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## ORIGINAL ARTICLE

# Knowledge, attitudes, and behaviors regarding sun protection, effects of the sun, and skin cancer among Turkish high school students and teachers

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## ABSTRACT

**Background/objective:** The incidence of skin cancer has increased dramatically worldwide over the past decades, and adolescents are prone to exposing themselves to the harmful effects of the sun. Although there are plenty of studies assessing the knowledge level and behavior of adolescents regarding sun protection and skin cancer, to the best of our knowledge, this is the first study evaluating both adolescents and their teachers. This study aimed to evaluate high school students' and teachers' knowledge, attitudes, and behaviors regarding sun protection and skin cancer.

**Methods:** A total of 396 students and 139 teachers from two high schools in Ankara, the capital of Turkey, were enrolled in the study. An anonymous questionnaire form was used to obtain the required data for our cross-sectional and nonrandomized study.

**Results:** Male students stayed significantly longer in the sun than female students ( $p < 0.001$ ). Only 41.8% of the students stated that they used a sunscreen when outside only in summer. This percentage was 81.9% for the teachers and is statistically higher than for the students ( $p < 0.001$ ). We found no difference with regard to sex, however, a female predominance in sunscreen usage has been reported in the literature.

**Conclusion:** Major information sources should be used more effectively to increase the knowledge level of the students.

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## Introduction

Solar ultraviolet radiation (UVR) is the most common environmental cause of the vast majority of skin disorders including skin cancer. Epidemiological studies have disclosed a strong association between solar UVR and all major types of skin cancer.<sup>1</sup> Although many factors such as advanced age, low Fitzpatrick skin types, and male gender have been associated with an increased risk of developing skin cancer, unprotected UVR exposure has been

reported as the single most important environmental risk factor.<sup>2</sup> Many epidemiological studies in the literature suggest that UVR from sun exposure and sunburns at early ages are associated with skin cancers in adulthood.<sup>3–5</sup> It was reported that a history of sunburn in early life almost doubles the risk of developing melanoma in adulthood.<sup>6–10</sup> The incidence of skin cancer is increasing in the world, hence, sun protection education is becoming crucial.<sup>11,12</sup>

Ankara, the capital of Turkey, has a semiarid or steppe climate with hot, dry summers and cold, snowy winters. The average temperature is 23°C in summer (minimum temperature 4.7°C and maximum temperature 41.0°C).<sup>13</sup> The average UV index value was 8.6 in summer 2012 and 5.0 (minimum 0.4 and maximum 9.9) throughout the year.<sup>14</sup>

The aim of this study was to evaluate high school students' and teachers' knowledge, attitudes, and behaviors concerning sun protection and skin cancer.

Conflicts of interest: The authors declare that they have no financial or non-financial conflicts of interest related to the subject matter or materials discussed in this article.

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## Materials and methods

### Design of the study

A cross-sectional study was conducted between January 2011 and January 2012 in the capital city Ankara. The study population included 400 students and 150 teachers from two high schools located in the center of the city.

### Study sampling

For our study, to determine the extent of the sampling, we used the formula  $n = Nt^2pq/d^2(N - 1) + t^2pq$ , which can be used when we know the number of elements of the statistically accepted research universe, and the extent of sampling was calculated as 384 people/students (Table 1). It was determined that a sample with 384 students could represent statistically all high school students in Ankara with 95% confidence. Considering this sample size, it was decided that two high schools were adequate for sampling. However, because the inhomogeneity of rural schools did not match with the schools located in the center of the city, we used the stratified sampling method (*aka* grouped sampling), in which all the elements in the universe have an equal chance of being selected, instead of the simple random sampling method. The strata were created according to the socioeconomic status of the city regions. In the sampling methods used in our study, schools were divided into two subgroups (central and rural) considering the socioeconomic status, and only one random school was selected from each subgroup. A school was selected for each stratum. The samples were selected using the simple random sampling method in the layers. Our sample of 396 students was statistically large enough to be representative of the research universe and could be generalized to all high school students in Ankara (Table 1).

### Questionnaire

The data were collected using an anonymous questionnaire that all participants were asked to complete during class time. Only the final core items, including 10 questions for adults and adolescents used by Glanz et al,<sup>15</sup> were used to obtain data to perform an objective evaluation. In the survey, both groups were asked 10 additional questions, in order to evaluate their detailed knowledge regarding sun protection, environmental factors, and the source of personal knowledge. In addition, we could compare the two groups using the additional questions. The study was performed after obtaining permission from the Governorate of Ankara and the Provincial Directorate of Education. Statistical analysis was

**Table 1** Determination of sample size with 95% confidence level and extent of the sampling ( $n = \frac{250000 \times 1.96^2 \times 0.5 \times 0.5}{0.05^2 \times (250000 - 1) + 1.96^2 \times 0.5 \times 0.5} \approx 384$ ).

Size of universe (person)	Accuracy (error can be tolerated)				
	±1%	±2%	±3%	±4%	±5%
1.000	<b>a</b>	<b>a</b>	<b>a</b>	375	278
2.000	<b>a</b>	<b>a</b>	696	462	322
3.000	<b>a</b>	1334	787	500	341
4.000	<b>a</b>	1500	842	522	350
5.000	<b>a</b>	1622	879	536	357
10.000	4899	1936	964	566	370
20.000	6489	2144	1013	583	377
50.000	8057	2291	1045	593	381
100.000	8763	2345	1056	597	383
500.000 to ∞	9423	2390	1065	600	<b>384</b>

The value in bold signifies 95% confidence level.

<sup>a</sup> In this case, >50% of the universe must be included in the sample.

performed using SPSS Version 16.0 statistical package program (SPSS, Inc., Chicago, IL, USA). The level of significance was  $p = 0.05$  in our study, and we used Pearson's Chi-square, Fisher's exact, and Student *t* tests for the statistical analysis.

## Results

A total of 396 students [218 students from Class 9 (aged between 14 years and 15 years), 96 students from Class 10 (aged between 15 years and 16 years), 42 students from Class 11 (aged between 16 years and 17 years), and 40 students from Class 12 (aged between 17 years and 18 years)] and 139 teachers completed the survey. The mean age was  $15.57 \pm 1.1$  years for the students and  $37.27 \pm 7.63$  years for the teachers; 61% of the students and 62.6% of the teachers were female (Table 2).

### Sun habits and sun protection behaviors

The most common time interval that the students were exposed to the sun was 2 h/d between 10 AM and 4 PM on weekdays in summer (45.6%). Male students stayed significantly longer in the sun than female students ( $p < 0.001$ ). The most common time interval on weekdays was 30 minutes to 1 hour for the teachers' group, and there was no difference between sexes.

A history of sunburn at least once in the past 12 months was higher in the teachers' group than in the students' group (51.4% and 38.8%,  $p = 0.023$  and  $p = 0.035$ , respectively). Only 41.8% of the students stated that they used a sunscreen when outside only in summer. This percentage was 81.9% for the teachers and statistically higher than that for the students ( $p < 0.001$ ). There was no difference between sexes in students regarding the usage of sunscreen products. The percentage of the male teachers who never wore sunscreen products was significantly higher than the female teachers (68.6% and 89.7%,  $p = 0.018$  and  $p = 0.039$ , respectively). The percentage of female students that never wore a hat for protection from sun exposure was significantly higher than the male students (67% and 33%,  $p < 0.001$ ).

None of the participants had a history of skin cancer in both groups. A history of skin cancer in relatives (1<sup>st</sup> or 2<sup>nd</sup> degree) was present in 3.1% of the students and 8.1% of the teachers.

Regarding protection from sun, 74.2% of the students and 96.4% of the teachers declared that they found that sun protection was necessary ( $p < 0.001$ ). Most male and female students never used an umbrella for protection from the sun (94.3% and 92.7%, respectively). The number and percentage of female teachers who used an umbrella to protect themselves from the sunlight were higher than those of the male teachers, male students, and female students (21.3% vs. 9.4%, 5.7%, and 7.3%, respectively;  $p < 0.001$  for all groups). Forty-nine percent of the students and 80.3% of the teachers agreed that sunglasses should be used for sun protection, in order to protect the eyes from the sun ( $p < 0.001$ ).

The majority of male and female students had never sunbathed (89.4% and 87.3%). The percentage of female teachers who spent time in the sun to induce tanning was statistically significantly higher than all the other groups (45.7% vs. 17.8%, 10.6%, and 12.7%, respectively;  $p < 0.001$  for all groups).

### Additional questions

To the first additional question regarding the sun protection factor (SPF) of sunscreen products, the majority of students answered that they did not know how much SPF was sufficient for sun protection (75.1% for males, 79.6% for females). Most of the teachers (50.8%) reported that an SPF of >30 could provide sufficient sun protection (Table 3).

**Table 2** Demographic data of the students and teachers.

Variable	Students						Teachers					
	Female		Male		All		Female		Male		All	
	n	%	n	%	n	%	n	%	n	%	n	%
Sex	241	61.0	155	39.1	396	100	87	62.6	52	37.4	139	100
Skin types												
Fair	26	6.6	19	4.8	45	11.4	4	2.9	8	5.7	12	8.6
Olive	45	11.3	28	7.1	73	18.4	29	20.9	6	4.3	35	25.2
Light brown	86	21.7	47	11.9	133	33.6	33	23.8	22	15.8	55	39.6
Dark brown	84	21.2	61	15.4	145	36.6	21	15.1	16	11.5	37	26.6

Almost half of the teachers (52.9%, predominantly females) used a sunscreen whenever they were outside. Most of the students (76.1%) applied sunscreen products only when they went out to the beach ( $p < 0.001$ ).

The face was the most important part of the body to be protected from sun exposure, according to both groups (Table 3). Half of the students (53.4%) stated that they did not know whether solarium was harmful and it could cause skin cancer in the long term or not; 26.2% of them agreed that solarium could cause skin cancer in the long term. Half of the teachers (55.4%) answered that solariums could cause skin cancer; 36.7% of them expressed no opinion regarding solariums (vs. students,  $p < 0.001$ ).

**Table 3** Knowledge level, attitudes, and behaviors of the participants regarding additional questions.

Variable	Students		Teachers		Total	
	n	%	n	%	n	%
<i>Knowledge level regarding SPF (AQ1: How much SPF is enough for sun protection in the summer?)</i>						
<15 SPF	31	8.8	6	4.7	37	7.7
15–30 SPF	27	7.6	40	31.2	67	13.9
>30 SPF	30	8.5	<b>65</b>	<b>50.8</b>	95	19.8
I do not know	<b>265</b>	<b>75.1</b>	17	13.3	282	58.6
<i>Priorities of body parts to protect from sun exposure according to the participants (AQ3: What part of the body should be most protected from sun exposure?)</i>						
Face	<b>142</b>	<b>39.9</b>	<b>49</b>	<b>38.3</b>	<b>191</b>	<b>39.5</b>
Trunk	137	38.5	48	37.5	185	38.5
Upper extremities	72	20.2	22	17.2	94	19.4
Lower extremities	5	1.4	9	7	14	2.9
<i>Sunscreen product selection priorities (AQ5: Which is the most important for you to choose a sunscreen product?)</i>						
Brand name	131	36	43	35	174	35.7
Price	20	5.5	3	2.4	23	4.7
SPF value	<b>154</b>	<b>42.3</b>	<b>66</b>	<b>53.7</b>	<b>220</b>	<b>45.2</b>
Smell	6	1.6	1	0.8	7	1.4
Fragrance free	12	3.3	4	3.3	16	3.3
Other	41	11.3	6	4.9	47	9.7
<i>Sunscreen product usage time (AQ6: When should you apply the sunscreen for appropriate protection?)</i>						
An hour ago	42	11.8	25	20	67	13.9
Half an hour ago	110	30.8	<b>78</b>	<b>62.4</b>	<b>188</b>	<b>39</b>
In the sun	<b>118</b>	<b>33.1</b>	20	16	138	28.6
After exposure	12	3.4	0	0	12	2.5
Other	74	20.7	2	1.6	76	15.8
I do not know	1	0.3	0	0	1	0.2
<i>Knowledge regarding reapplying sunscreens (AQ7: Is reapplying sunscreen essential for proper protection?)</i>						
Only before exposure	99	33.8	<b>57</b>	<b>52.3</b>	<b>156</b>	<b>38.8</b>
Once in 2–3 h	93	31.7	47	43.1	140	34.8
In the case of sunburn	<b>101</b>	<b>34.5</b>	5	4.6	106	26.4
<i>Information source regarding sun prevention (AQ8: Which of the following is your major information source regarding sun prevention?)</i>						
Television	<b>191</b>	<b>49.6</b>	<b>65</b>	<b>49.2</b>	<b>256</b>	<b>49.5</b>
Internet	95	24.7	57	43.2	152	29.4
School	50	13	2	1.5	52	10.1
Doctor	37	9.6	2	1.5	39	7.5
Family	12	3.1	6	4.5	18	3.5

The values in bold signify  $p < 0.05$ .

AQ = additional question; SPF = sun protection factor.

The majority of the teachers (53.7%) and students (42.3%) tended to classify and choose sunscreen products according to their SPF values. They thought that sunscreens with high SPF values were of better quality. Brand names were the second significant factor influencing the selection of sunscreen products (Table 3).

The majority of the teachers (62.4%) thought that a sunscreen should be applied half an hour prior to exposure, and 33.1% of the students tended to use sunscreen in the sun (Table 3). Half of the teachers (52.3%) used a sunscreen only in the morning. As detailed in Table 3, 34.5% of the students tended to reapply the sunscreen only in the case of sunburn.

The majority of the teachers (99.3%) and students (92.1%) thought that exposure to ultraviolet lights could cause skin cancer in the long term. A total of 60.2% of the students and 69.7% of the teachers agreed that prolonged exposure to the sun could cause cataracts. There was no statistical significance between the two groups in the last two questions. Drugs could cause sun sensitization, according to 91% of the teachers and 67.9% of the students ( $p < 0.001$ ).

The first and second most important information sources were television and the Internet for both groups. Only 9.6% of the students and 1.5% of the teachers benefit from health professionals regarding sun protection (Table 3).

## Discussion

This study was carried out to evaluate Turkish high school students' and teachers' knowledge and behaviors regarding the effects of the sun and sun protection. Although a lot of studies have evaluated knowledge levels, perceptions, and behaviors of adolescents regarding sun protection, to the best of our knowledge, our study is the first to assess both adolescents and their teachers.

Although a high-level of acceptance of the necessity of sun protection by students was determined by our questionnaire (74.2%), the behavior of the students' group was shown to be unsatisfactory. The prevalence of sunscreen usage among the adolescents in our study was only 41.8%. This prevalence was lower than that found in similar studies reported from Thailand (72.7%),<sup>16</sup> Australia (66.7%),<sup>17</sup> Italy (78.7%),<sup>18</sup> Brazil (74.3%),<sup>19</sup> and Switzerland (80.6%).<sup>20</sup> The percentage that we found was higher than that reported in only one study carried out in Singapore (22%).<sup>21</sup> We found no difference between sexes, although there was a female predominance in sunscreen usage in the literature.<sup>16,17,19</sup>

The percentage of familial cancer history in the students was lower (3.1%) than that reported in a previous study from Brazil (12.7%).<sup>19</sup> There was no significant difference in sunscreen use between students with and without a familial history of cancer (66.7% vs. 41.9%,  $p = 0.137$ ). Sunscreen use was significantly statistically higher in teachers with a familial cancer history (55.6% vs. 85.3%,  $p = 0.021$ ).

We found no association between sunburn history and skin types in both groups, although the previous studies in the literature reported an association.<sup>16,19</sup>

Proper use of a sunscreen product with an SPF of 30 before sun exposure can prevent sun damage, as reported in the literature.<sup>22,23</sup> Our study disclosed that the majority of the students did not know how much SPF was sufficient for sun damage prevention, and the teachers believed that a higher SPF (>30) could offer better protection. Reinau et al<sup>20</sup> reported that, in Switzerland, only 12.3% of the students chose the answer “I don't know”. SPF value was also the most significant cause of selection of a sunscreen for students and teachers in our study.

The incidence of skin cancer in Turkey was 18.9/100,000 in 2005.<sup>24</sup> In 2006, the estimated age-specific and age-adjusted incidence rates for all types of cancers, excluding nonmelanoma skin cancers, were 210.1/100,000 in males and 129.4/100,000 in females.<sup>25</sup> Skin cancer was among 10 most frequent cancer types in Turkey.<sup>24</sup> According to the data provided by KETEM (Cancer Early Diagnosis Screening and Training Center), skin cancer was the fourth most common cancer type with an incidence rate of 9.14/100,000 in Ankara in 2004.<sup>26</sup> In 2009, although the skin cancer incidence rate for the population between 15 years and 19 years of age was 0.8 [per 100,000 of the total population (6,234,620)], it was 7.1 in the 35–39-year age range [per 100,000 of the total population (5,505,313)]. Consequently, the population in the 35–39-year age range had an 8.87-times higher crude skin cancer rate in 2009.<sup>27</sup>

Turkey is a member of the Schools for Health in Europe, which is a network organization that includes 43 countries. The Republic of Turkish Ministry of Health Department of Health Promotion is the coordinating platform of the Schools for Health in Turkey. In 2008, as a project of the European Network of Health Promoting Schools, the Ministry of Health of Turkey initiated “Safe School Program” including missions of sun protection and early diagnosis of the skin cancers. Nurses played significant roles in the promotion of sun protection, education, and early diagnosis programs in schools.<sup>24</sup> In the high school curriculum, the scope of the lesson named “medical knowledge” was expanded, and solar damage and sun protection programs were included.

## Conclusion

In our study, we found that the teachers' group had a better knowledge than the students' group. A significant limitation of our study was that it included only two schools. Further studies including a larger number of institutions should be performed. Our results disclosed that there may be a problem in transferring the required and sufficient knowledge regarding sun protection from teachers to students. Major information sources such as television and the Internet should be used effectively with public health information campaigns to educate students and even teachers.

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