



Determination of Skin Cancer Risk Levels, Risk Perceptions, and Knowledge and Behaviors of Agricultural Workers

Tarımda Çalışanların Deri Kanseri Risk Düzeyleri, Risk Algıları, Bilgi ve Davranışlarının Belirlenmesi

Dilek AYAZ¹
Selma ÖNCEL²

¹Department of Public Health Nursing, Akdeniz University, Institute of Health Sciences, Antalya, Turkey

²Department of Public Health Nursing, Akdeniz University Faculty of Nursing, Antalya, Turkey

ABSTRACT

Objective: This study was conducted to determine skin cancer risk perceptions, risk levels, and sun protection knowledge and behaviors of agricultural workers.

Methods: The research was a descriptive type. It was made in Kumluca District, Antalya Province, between March and July 2015. The sample included 415 individuals working in agriculture. The data were collected by face-to-face interview method. Descriptive statistics, chi-square analysis, Mann-Whitney *U*-test, Kruskal-Wallis *H* test, and correlation analysis were used to evaluate the data.

Results: At the end of the study, it was determined that 25.5% of agricultural workers were at high risk, but that 50.8% did not consider themselves at risk for skin cancer. The mean knowledge score of participants was 6.40 ± 2.17 , and the mean behavior score was 9.11 ± 4.92 . The variables that significantly affect both knowledge and behavior mean scores are as follows: secondary school and above education level, female gender, high risk perception, being under age of 30, and working for less than 10 years. A weak positive relationship was found between the participants' mean knowledge and behavior scores.

Conclusion: Our study results showed that the skin cancer risk perception and sun protection knowledge and behaviors of agricultural workers were low. It was determined that individuals at young ages, with middle school education level and above, and working for less than 10 years had higher risk perception and knowledge and behavior scores. Within the scope of these results, it was recommended to organize training and screening programs for skin cancer and sun protection, especially for individuals with high risk levels and low knowledge, behavior, and risk perception levels.

Keywords: Public health nurse, agricultural workers, skin cancer, risk perception, sun protection behavior

ÖZ

Amaç: Bu çalışma, tarımda çalışanların deri kanseri risk algıları, risk düzeyleri, güneşten korunma bilgisi ve davranışlarını belirlemek amacıyla yapılmıştır.

Yöntemler: Araştırma tanımlayıcı tiptedir. Mart-Temmuz 2015 tarihleri arasında Antalya İli Kumluca İlçe merkezinde yapılmıştır. Örneklem, tarımda çalışan 415 birey alınmıştır. Veriler yüze görüşme yöntemi ile toplanmıştır. Verilerin değerlendirilmesinde; tanımlayıcı istatistikler, Ki-kare Analizi, Mann Whitney U testi, Kruskal Wallis-H testi, Korelasyon Analizi kullanılmıştır.

Bulgular: Araştırma sonunda tarımda çalışanların %25,5'inin yüksek risk düzeyinde olduğu, fakat %50,8'inin kendisini deri kanseri için riskli görmediği belirlenmiştir. Katılımcıların bilgi puan ortalaması $6,40 \pm 2,17$, davranış puan ortalaması $9,11 \pm 4,92$ 'dir. Hem bilgi hem de davranış puan ortalamalarını anlamlı düzeyde etkileyen değişkenler; ortaokul ve üzeri eğitim seviyesi, kadın cinsiyeti, yüksek risk algısı, 30 yaş altında ve 10 yıldan az süredir çalışıyor olmasıdır. Katılımcıların bilgi ve davranış puan ortalamaları arasında pozitif yönde zayıf bir ilişki bulunmuştur.

Sonuç: Çalışma sonuçları tarım çalışanlarının risk algısı, güneşten korunma bilgi ve davranışlarının düşük düzeyde olduğunu göstermiştir. Genç yaşta, ortaokul ve üzerinde eğitim seviyesinde ve 10 yıldan az süredir çalışıyor olanların, hem risk algılarının hem de bilgi ve davranış puan

Geliş Tarihi/Received: 14.05.2021

Kabul Tarihi/Accepted: 27.10.2022

Yayın Tarihi/Publication Date:

29.12.2022

Sorumlu Yazar/Corresponding author:

Dilek AYAZ

E-mail: 201950020002@ogr.akdeniz.edu.tr

Cite this article as: Ayaz D, Öncel S. Determination of skin cancer risk levels, risk perceptions, and knowledge and behaviors of agricultural workers. *J Nursology*. 2022;25(4):268-273.



Content of this journal is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License.

ortalamalarının daha yüksek olduğu belirlenmiştir. Bu sonuçlar kapsamında özellikle risk düzeyi yüksek, bilgi, davranış ve risk algı düzeyleri düşük bireylere yönelik, deri kanseri ve güneşten korunma eğitim ve tarama programlarının düzenlenmesi önerilmiştir.

Anahtar Kelimeler: Halk sağlığı hemşiresi, tarımda çalışanlar, deri kanseri, risk algısı, güneşten korunma davranışı

INTRODUCTION

Prolonged and repeated exposure to ultraviolet rays is the most important etiological factor in the development of skin cancer. Skin cancers caused by ultraviolet radiation (UVR) are among the most common types of occupational cancer worldwide.¹ The International Agency for Research on Cancer (IARC) has legally classified UVR as a human carcinogen (group 1).² Agricultural workers are exposed to UVR due to working outdoors for long hours. Therefore, they constitute an important risk group for skin cancer.³ According to the World Health Organization (WHO), every year 2-3 million non-melanoma, and 132.000 malignant melanoma skin cancers occur in the world.⁴

According to Global Cancer Observatory (GLOBOCAN) Turkey 2020 data, the 5-year prevalence of skin cancer is 6.43 per 100.000 people and the cumulative incidence rate is 0.18.⁵ In a retrospective descriptive pathological study conducted in Turkey, it was determined that skin cancer was the most common type of cancer (17%).⁶ It was also reported that agricultural workers have a higher incidence of skin cancer compared with other occupational groups and the general community.⁷⁻¹⁰

Minimizing the harmful effects of the sun's rays has a key role in protecting against skin cancer, which is a preventable type of cancer. Studies have shown that individuals with high skin cancer risk perceptions and risk levels attach more importance to sun protection^{11,12} and improve their knowledge¹³ and behavior positively.¹⁴⁻¹⁶ In order to reduce the incidence of skin cancer, it is important for healthcare professionals to determine the risk levels and risk perceptions of individuals and to provide consultancy and training on protective behaviors. For all these reasons, this study was conducted to determine the skin cancer risk perceptions, risk levels, and sun protection knowledge and behaviors of agricultural workers.

Research Questions

- What are the skin cancer risk perceptions of agricultural workers?
- What are the knowledge levels of agricultural workers regarding skin cancer and sun protection?
- How are the skin cancer prevention and sun protection behaviors of agricultural workers?
- What are the factors affecting the risk perceptions, knowledge levels, and skin cancer prevention and sun protection behaviors of agricultural workers?

METHODS

Design

The research was a descriptive type.

Population and Sample

This research was carried out in the Kumluca district center of Antalya, where most greenhouse agriculture is carried out in Turkey. The population and sample of the research were composed of agricultural workers in the district center, where agriculture is intensively carried out. Kumluca district employs different numbers of workers each season. The total number of employees

and casual or unpaid family workers working on their behalf was not reached. For this reason, the sample size was determined by using the sample determination formula in cases where the number of individuals in the universe is unknown. In calculating the sample size, the mean sun *protection knowledge score* of $P = .37$ and significance level of $d = 0.05$ in the study by Malak et al¹⁷ were used. The sample size to be included in the study was calculated as 415 individuals. No selection method was used in sample selection, and all agricultural workers who agreed to participate were included in the study. As a result of the research, the power of the study was calculated as 0.99 according to the post hoc power analysis made in the G-power program.

Data Collection

The research data were collected by the researchers between March and July 2015 using the face-to-face interview method. The data were collected with a questionnaire prepared by the researchers based on the literature.^{11,13,17-21} In the first part of the questionnaire, there were 9 questions about the sociodemographic characteristics of the individuals (age, gender, education level, number of years working in agriculture). In the second part, Fitzpatrick skin phototype classification (skin type 1 and 2 "high risk," skin type 3 and 4 "medium risk," and skin type 5 and 6 "low risk") was used to determine skin cancer risk levels. Individuals' risk perceptions were determined with the question, "How do you see your risk of developing skin cancer?" The knowledge level of the participants was measured with 12 questions prepared by examining the relevant literature ("1" point for correct answers, "0" points for incorrect and do-not-know answers). An increase in the mean scores of individuals was interpreted as a good level of knowledge. Behavior level was evaluated with 11 questions based on the "Sun Protection Behavior Scale,"¹⁹ which was developed for adolescents. The pre-application of the data collection form was made with 20 agricultural workers. At this stage, it was observed that individuals had insufficient adaptation to the current scale. Some additions and changes were made considering that this scale was not suitable for agricultural workers. Individuals' responses were scored as 3 points for "always," 2 points for "often," 1 point for "sometimes," and 0 points for "never." Scores ranged from 2 to 25. An increase in the mean score was interpreted as good sun protection behavior.

Statistical Analysis

Skin cancer risk perception and sun protection knowledge and behavior mean scores were the dependent variables of the study. The independent variables of the study were sociodemographic characteristics and risk levels of the participants. The analysis of the data was made with the Statistical Package for Social Sciences 21.0 software package. The number and percentage distributions of the employees' sociodemographic characteristics, skin cancer risk levels, risk perceptions, and sun protection knowledge and behavior scores were used. Nonparametric tests were applied because the dependent variables did not conform to normal distribution. Chi-square test, Bonferroni-corrected chi-square test, Kruskal-Wallis H test, and Mann-Whitney U -test were used. Whether there was a relationship between the participants' skin

cancer and sun protection knowledge and behavior score averages was determined by the Spearman correlation test. In all analyses, an alpha value of $P < .05$ was accepted as the limit of significance.

Ethics

Ethical consent was obtained from the Akdeniz University Clinical Research Ethics Committee (70904504), and informed consent was obtained from participants.

RESULTS AND DISCUSSION

Sociodemographic characteristics of the individuals are shown in Table 1. Among the participants, 60.7% were male ($n=252$) and their mean age was 43.23 ± 13.39 . More than half of the individuals (68.4%) had a primary school education level and below. The mean length of time spent working by all participants was 23.4 ± 12.07 years. Among the risk factors for skin cancer, the rate of individuals with a family history of skin cancer was 3.4%, while the rate of individuals with skin cancer was 0.24. The percentage of individuals with 11 or more moles on their body was 84.1%, and 42.7% stated that they had suffered from sunburn at least once in the last year.

According to the Fitzpatrick skin type classification, it was determined that the majority of participants (73.0%) were in the skin type 3 and 4 groups, indicating a moderate risk level. The number of individuals with a low risk level was very small ($n=6$, 1.5%). One in 4 people had a high risk level (25.5%). It was determined that 50.8% of individuals did not consider themselves at risk of developing skin cancer. Staying in the sun for a long time was the factor that most affected the perception of risk (38.8%) (Table 2).

Participants' skin cancer risk perceptions and risk levels were compared. According to the Bonferroni-corrected chi-square test, risk perceptions of individuals with low and high risk levels differed significantly ($\chi^2=8.516$, $P=.014$). The higher the risk level, the higher the risk perception.

Table 1. Sociodemographic Characteristics of Individuals (n = 415)

Individual Features	n	%
Age (mean age: 43.23 ± 13.39)		
<30	69	16.6
30-39	103	24.8
40-49	122	29.4
≥ 50	121	29.2
Gender		
Female	163	39.3
Male	252	60.7
Education level		
Primary school and below	284	68.4
Middle school and above	131	31.6
Total working years (mean working years 23.4 ± 12.07)		
≤ 10 years	84	20.2
11-29 years	194	46.7
≥ 30 years	137	33.0
Total	415	100

Table 2. Individuals' Skin Cancer Risk Levels and Risk Perceptions

	n	%
Risk level		
Low risk (type 5 and 6)	6	1.5
Moderate risk (type 3 and 4)	303	73.0
High risk (type 1 and 2)	106	25.5
History of previous illness	1	0.2
Family history of skin cancer	14	3.4
Sunburn in the last 1 year	177	42.7
Risk perception		
Feeling at risk	211	50.8
Not feeling at risk	204	49.2
Reasons for seeing yourself at risk		
Long stay in sun	152	38.8
Having sensitive skin type	50	12.5
History of previous illness	1	0.2
Family history of skin cancer	11	2.7
Total	415	100

One of the most important findings of the study was that 1 out of every 4 people were (25.5%) at high risk and 3 out of 4 people (73.0%) were at medium risk. A high number of individuals with low risk levels also reduces the possibility of developing skin cancer. In this study, there were only 14 individuals (3.4%) with a family history of skin cancer. In studies conducted with farmers in Australia and America, the rate of having a family history of skin cancer varies between 6% and 37%^{22,23} and a history of suffering from skin cancer between 5% and 42%.^{20,24-26} In this study, only 1 person was diagnosed with skin cancer. The low number of individuals diagnosed with skin cancer in a city such as Antalya, where the sun is directly overhead, may be due to individuals not applying to health services due to being unaware of the changes in their bodies. In addition, the fact that skin screening is not routinely performed as an early diagnosis method in primary health care services may be another reason. An important result was that about half of the participants (42.7%) had a history of sunburn in the last year. A similar result was found in open field workers in Cyprus, which is similar in terms of climate characteristics (48.9%).¹⁴

When the studies conducted with farmers were examined, it was seen that the risk perceptions of individuals were generally at a low level, in line with the results of this study.^{13,15,18,27} In a study by Rocholl et al.²⁷ in which the skin cancer risk perceptions of agricultural workers were evaluated qualitatively, it was determined that the participants underestimated the risk of skin cancer. In a study conducted in South Wales, 40.3% of individuals underestimated the risk of developing skin cancer.²⁸ As in this study, in the study of Panahi et al.²⁹ individuals feel at risk due to staying in the sun for a long time. Moreover, it was found that individuals with low risk perception exhibit less sun protection behavior.³⁰ Similar to the results of Öncel and Gündoğdu's³¹ literature review, it was an expected result that individuals with high risk level and risk perception had better sun protection behaviors. In addition, it was determined that having sunburn in the last 1 year increased the risk perception and indirectly the behavior of sun protection.³² According to the study by Janda et al.²⁰ individuals who stated that their skin burned very quickly had higher sun protection

scores. In the study by Kearney et al.¹³ it was found that people with fair skin and sensitive skin were more prone to protective behaviors than those with less sunburn. In studies, it was determined that the low risk perception in individuals was increased with education and information, and sun protection behaviors developed positively.³³ For this reason, it appears that training is important in order to develop protective behaviors in individuals.

Factors Affecting Individuals' Knowledge and Behavior Related to Skin Cancer and Sun Protection

Sociodemographic characteristics, risk levels, risk perceptions, knowledge, and behavior mean scores are compared in Tables 3 and 4. The mean knowledge score of the participants was 6.40 ± 2.17 over a score of 0-12 (Table 5). Although there was a significant difference between women and men, this difference was small ($U_z = -2.425$, $P = .015$). The mean knowledge scores of individuals who were 50 years old and above and those who had primary school education and below were significantly lower, ($\chi = 54.485$, $P = .000$; $U_z = -6.374$, $P = .000$, respectively). Similarly, the mean knowledge scores of individuals with high risk level and risk perception were also found to be high ($\chi^2 = 9.362$, $P = .009$; $U_z = -8.106$, $P = .000$) (Table 3).

One of the important results of the study is that individuals younger than 30 years of age (8.11 ± 1.96) and with secondary

Table 3. Comparison of Individuals with Sociodemographic Characteristics and Mean Knowledge Scores (n = 415)

Features	Mean Knowledge Scores		
	$\bar{x} \pm ss$	P	$\chi^2/U_{(z)}$
Gender			
Female	6.71 ± 2.18	.015	-2.425*
Male	6.21 ± 2.15		
Age			
<30	8.11 ± 1.96	<0.001	54.485**
30-39	6.33 ± 2.27		
40-49	6.19 ± 2.06		
≥ 50	5.71 ± 1.80		
Education level			
Primary school and below	5.94 ± 2.10	<0.001	-6.374*
Secondary school and above	7.41 ± 1.98		
Total working years			
≤ 10	7.78 ± 2.12	<0.001	40.499**
11-29	6.15 ± 2.08		
≥ 30	5.92 ± 2.00		
Risk perception			
Not feeling at risk	5.55 ± 1.92	<0.001	-8.106*
Feeling at risk	7.28 ± 2.07		
Risk level			
Low risk (type 5 and 6)	6.33 ± 0.51	.009	9.362**
Moderate risk (type 3 and 4)	6.19 ± 2.08		
High risk (type 1 and 2)	7.02 ± 2.38		

* $U_{(z)}$: Mann-Whitney U test; ** χ^2 : chi-square test.

Table 4. Comparison of Individuals with Sociodemographic Characteristics and Mean Behavior Scores (n = 415)

Features	Mean Behavior Scores		
	$\bar{x} \pm ss$	P	$U_{(z)}/\chi^2$
Gender			
Female	9.84 ± 5.16	.021	-2.312*
Male	8.65 ± 4.70		
Age			
<30	11.8 ± 4.96	<0.001	31.057**
30-39	8.25 ± 4.52		
40-49	9.00 ± 5.14		
≥ 50	8.38 ± 4.46		
Education level			
Primary school and below	8.27 ± 4.49	<0.001	-5.273*
Secondary school and above	10.95 ± 5.30		
Total working years			
≤ 10	11.0 ± 5.06	<0.001	18.597**
11-29	8.61 ± 4.46		
≥ 30	8.67 ± 5.19		
Risk level			
Low risk (type 5-6)	13.3 ± 6.71	.002	12.138**
Moderate risk (type 3-4)	8.56 ± 4.51		
High risk (type 1-2)	10.4 ± 5.57		
Risk perception			
Feeling at risk	10.75 ± 4.91	<0.001	-7.577*
Not feeling at risk	7.53 ± 4.39		

* $U_{(z)}$: Mann-Whitney U-test; ** χ^2 : chi-square test.

school education and above have a higher mean knowledge score than the others (7.41 ± 1.98).

In parallel with the results of this study, the study by McCool et al¹¹ found that young people with a high level of education had high mean knowledge scores.¹¹ In a study conducted in Turkey, the level of knowledge increased from 37.1% to 65.7% after the applied training.¹⁷ Education can be considered as a result that is expected to lead to changes in knowledge and behavior in people.

It was an important finding that the increase in the level of knowledge in this study also improved the sun protection behavior level positively. In the study by Carley and Stratman,¹⁸ it was shown that increasing the knowledge of individuals had a positive effect on their behavior. Considering the studies aimed at increasing the level of knowledge, radio messages,³⁴ counseling,¹⁶ and educational interventions²² have been effective. These

Table 5. Relationship Between Mean Knowledge and Behavior Scores of Individuals Participated in Study

	Mean \pm ss	Min	Max	r ^s	P
Mean knowledge score	6.40 ± 2.17	0	12	0.526	<0.001
Mean behavior score	9.11 ± 4.92	2	25		

*Spearman correlation analysis.

results revealed the necessity of informing agricultural workers in different ways and in every environment where there is an opportunity.

The mean behavior score of the participants was calculated as 9.11 ± 4.92 over a score of 2-25 (Table 5). As seen in Table 4, a significant difference was found between mean behavior scores and all variables. Women's mean behavior scores were significantly higher than those of men (9.84 ± 5.16) ($U_z = -2.312$, $P = .021$). The mean behavior scores of individuals with high levels of education and risk perception were significantly higher ($U_z = -5.273$, $P < 0.001$; $U_z = -7.577$, $P < 0.001$) (Table 4).

Participants' mean behavior scores were quite low. As in the systematic review by Kearney et al.³⁵ this result was an indication that agricultural workers did not exhibit adequate sun protection behavior to protect against skin cancer.

It is known that women display more sun protection behavior than men.^{15,24,30} Traditionally, women wearing long sleeves and covering their head with the help of a scarf can be effective in unwittingly demonstrating sun protection behavior. In general, the most preferred method of sun protection is the use of a traditional type of brimmed hat.^{27,36,37} The fact that employees prefer to wear hats with only a front part may be due to the fact that these hats are distributed free of charge by pesticide and fertilizer dealers and have less risk of snagging on plants than wide-brimmed ones.

Contrary to the study by Babazadeh et al.³⁸ another remarkable result was that as education level increased, sun protection behavior increased. Therefore, educational interventions aimed at increasing the health literacy of agricultural workers should be implemented. In parallel with the literature, the least used protection method in this study was the use of sunglasses and sunscreen.^{29,37,39,40} In the studies conducted, it has been reported that the reasons for individuals not to exhibit sun protection behavior are "too hot" for long-sleeved shirts and trousers, "expensive" and "forgetting" for sunscreen, and "unusable" for a wide-brimmed hat.^{27,29}

It was also examined whether there was a relationship between the participants' mean knowledge and behavior scores. As a result of Spearman correlation analysis, a weak positive relationship was found ($r = 0.526$, $P < 0.001$) (Table 5). In the cross-sectional study of D'Souza et al.²⁸ unlike our results, no relationship was found between sun protection knowledge and behaviors.

The low level of education of agricultural workers made it difficult for them to adapt to existing surveys. Different measurements and evaluations in other studies and the lack of a common scoring method prevented comparison. In addition to all these, the lack of validity and reliability of the questionnaire used constituted the limitations of this study.

Limitations of Study

The research was carried out with a group of agricultural workers living in Kumluca district of Antalya. The unique cultural characteristics and low education level of the agricultural workers made it difficult to adapt to the existing scales. Lack of a standard data collection form suitable for agricultural workers was among the limitations of the study. In addition, responses of employees to sun protection behavior are based on declaration without observation.

CONCLUSION

Our study results showed that the skin cancer risk perception and sun protection knowledge and behaviors of agricultural workers were low. Furthermore, knowledge and behavior mean scores were interrelated. The majority of individuals were at medium- and high-risk levels. Within the scope of these results, it had been confirmed that agricultural workers constitute a risky group. High-risk individuals who had fair and sensitive skin, worked under the sun for long hours, had a history of skin cancer, or had a family history of skin cancer should be prioritized in terms of screening and education programs. Furthermore, for those with low knowledge and behavior levels, it was suggested that skin cancer and sun protection interventions should be organized for men, 50 years old and above, primary school education and below, 30 years or more of working years, and individuals with low risk perception. Especially, public health nurses working in primary care are more likely to encounter agricultural workers. Public health nurses should inform agricultural workers about skin cancer risk factors and risk levels. In addition, individuals should be taught skin self-examination. Sun protection training can be held in agricultural fair and event areas where individuals are present collectively. In conclusion, it was recommended to develop routine screening programs and implement training interventions for this group working in open spaces for long hours.

Ethics Committee Approval: Ethical committee approval was received from the Ethics Committee of Akdeniz University (Date: 17.02.2015, No: 70904504).

Informed Consent: Informed consent was obtained from all participants who participated in this study.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept - DA, SÖ; Design - DA, SÖ; Supervision - SÖ; Resources - DA, SÖ; Data Collection and/or Processing - DA; Analysis and/or Interpretation - DA, SÖ; Literature Search - DA, SÖ; Writing Manuscript - DA; Critical Review - DA, SÖ.

Declaration of Interests: The authors declare that they have no competing interest.

Funding: The authors declare that this study had received no financial support.

Etik Komite Onayı: Bu çalışma için etik komite onayı Akdeniz Üniversitesi Klinik Olmayan Araştırmalar Etik Kurulundan (Tarih: 17.02.2015, No:70904504) alınmıştır.

Hasta Onayı: Bu çalışmaya katılan tüm katılımcılardan bilgilendirilmiş onay alınmıştır.

Hakem Değerlendirmesi: Dış bağımsız.

Yazar Katkıları: Fikir -DA, SÖ; Tasarım - DA, SÖ; Denetleme - SÖ; Kaynaklar -DA, SÖ; Veri Toplanması ve/veya İşlemesi - DA; Analiz ve/veya Yorum - DA, SÖ; Literatür Taraması - DA, SÖ; Yazıyı Yazan - DA; Eleştirel İnceleme - DA, SÖ.

Çıkar Çatışması: Yazarlar, çıkar çatışması olmadığını beyan etmişlerdir.

Finansal Destek: Yazarlar, bu çalışma için finansal destek almadıklarını beyan etmişlerdir.

REFERENCES

1. de Graaf L, Talibov M, Boulanger M, et al. Health of greenspace workers: morbidity and mortality data from the AGRICAN cohort. *Environ Res.* 2022;212(C):113375. [CrossRef]

2. International Agency for Research on Cancer (IARC). Radiation volume 100 D. A study on man. Lyon: WHO Press; 2012. Available at: <http://monographs.iarc.fr/ENG/Monographs/vol100D/mono100D.pdf>. Accessed 26 Feb 2022.
3. Rushton L, J Hutchings S. The burden of occupationally-related cutaneous malignant melanoma in Britain due to solar radiation. *Br J Cancer*. 2017;116(4):536-539. [\[CrossRef\]](#)
4. World Health Organization. How common is skin cancer? *Radiation: Ultraviolet Radiation (UV) and Skin Cancer*; 2020. Available at: [https://www.who.int/news-room/q-a-detail/radiation-ultraviolet-\(uv\)-radiation-and-skin-cancer#](https://www.who.int/news-room/q-a-detail/radiation-ultraviolet-(uv)-radiation-and-skin-cancer#).
5. World Health Organization. *The Global Cancer Observatory, Turkey Globocan*; 2020. Available at: <https://gco.iarc.fr/today/data/factsheet/populations/792-turkey-fact-sheets.pdf>.
6. Bař Y, Erenler BH, Güney G, et al. Distribution of cancer cases between January 01, 2014 and December 30, 2016 in Çorum City, Turkey. *Turk J Oncol*. 2017;32(4):153-159.
7. Togawa K, Leon ME, Lebailly P, et al. Cancer incidence in agricultural workers: findings from an international consortium of agricultural cohort studies (AGRICOH). *Environ Int*. 2021;157:106825. [\[CrossRef\]](#)
8. Zhao G, Ronda E, Cea L, Pulido J, Barrio G, Regidor E. Mortality by cause of death and risk behaviors in farmers versus non-farmers: the importance of avoiding the healthy worker effect. *Int Arch Occup Environ Health*. 2019;92(4):599-608. [\[CrossRef\]](#)
9. Trakatelli M, Barkitzi K, Apap C, Majewski S, De Vries ED, EPIDERM group. Skin cancer risk in outdoor workers: a European multicenter case-control study. *J Eur Acad Dermatol Venereol*. 2016;30(3):5-11. [\[CrossRef\]](#)
10. Juzeniene A, Grigalavicius M, Baturaite Z, Moan J. Minimal and maximal incidence rates of skin cancer in Caucasians estimated by use of sigmoidal UV dose-incidence curves. *Int J Hyg Environ Health*. 2014;217(8):839-844. [\[CrossRef\]](#)
11. McCool JP, Reeder AI, Robinson EM, Petrie KJ, Gorman DF. Outdoor workers' perceptions of the risks of excess sun-exposure. *J Occup Health*. 2009;51(5):404-411. [\[CrossRef\]](#)
12. Hammond V, Reeder AI, Gray AR, Bell ML. Are workers or their workplaces the key to occupational sun protection? *Health Promot J Austr*. 2008;19(2):97-101. [\[CrossRef\]](#)
13. Kearney GD, Lea CS, Balanay J, et al. Assessment of sun safety behavior among farmers attending a regional farm show in North Carolina. *J Agromedicine*. 2013;18(1):65-73. [\[CrossRef\]](#)
14. Dag S, Hisar F. Determination of knowledge and applications of workers working out in the open about skin cancer. *TAF Prev Med Bull*. 2016;15(6):532-536. [\[CrossRef\]](#)
15. Reeder AI, Gray A, McCool JP. Occupational sun protection: workplace culture, equipment provision and outdoor workers' characteristics. *J Occup Health*. 2013;55(2):84-97. [\[CrossRef\]](#)
16. Robinson JD, Silk KJ, Parrott RL, Steiner C, Morris SM, Honeycutt C. Healthcare providers' sun-protection promotion and at-risk clients' skin-cancer-prevention outcomes. *Prev Med*. 2004;38(3):251-257. [\[CrossRef\]](#)
17. Malak AT, Yildirim P, Yildiz Z, Bektas M. Effects of training about skin cancer on farmers' knowledge level and attitudes. *Asian Pac J Cancer Prev*. 2011;12(1):117-120.
18. Carley A, Stratman E. Skin cancer beliefs, knowledge, and prevention practices: a comparison of farmers and nonfarmers in a midwestern population. *J Agromedicine*. 2015;20(2):85-94. [\[CrossRef\]](#)
19. Aygun O, Ergun A. Validity and reliability of sun protection behavior scale among Turkish adolescent population. *Asian Nurs Res*. 2015;9(3):235-242. [\[CrossRef\]](#)
20. Janda M, Stoneham M, Youl P, et al. What encourages sun protection among outdoor workers from four industries? *J Occup Health*. 2014;56(1):62-72. [\[CrossRef\]](#)
21. Buster KJ, You Z, Fouad M, Elmets C. Skin cancer risk perceptions: a comparison across ethnicity, age, education, gender, and income. *J Am Acad Dermatol*. 2012;66(5):771-779. [\[CrossRef\]](#)
22. Jeihooni AK, Rakhshani T. The effect of educational intervention based on health belief model and social support on promoting skin cancer preventive behaviors in a sample of Iranian farmers. *J Cancer Educ*. 2019;34(2):392-401. [\[CrossRef\]](#)
23. Gaetano DE, Hodge B, Clark A, Ackerman S, Burdick P, Cook ML. Preventing skin cancer among a farming population: implementing evidence-based interventions. *AAOHN J*. 2009;57(1):24-31; quiz 32. [\[CrossRef\]](#)
24. Woods CE, O'Shea E, Barrett F, Bookallil L, East L, Usher K. Occupational exposure: rural Australian farmers' sun-protective behaviours. *J Public Health (Berl)*. 2020;28(6):675-684. [\[CrossRef\]](#)
25. Susitaival P, Beckman R, Samuels SJ, Schenker MB. Self-reported dermatitis and skin cancer in California farm operators. *Am J Ind Med*. 2004;46(2):136-141. [\[CrossRef\]](#)
26. Carpenter WS, Lee BC, Gunderson PD, Stueland DT. Assessment of personal protective equipment use among midwestern farmers. *Am J Ind Med*. 2002;42(3):236-247. [\[CrossRef\]](#)
27. Rocholl M, Ludewig M, John SM, Bitzer EM, Wilke A. Outdoor workers' perceptions of skin cancer risk and attitudes to sun-protective measures: a qualitative study. *J Occupational Health*. 2020;62(1):1-9.
28. D'Souza C, Kramadhari N, Skalkos E, Dutton T, Bailey J. Sun safety knowledge, practices and attitudes in rural Australian farmers: a cross-sectional study in western New South Wales. *BMC Public Health*. 2021;21(1):731. [\[CrossRef\]](#)
29. Panahi H, Salehi L. Perspectives of paddy workers regarding the use of sunscreen: a theory-based qualitative research. *Arch Public Health*. 2019;77(35):35. [\[CrossRef\]](#)
30. Zink A, Schielein M, Wildner M, Rehfuess EA. 'Try to make good hay in the shade - it won't work!' A qualitative interview study on the perspectives of Bavarian farmers regarding primary prevention of skin cancer. *Br J Dermatol*. 2019;180(6):1412-1419. [\[CrossRef\]](#)
31. Öncel S, Gündoğdu D. Deri kanseri risk Algisının güneşten korunma Davranışlarına etkisi: sistematik derleme. *Turk Klin Public Health Nurs-Spec Top*. 2017;3(1):52-60.
32. Riccò M, Razio B, Poletti L, Panato C. Knowledge, attitudes, and sun-safety practices among agricultural workers in the autonomous province of Trento, North-Eastern Italy (2016). *G Ital Dermatol Venereol*. 2020;155(1):31-40. [\[CrossRef\]](#)
33. Gharlipour Z, Taheri AM, Mohebi S. Effect of educational program-based protection motivation theory on preventive behaviors of skin cancer among farmers in Kashan. *Int J Cancer Manag*. 2019;12(3):9.
34. Jones K, Parrott R, Lemieux R. Rural farmers' exposure to radio messages about sun protection: implications for skin cancer prevention. *J Radio Stud*. 2001;8(2):411-424. [\[CrossRef\]](#)
35. Kearney GD, Xu X, Balanay JA, Becker AJ. Sun safety among farmers and farmworkers: a review. *J Agromedicine*. 2014;19(1):53-65. [\[CrossRef\]](#)
36. Backes C, Milon A, Koechlin A, Vernez D, Bulliard JL. Determinants of sunburn and sun protection of agricultural workers during occupational and recreational activities. *J Occup Environ Med*. 2017;59(11):1089-1094. [\[CrossRef\]](#)
37. Schenker MB, Orenstein MR, Samuels SJ. Use of protective equipment among California farmers. *Am J Ind Med*. 2002;42(5):455-464. [\[CrossRef\]](#)
38. Babazadeh T, Nadrian H, Banayejeddi M, Rezapour B. Determinants of skin cancer preventive behaviors among rural farmers in Iran: an application of protection motivation theory. *J Cancer Educ*. 2017;32(3):604-612. [\[CrossRef\]](#)
39. Ragan KR, Buchanan Lunsford N, Thomas CC, Tai EW, Sussell A, Holman DM. Skin cancer prevention behaviors among agricultural and construction workers in the United States, 2015. *Prev Chronic Dis*. 2019;16(15):E15. [\[CrossRef\]](#)
40. Trenerry C, Fletcher C, Wilson C, Gunn K. "She'll Be Right, Mate": a mixed methods analysis of skin cancer prevention practices among Australian farmers—an at-risk group. *Int J Environ Res Public Health*. 2022;19(5):2940. [\[CrossRef\]](#)