



ORIGINAL ARTICLE

Knowledge, attitudes and practices of the general public toward sun exposure and protection: A national survey in Saudi Arabia



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Abstract *Background:* Many international studies have been conducted to assess the knowledge, attitudes and practices (KAP) of the public toward sun exposure and sun-protection measures. However, there are scarce data on these factors from the Middle East. *Objectives:* This study aimed to explore the KAP of the public toward sun exposure and sun-protection measures among Saudis. *Methods:* A cross-sectional survey using a specially designed questionnaire was conducted on a stratified random sample of the general population in the five geographical regions of Saudi Arabia (central, eastern, northern, southern, and western). Data were collected between October 2010 and March 2011. Multiple logistic regressions were applied to relate the use of sunscreen and skin cancer awareness with various socio-demographic variables. *Results:* The questionnaire was distributed to 2900 Saudis. A total of 2622 questionnaires were completed, returned, and included in the data analysis, corresponding to a response rate of 90.4%. The mean (SD) age of respondents was 27.8 ± 9.7 years. Fifty percent (1301/1601) of the respondents were males. Fifty-five percent (1406/2544) were aware of the association between sun exposure and skin cancer. Female, young and student respondents were more likely to be aware of the connection between sun exposure and skin cancer ($p < 0.001$). Likewise, respondents from the middle social class and those with higher education levels were more likely to be informed ($p < 0.02$). The prevalence of regular sunscreen use among study participants was only 23.7%, and female and employed respondents were more likely to use sunscreen ($p < 0.001$). Protective clothes were the most commonly used sun protection measure as reported by more than 90% of our

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participants. *Conclusion:* This study has shown that sun awareness and protection are generally inadequate in the Saudi population and suggests the need for health education programs.

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1. Introduction

Many skin diseases are caused by excessive and unprotected sun exposure. High cumulative levels of ultraviolet (UV) radiation can damage skin cells, affect the skin's normal growth and appearance and cause acute skin damage, including tanning and burning. Furthermore, more complicated chronic skin problems can occur with long term exposure, such as pigmentary changes (e.g., melasma, lentigines), skin aging and skin cancer (Armstrong and Kricger, 2001; Macckie, 2000; Mabruk et al., 2009; Scerri and Keefe, 1995). Skin cancer has increased progressively during the past four decades (Rigel et al., 2004). Individual hazard of skin cancer has a robust relation with skin type, with the superior risk among skin type which burn easily and do not tan well (Livingston et al., 2001, 2003). Although skin cancers are less common in dark-skinned people, the prognosis is worse because the cancers tend to be diagnosed late (Nyiri, 2005). UV radiation is also responsible for significant eye damage, especially cataract formation (Taylor et al., 1988; Rosmini et al., 1994). All of these consequences of chronic UV radiation exposure are likely avoidable if suitable types of sun-protection behaviors are in use. Avoiding sun exposure between 10:00 a.m. and 2:00 p.m., seeking shade, using sunscreen, minimizing sunburns, avoiding tanning beds and wearing wide-brimmed hats, protective clothing, and sunglasses are the main recommendations for efficient sun protection (Berret et al., 2002; Emmons and Colditz, 1999; Jorgensen et al., 2000; Lim and Cooper, 1999). Sunscreens reduce the transmission of UV radiation into the skin by reflecting, absorbing, or dispersing such emission. Thus, sunscreen is a form of safeguard against sunlight (Kirsner et al., 2005). Female gender, higher income, greater schooling, and light skin color are positively associated with the use of sunscreen (Boggild and From, 2003; Hall et al., 1997). Patient education efforts proved to increase public understanding of the detrimental effects of excessive sun exposure and the advantages of sunscreen use (Swindler et al., 2007; Walkosz et al., 2007; Hornung et al., 2007). International surveys have revealed that skin cancer prevention and control programs are lucrative in increasing knowledge about skin cancer and the risks of exposure to UV radiation but do not look as if it has a key effect on behavior adaptation (Argyriadou et al., 2005). In local clinical dermatology practice, we have observed that many patients do not protect themselves from sun and report misinformation and unhealthy attitudes toward this issue. Identifying deficits in sun protection knowledge and behavior can serve as a starting point for primary prevention interventions. Knowledge, attitudes and practices (KAP) of the public toward sun exposure and protection have been studied in several societies; however, there is only one study regarding this subject from one province (Qassim) in Saudi Arabia. A diverse climate condition and socio-cultural background is present in different provinces of Saudi Arabia (Al Robaee, 2010). In this study, we aimed to

perform a nation-wide survey to evaluate the level of KAP regarding sun exposure and protection among adults and to establish the prevalence of sunscreen use on the country level.

2. Methods

A cross-sectional survey was conducted on both males and females who attended primary health care centers (PHCC) in the five geographical regions of Saudi Arabia (central, eastern, western, southern, and northern). From each region, one major city was selected. A total of 5 cities were selected: Riyadh, Jeddah, Dammam, Tabuk and Abha. A clustered multi-staged random sampling technique was applied. In each city, PHCCs were distributed according to the geographical divisions into five districts with 10–15 PHCCs in each district. One PHCC was chosen randomly from each district. Therefore, we had a total of 5 PHCCs in each of the selected cities. Data were collected between October 2010 and March 2011. Data collection was performed by trained research assistants. The specially designed questionnaire used for data collection in this study was pilot tested three times on 33, 62 and 76 subjects to calculate approximately the time for questionnaire completion, verify the command of questions by the participants and improve the questionnaire accordingly. These questionnaires were excluded from the concluding analysis. The final self-administered questionnaire included 22 questions and required approximately 5 min to complete. Approved by the ethics committee of King Saud University, Riyadh, Saudi Arabia was obtained. The questions were generally of a closed-ended format, but the choices were remodeled according to the feedback from the pilot questionnaires to make the choices more relevant and appropriate. The questionnaire was composed of two sections. Seven questions were integrated in first section about personal information, such as age, gender, marital status, educational level, household average monthly income, occupation and residence (urban vs. rural). The second section of the questionnaire comprised of 15 questions about the participant's knowledge about the sun's harmful effects on the skin, the frequency and duration of sun exposure, history of sunburn or skin pigmentation, sun tanning habits, use of sun protection methods (such as long-sleeved clothes, head covers, sunglasses, and sunscreen), the familiarity and attitude of participants toward sunscreen use, and the most important source of information regarding sun exposure effects.

2.1. Statistical analysis

The Statistical Package for the Social Sciences Program (SPSS) version 18 (SPSS Inc., Chicago, IL) was used. Numerical variables were reported as the mean \pm standard deviation. The Chi-square test was used for appraisal of the association between different categorical variables. Statistical significance was defined as a p -value < 0.05 . Multiple logistic regressions

were used to relate the use of sunscreen and skin cancer awareness with different socio-demographic variables.

3. Results

The questionnaire was distributed to 2900 Saudis. In total, 2622 questionnaires were completed, returned, and included in the data analysis, corresponding to a response rate of 90.4%. There was a diverse range of age of respondents; the mean age of respondents was 27.8 years (age range, 15–70 years; SD, 9.7). There was an equal gender split in respondents group (50% were men, 1301/1601). The socio-demographic records of the study population are depicted in [Table 1](#).

3.1. Sun exposure knowledge and behavior

The level of awareness among respondents regarding unprotected sun-exposure induced skin damage is shown in [Table 2](#). This study has indicated a high sun exposure rate among respondents; the mean weekly sun exposure duration was 19.13 h (SD, 14.25). The majority of respondents were aware that they have to avoid sun exposure from 11 am to 3 pm (87.7%, 2295/2617). Sixty-six percent (1741/2606) reported that they usually spend more time outdoors during winter compared to summer. Ninety-six percent (2467/2564) reported that sun exposure can cause skin tanning, while almost two thirds of respondents (67.7%, 1741/2571) were mindful of the association between sun exposure and skin burn. Forty-three percent (1109/2566) were aware of the relationship between sun exposure and skin aging. Understanding of the

Table 1 Socio-demographic data of the survey participants (a cohort of 2622 Saudis).

Characteristics	(%) Count ^a
<i>Gender</i>	
Males	(50) 1301
Females	(50) 1300
Age, Mean (SD),	(9.7) 27.8
<i>Marital Status</i>	
Un-married	(58.4) 1519
Married	(41.6) 1084
<i>Education</i>	
Illiterate	(1.4) 37
Secondary school or below	(31.9) 837
Above secondary school	(65.8) 1723
<i>Socioeconomic Status</i>	
High	(10.6) 266
Medium	(51.4) 1289
Low	(37.4) 951
<i>Occupation</i>	
Employed	(49.1) 1272
Student or un-employed	(50.9) 1319
<i>Residence</i>	
Urban	(88.4) 2262
Rural	(11.6) 296

^a The denominator is different among variables due to missing responses.

Table 2 Awareness of sun exposure-induced skin damage among 2622 respondents.

	Don't know (%) N	Yes (%) N	No (%) N
<i>What damage does excessive sun-exposure cause?</i>			
Skin burn	(67.7) 1741 ^a	(7) 180	(23.3) 650
Tanning	(96.2) 2467 ^a	(1.5) 39	(2.3) 58
Skin aging	(43.2) 1109 ^a	(15.9) 408	(40.9) 1049
Hyperpigmentation	(62.4) 1602 ^a	(9.9) 253	(27.7) 710
Skin cancer	(55.3) 1406 ^a	(11.9) 303	(32.8) 835
Has no side effects	(12.5) 217	(73.3) 1855 ^a	(14.2) 358

^a Correct answer.

Table 3 Multiple logistic regression analyses of skin cancer awareness and socio-demographic characteristics.

	Odds ratio (95% C.I.)	<i>p</i> value
Female	2.03 (1.7–2.4)	0.001
Younger age group	0.65 (0.5–0.8)	0.001
Postgraduates	1.25 (1–1.5)	0.02
Medium social class	0.77 (0.6–0.9)	0.02

association between sun exposure and skin hyperpigmentation was reported by 62% of the respondents (1602/2565). Fifty-five percent (1406/2544) were aware of the relationship between sun exposure and skin cancer. Sun bathing is not a common practice among our study group and 68% of our respondents (1777/2612) reported that they were never exposed to the sun for this intention. Seventeen percent (460/2618) gave a positive history of sunburn during the last 2 years. Twenty-six percent (674/2617) reported that they have skin hyperpigmentation. The male participants reported a higher weekly period of sun exposure than the females ($p < 0.0001$). Likewise, there was a significant increase in the duration of sun exposure in the younger age group ($p < 0.0001$). A higher weekly duration of sun exposure was associated with a positive history of sunburn ($p < 0.0001$). Respondents who accounted for a higher weekly length of exposure to the sun reported more skin hyperpigmentation ($p < 0.002$). Respondents who reported wearing head covers (Hijab or Ghotra) and women who reported using face covers (veil) were less likely to experience skin hyperpigmentation ($p < 0.006$ and < 0.008 , respectively). The logistic regression of demographic factors influencing perception of the relationship between sun exposure and skin cancer is summarized in [Table 3](#). Female, young and student respondents reported higher rates of skin cancer knowledge ($p < 0.001$). Similarly, middle social class and higher education levels were more likely to be linked with the understanding of the connection between sun exposure and skin cancer ($p < 0.02$). Nevertheless, there was no significant difference found in knowledge between respondents based on their social status or area of residence (rural vs. urban).

3.2. Sun protection measures

[Table 4](#) shows the sun-protective behavior of respondents. The majority of study respondents reported that they were protecting themselves during their outdoor activities by

Table 4 Sun-protection behaviors among 2622 respondents.

	Regularly (%) N	Never (%) N	Sometimes (%) N
<i>Which of the following do you often use during the daytime?</i>			
Head cover	(9.7) 249	(25.5) 689	(64.8) 1670
Face cover (veil)	(7.01) 90	(17.2) 221	(75.76) 972
Long-sleeved clothes	(5) 128	(37.3) 959	(57.7) 1481
Sunglasses	(18.5) 473	(38.6) 988	(42.9) 1097
Umbrella	(66.9) 1709	(24) 613	(9.2) 234
Stay in shade	(2.1) 54	(33.6) 874	(64.3) 1670

wearing long-sleeved clothes (95%, 2440/2568), wearing sunglasses (81.5%, 2141/2558), and seeking shade (97.9%, 2544/2598). Ninety percent (2329/2578) reported that they were using a head cover (Hijab for women or Ghotra for men) during their outdoor activities. In addition, 93% (1193/1283) of women respondents reported that they were using a face cover (veil). When asked “do clothes have any role in protection from sun hazards?”, 36% (945/2609) agreed, 54.2% (1413/2609) said that it depends on the clothing type, and 9.6% (251/2609) did not think that clothes have any role in sun protection. Twenty-one percent (558/2592) reported that they had never heard about sunscreen. Data on sunscreen knowledge and use among our respondents are shown in Fig. 1. Forty-one percent (1062/2566) reported that they never used sunscreen, while only 23.7% (608/2566) reported regular use of sunscreen during their outdoor activities. Of respondents who had ever used sunscreen, only 63.3% (1246/1969) of them were aware of the duration of its efficacy. Doctors, internet and media were the most common sources of information regarding sun exposure and protection as reported by 25.2% (609/2420), 23.4% (566/2420), and 24.4% (590/2420) of respondents, respectively. The logistic regression analysis of demographic factors influencing sunscreen use is shown in Table 5. Not surprisingly, women reported a higher rate of sunscreen use compared to men ($p < 0.001$). Similarly, employed, student respondents and younger respondents were more likely to use sunscreen compared to respondents who

Table 5 Logistic regression analysis of demographic factors influencing sunscreen use.

	(95% C.I.)	<i>p</i> value
Female	2.96 (2.4–3.6)	0.001
Married	0.79 (0.5–1.3)	0.37
Young age	1.18 (0.9–1.5)	0.21
Employed	1.96 (1.4–2.7)	0.001
Student	1.41 (1.0–2.0)	0.05

were unemployed and above 30 years, though, this effect was not considerable after adjusting for other factors. Similarly, it is found that married and single people used sunscreen more than divorced and widowed people; however, this effect was insignificant in the multivariate analysis.

4. Discussion

Little is known about public awareness and behaviors regarding sun exposure and protection measures among Saudi people. To our understanding and after a broad literature review, only one study was found on this topic that was conducted in one province of Saudi Arabia. Different regions of Saudi Arabia have diverse climate conditions, latitude and socio-cultural background. The climate of Saudi Arabia has distinct high temperatures during the day and low temperatures in nighttime. Most of the country follows the prototype of the desert climate, excluding southwest. From May to September, daytime temperatures reach 45 °C or higher throughout the country, with somewhat cooler coastal temperatures. The south has moderate temperatures, which can go as low as 10 °C during the summer in the mountains of Sarawat in Asir.

In our clinical dermatology practice, we noticed that many sun related skin disorders (e.g., sunburn) are more frequent in the winter because weather in the summer period is excessively hot and people are more prone to involve in recreational activities during winter season. This study has indicated a high sun

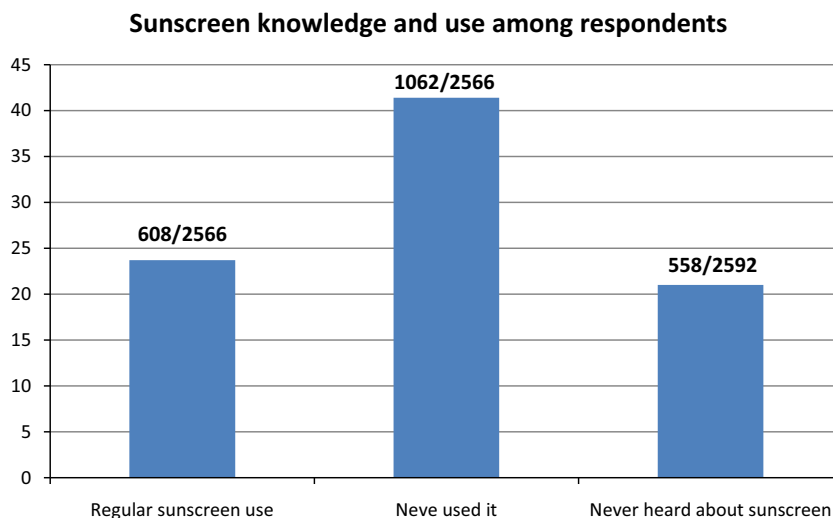


Figure 1 Sun screen knowledge and use among respondents.

exposure rate among respondents, with a mean of weekly sun exposure extent of 19.13 h (SD, 14.25). Males and the younger people were related with more sun exposure ($p < 0.0001$). Sixty-six percent of our study respondents reported that they generally spend extra time outdoors during winter compared to summer. Fifty-five percent demonstrated awareness of the link between sun exposure and the risk of skin cancer, which is similar to the previous study carried out in Qassim Province (Al Robaee, 2010). This level of knowledge is considered to be low compared to analogous studies carried out in western communities. For example, the linkage between skin cancer and sun exposure was made by around 90% of study participants in Australia, 85% in Canada, 92% in United States, and 92.5% in Malta (Aquilina et al., 2004). Consistent with prior research in this area, men gender and people with low educational levels had poorer knowledge. The outcome of this study has shown that women were more likely to be familiar with about the sun's detrimental effects on the skin and were more apt to take the protective measures, including sunscreen application. However, no gender distinction was noted in the use of protective clothing. The finding that women use sunscreen more often than men has been reported by a good number of studies on this subject matter (Al Robaee, 2010; Aquilina et al., 2004; Paul et al., 2003; Wesson and Silverberg, 2003; Thieden et al., 2004). Nikolaou et al. (2009) found that sunglasses was the most commonly used sun-protection measure in Mediterranean inhabitants (83.4%), while wearing protective clothes was not as much of popular (57.8%). They also found that sunscreen was used by the huge majority of their study group (77.1%). As we have shown, protective clothes were the most commonly used sun protection measure in Saudi Arabia, as 95% of respondents reported wearing long-sleeved clothes, 90% of them reported wearing a head cover (Hijab for women or Ghotra for men), and 93% of women respondents reported using a face cover (veil) during outdoor activities. This finding might be because the Saudi population has certain customs and traditions related to clothes; however, the sun protection effectiveness of these clothes is not well-known. The use of UV-blocking fabrics can provide tremendous protection against the hazards of sunlight, especially for the garments manufactured and labeled as UV-protective clothing (Gambichler et al., 2010). We feel that UV shielding clothes will be a very successful sun protective measure in our community if future educational programs regarding this subject and concern can be developed. Regardless of the reasonably good knowledge and familiarity among our study respondents that exposure to sun predisposes individuals to many skin disorders, including sunburn and skin cancer, the rate of sunscreen awareness was pretty low.

Our study pointed out that the rate of regular sunscreen use in the Saudi population is 23.7%. Additionally, 41.4% of the study respondents reported that they have never used sunscreen, and 21% of them had not at all heard about sunscreen. Approximately 37% of sunscreen users in this survey were not aware of the duration of sunscreen efficacy. Certainly, this low rate of sunscreen use and knowledge among the general Saudi population as reported by this study is quite alarming and should spotlight the interest in this issue with regard to future studies and health education programs. Knowledge only is not sufficient to make a transform in approach and perhaps more learning is needed.

Behaviorally based intervention strategies are desirable to bring a change in attitude and behavior. Life-long prevention habits are most flexible during childhood (Girgis et al., 1993). Schools are perfect locale because of their existing infrastructure to help children attaining the essential healthy behaviors. Sun protection perception and ideas can be integrated into existing areas of the curriculum and study programs, such as home economics, health, physical education and science.

This study has several strengths. It was a national survey and included a relatively large sample, which allow us to generalize our results to some degree. To avoid any bias, the survey was distributed to a fairly representative sample of the general community. We randomly chose one PHCC in each region of the five geographical regions of Saudi Arabia. Advanced statistical analysis was used (multiple logistic regression) to relate the use of sunscreen and skin cancer awareness with various socio-demographic variables. Nevertheless, this study has methodological limitations that should be kept in mind when interpreting the results. One limitation to our findings is the reality that the participants were asked to agree or disagree with offered statements about sun exposure hazards, including skin burn and skin cancer, which may bias responses and direct to an inaccurate evaluation of the proportion of community who have true and factual information of these sun exposure side effects. An open-ended questionnaire about the risk of sun exposure may possibly give a better assessment for the population that is not aware of sun exposure hazards. A further limitation of this study might share a possible recall bias.

5. Conclusion

This study has specified a low level of public awareness among the Saudi people about sun exposure dangers and sun protection measures. Additionally, this study has indicated that sun protection is generally insufficient in adults and only a small fraction of our population uses sunscreen during outdoor activities on a regular basis. This result emphasizes the need for further studies and future wellbeing education programs to raise public awareness of the sun's damaging effects on the skin and to highlight the significance of sunscreen use. In addition, prospective studies should specify the importance of protective clothes, such as some appropriate types of UV-blocking textile materials, for use among our Saudi population, as we believe that this kind of sun protection may be particularly convenient and suitable to our population.

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