exposure and use of sunscreen among adults in Aseer region, Saudi Arabia. Saudi J Med Med Sci 2024;12:157-63.
18. Mahmood A, Babar MS, Khan AY, Ali S, Bashir RA, Sadiq HZ, *et al.* Awareness of melanoma and skin self-examination at a tertiary care hospital in Pakistan: A study of knowledge, attitudes, and practices. Cureus 2024;16:e74251.
19. Nassar RA, Alkubabji AM, Simaan CY, Abu Hanna CN, Zoubi SM, Jadallah LM, *et al.* Patterns and perceptions of sunscreen use in dermatology vs. Non-dermatology populations: A cross-sectional study. Open Dermatol J 2025;19:e18743722432283.
20. Baghani M, Banan Khojasteh SM, Kamyab K, Hosseini-Baharanchi FS, Shamsodini A, Ebrahimi A, *et al.* Knowledge, attitude, and practice toward skin cancer among patients of dermatology clinic patients, medical students, and general practitioners. J Multidiscip Healthc 2024;17:2325-38.

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