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THE RELATIONSHIP BETWEEN MALIGNANT SKIN DISEASES AND HEALTH LITERACY AND PROTECTION FROM SUN AND SKIN CANCER: A CASE-CONTROL STUDY

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Abstract – *Objective:* *In recent years, skin cancer increased with the increase in sun exposure of people all over the world. In this study, we aimed to find out how much people in Turkey know about how to protect themselves from the sun and skin cancer, how they act to protect themselves from the sun and skin cancer, how they feel about sun protection, and how well they understand health issues.*

Patients and Methods: *This study was designed as a case-control study. This study included 105 patients who were followed up in our clinic with malignant skin diseases (malignant melanoma (MM), basal cell carcinoma (BCC), and squamous cell carcinoma (SCC)) between March 2020 and March 2021. Our control group comprised 105 healthy volunteers. This study collected data with a data collection form and the Health Literacy Scale.*

Results: *The results showed that the mean knowledge level of the control group was higher than that of the case group. Similarly, the mean behavior of protection from sun and skin cancer and mean sun protection attitude is higher in the control group than in the malignant skin diseases group. There is a statistically significant difference between the mean health literacy levels of the malignant skin disease group and the control group. The mean health literacy levels of the malignant skin disease group are lower than the control group. There is a statistically significant effect of health literacy, age, knowledge level of protection from sun and skin cancer, and behavior of protection from sun and skin cancer on the probability of skin cancer.*

Conclusions: *Increasing the level of knowledge may positively affect compliance with skin cancer preventive measures and decrease skin cancer-related morbidity and mortality.*

KEYWORDS: *Knowledge, Skin cancer, Sun protection, Behavior.*

INTRODUCTION

Skin cancer is very common, and the incidence has increased in recent years. Skin cancer is a type of cancer that can be curatively treated if diagnosed early and can be prevented by skin cancer protection behaviors such as sun protection and skin self-examination. The most common skin cancers are basal cell carcinoma (BCC), squamous cell carcinoma (SCC), and malignant melanoma (MM). In the last 20–30 years, a significant increase in the incidence and mortality of MM has been observed compared to other cancers[1-3].

Genetic and environmental factors play a role in the development of skin cancer. Sun exposure is the most common environmental factor. People with fair skin, freckles, many nevi, atypical or dysplastic nevi, a family history of skin cancer, people who spend a lot of time outdoors, near the equator, at high altitudes, or who are exposed to

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intense sunlight all year round are the most at risk. In addition, radioactive radiation therapy (irradiation) for any reason, open wounds that have not healed for many years, tar, pitch, arsenic, etc., are all factors that can cause skin cancer. Skin cancer can also result from chronic exposure to chemical carcinogens, e.g., chronic microtrauma[4-6]. Increased public tanning, holiday sun exposure, and similar activities have increased the negative effects of ultraviolet (UV) radiation on human health. Reducing people's exposure to UV radiation from sunlight by developing positive sun protection behaviors is the most important part of reducing the public health burden of skin cancer[3].

Health literacy is understood, interpreted, and appropriate behavior when a patient is asked to provide medical information. When comparing people with inadequate and limited health literacy with people with adequate health literacy, it is known that diagnosis and treatment are delayed, hospital stays are longer, unnecessary hospital costs increase, and the rate of unnecessary investigations is higher. In examining the relationship between people's health literacy and their health management, we find that people with insufficient or limited health literacy use preventive health services less than people with sufficient health literacy and that their management of chronic diseases is poorer. Mortality and morbidity rates are also higher among these people[7,8].

The incidence of skin cancer has increased considerably in recent years. This risk results from the cumulative effects of lifelong sun exposure[9]. However, it has been proven that 80% of skin cancers can be prevented with effective prevention methods and regular habits[10]. For this reason, it is very important to inform people about the issue and encourage them to change their attitudes and behaviors towards skin cancer. People think that in order to develop good habits, it is important to know what affects attitudes and behaviors and how health literacy affects health habits.

Studies in the literature examine the relationship between skin cancer and health literacy and health attitudes and behaviors. However, no studies have compared the effects of health literacy and health attitudes and behaviors in patients with and without skin cancer. In this study, we aimed to compare the level of knowledge about sun and skin cancer protection, sun and skin cancer protection behaviors, sun protection attitudes, and health literacy in patients with malignant skin diseases and healthy controls in Turkey. Based on the study's results, we aim to measure the impact of health literacy on sun protection and skin cancer awareness and guide patients on this topic.

PATIENTS AND METHODS

An Ethics Committee approval was obtained from the Cumhuriyet University Ethics Committee (Date: 19.02.2020; Decision No: 2020-02/11). This study was designed as a case-control and survey study. The study included 105 patients treated for malignant skin diseases (MM, BCC, and SCC) at our clinic between March 2020 and March 2021. Our study did not include patients under eighteen years of age and those with psychiatric disorders. Our control group consisted of 105 healthy volunteers. This study collected data using a survey questionnaire and the Health Literacy Scale.

Data Collection Form

The data collection form consisted of two parts. In the first part, socio-demographic characteristics such as age, gender, education, occupation, place of residence, smoking and co-morbidity were asked. In the second part, the level of knowledge about protection from the sun and skin cancer, the behavior towards protecting from the sun and skin cancer, and the attitude towards sun protection were asked.

Knowledge Level of Protection from Sun and Skin Cancer

In this part of the data collection form, 9 questions on sun protection methods and the aetiopathogenesis of skin cancer are included in determining the level of knowledge of the participants. Participants were asked to answer "yes," "no," or "I do not know" to each question. The "yes" option scored 1 point, and the "no" and "I do not know" options scored 0 points. Accordingly, the participant's level of knowledge was determined by adding up the (correct) yes answers to 9 questions, each worth 1 point. Accordingly, the person with the highest knowledge level received 9 points, while the person with the lowest level received 0 points.

The behavior of Protection from Sun and Skin Cancer

Participants rated 13 sun protection and skin cancer behaviors on a 4-point Likert scale (never=1, sometimes=2, often=3, always=4) according to the frequency of use. The scores assigned to these 13 behaviors were summed and divided by 13, and the average of the participants' protective behaviors was calculated. High scores indicate highly protective behaviors.

Sun Protection Attitude

Participants' attitudes toward sun protection were measured with 5 items. Each item was scored with a 5-point Likert (1=strongly disagree/5=strongly agree). The attitude toward sun protection score was calculated by dividing the total score by the number of items. High scores indicate high attitudes toward protection.

Health Literacy Scale

In the study, the health literacy level of the participants was measured with the Health Literacy Scale, developed by Sorensen[11] (47 items: European Health Literacy Survey Questionnaire; HLS-EU-Q) and later simplified, which was reduced from 47 items to 25 items[12]. Aras and Bayık[13] conducted the Turkish validity and reliability of the 25-item version of the scale. The scale consists of 25 items and 4 sub-dimensions: accessing information; understanding information; appraising information, and applying information. There are 5 items in the dimension of accessing information, 7 items in the dimension of understanding information, 8 in the dimension of appraising information, and 5 in the dimension of applying information. All items on the scale take values between 1 and 5. Accordingly, while the minimum score obtained from the scale is 25, the maximum score is 125. High scores indicate a high level of health literacy.

Statistical Analysis

Numerical variables are presented as the mean ± standard deviation (SD), and categorical variables are presented as population percentages. Chi-square tests were used to analyze whether socio-demographic characteristics differed between malignant skin patients and healthy volunteers. Similarly, a Student's *t*-test was used to determine whether the mean of knowledge, attitude, and behavior for protection from sun and skin cancer differed between those with and without cancer. Variables with a statistically significant effect in the chi-square and Student's *t*-tests were used as independent variables in the multivariate logistic regression analysis. Differences with $p<0.05$ were considered statistically significant.

RESULTS

The distribution of the case-control group and the results of the hypothesis test are given in Table 1. 59% of the control group and 43% of the case group were female. There is a statistically significant difference in gender according to the case-control group ($p=0.006$). Most participants (53.3%) graduated from high school or higher. The percentage of high school and higher graduates is lower in the malignant skin diseases group (25.7%) than in the control group (81%) ($p<0.001$). According to the case-control group, there is a statistically significant difference in occupation ($p<0.001$). The percentage of people living in rural areas in the malignant skin diseases group is higher than in the control group ($p<0.001$). The percentage of non-smokers in the control group (73.3%) is lower than in the malignant skin diseases group (54.3%). However, the percentage of those who quit smoking (23.8%) is also higher in the malignant skin diseases group ($p<0.001$). The percentage of the control group with co-morbidity was lower than the case group ($p<0.001$). The mean age of the malignant was higher than the mean age of the control group ($p<0.001$). There is a statistically significant difference between the mean knowledge level of sun and skin cancer protection between the case and control group ($p<0.001$). The mean knowledge level of the control group is higher than that of the case group.

Similarly, the mean behavior of protection from sun and skin cancer and mean sun protection attitude are higher in the group than in the malignant skin diseases group ($p<0.001$). Finally, there is a statistically significant difference between the mean health literacy levels of the malignant skin disease group and the control group ($p<0.001$). The mean health literacy levels of the malignant group (108.84±15.26) are lower than the healthy volunteers (77.69±15.94).

The result of the multiple logistic regression analysis related to the risk of cancer is in Table 2. The goodness of fit of the established model was examined with the chi-square statistics ($p<0.001$) and the independent variables used accordingly (health literacy, age, education, place of residence, smoking, co-morbidity, knowledge level of protection from sun and skin cancer, behavior of protection from sun and skin cancer, sun protection attitude) are sufficient to define the dependent variable (malignant skin diseases). The correct classification percentage of the model is 94.3%. The explanatory coefficient of the model is 67.4% according to Cox & Snell R^2 and 89.9% according to Nagelkerke R^2, respectively.

Table 2 shows a statistically significant effect of health literacy, age, knowledge level of protection from sun and skin cancer, and behavior of protection from sun and skin cancer on the probability of skin cancer ($p<0.05$). Accordingly, as the level of health literacy increases, the risk of

TABLE 1. Distribution of case-control group according to different factors.

Variables	*Malignant Skin Diseases (N(%) or Mean±SD)*		*Test statistic (X^2 or t)*	*p*
	No (n=105)	*Yes (n=105)*		
Gender				
Female	62 (59.0)	43 (41.0)	6.876	0.006
Male	43 (41.0)	62 (59.0)		
Education				
Middle school and lower	20 (19.0)	78 (74.3)	64.362	<0.001
High school and higher	85 (81.0)	27 (25.7)		
Occupation				
Yes	48 (45.7)	17 (16.3)	21.03	<0.001
No	57 (54.3)	87 (83.7)		
Place of Residence				
Urban	81 (77.1)	34 (32.4)	42.461	<0.001
Rural	24 (22.9)	71 (67.6)		
Smoking				
Yes	24 (22.9)	23 (21.9)		
No	77 (73.3)	57 (54.3)	18.213	<0.001
Quit	4 (3.8)	25 (23.8)		
Co-morbidity				
Yes	24 (22.9)	53 (50.5)	17.245	<0.001
No	81 (77.1)	52 (49.5)		
Age	36.67±11.44	60.34±14.69	-13.031	<0.001
Knowledge Level of Protection from Sun and Skin Cancer	6.76±1.19	3.01±2.19	15.427	<0.001
The behavior of Protection from Sun and Skin Cancer	2.54±0.45	1.86±0.41	11.557	<0.001
Sun Protection Attitude	4.02±0.62	3.18±0.63	9.736	<0.001
Health Literacy	108.84±15.26	77.69±15.94	14.466	<0.00

skin cancer decreases, and an increase of 1 unit in health literacy reduces the risk of skin cancer by 7.3% (1-0.927). According to the analysis, the risk of skin cancer increases with age. An increase in the age of the participants by 1 year increases the probability of skin cancer by 1.113 times. As knowledge of sun and skin cancer protection increases, the risk of skin cancer decreases. Accordingly, a 1 unit increase in the knowledge level of protection from the sun and skin cancer reduces the probability of skin cancer by 71.6% (1-0.284). Finally, in this study, we found that the probability of skin cancer decreases as the behavior of protection from the sun and skin cancer increases. Therefore, a 1 unit increase in the behavior of protection from the sun and skin cancer reduces the probability of skin cancer by 85.7% (1-0.143).

DISCUSSION

Recently, melanoma and other skin cancers have increased as people worldwide have become more exposed to the sun. A family or personal history of skin cancer, fair skin, and sun exposure can be the most important risk factors for skin cancer[14]. In the Turkish literature, the frequency of sunscreen use was reported as 27.4% in summer only and 28.4% all the time. These values were considered to be quite low[15].

This study shows a statistically significant difference between genders in the case-control group. It was found that the incidence of skin cancer was significantly higher in men than in women. The higher incidence of skin cancer in men can be explained by UV exposure, as men are more likely to be employed than women and to work outdoors more. Similarly, previous studies have reported that skin cancer is more common in men[16,17]. In the literature, it is stated that male gender is a factor in skin cancers. Compared to women, men are less likely to display sun-protective behaviors or preventive behaviors against the damage of UV. Men are also less likely to self-detect melanoma. Sex hormones play a fundamental role in skin cancers, as some studies have shown the association of estrogen and estrogen receptors with melanoma survival in women. In particular,

TABLE 2. Multivariate logistic regression results.

Variables	*B*	*S.E.*	*p*	*Odds Ratio*	*95% C.I. for Odds Ratio*	
					Lower	*Upper*
Health Literacy	-0.076	0.028	0.006	0.927	0.878	0.978
Age	0.107	0.035	0.003	1.113	1.038	1.193
Gender						
Female	1 (Referans)					
Male	0.368	0.898	0.682	1.444	0.248	8.396
Education						
Middle school and lower	1 (Referans)					
High school and higher	-0.033	0.901	0.971	0.968	0.166	5.654
Occupation						
No	1 (Referans)					
Yes	-0.049	0.988	0.961	0.953	0.137	6.608
Place of Residence						
Rural	1 (Referans)					
Urban	-1.093	0.797	0.170	0.335	0.070	1.597
Smoking						
No	1 (Referans)					
Quit	-0.343	0.953	0.719	0.709	0.109	4.595
Yes	0.600	1.266	0.636	1.822	0.152	21.803
Co-morbidity						
Yes	1 (Referans)					
No	-0.896	1.024	0.382	0.408	0.055	3.040
Knowledge Level of Protection from Sun and Skin Cancer	-1.260	0.330	0.000	0.284	0.149	0.541
The behavior of Protection from Sun and Skin Cancer	-1.947	0.871	0.025	0.143	0.026	0.786
Sun Protection Attitude	0.362	0.638	0.570	1.436	0.411	5.017

Cox & Snell R^2= 0.674; *Nagelkerke* R^2 = 0.899. X^2= 234.568; p< 0.001. Correct Classification Percentage: 94.3%. Dependent variable: 1=Case Group (Malignant Skin Diseases); 0=Control Group (Healthy Volunteers).

the female immune system is more effective than the male, and both innate and adaptive immune responses of females are stronger than males[18,19].

There is a statistically significant difference between occupations in the case-control group. The lower incidence of malignancies in workers can be explained by age. This result can be explained by the fact that the active working population is young and the incidence of skin cancer increases with age, which is low in this group.

The percentage of the control group with co-morbidity was lower than that of the case group. This can be explained by the fact that the average age of the malignant skin disease group is higher than that of the control group, so age-related co-morbidities are higher in the case group. Accordingly, Gordon[20] found that the risk of developing skin cancer, especially BCC, is increased in patients receiving radiation for the treatment of reducing solid tumors such as breast and prostate cancer.

The percentage of graduates is lower in the group with malignant skin disease than in the control group. Skin cancer and sun protection behavior and knowledge levels can be explained by the difference in education levels between the two groups. This result is an expected finding, as educated people are generally more likely to seek and obtain information about diseases. Similarly, the previous study found related participants' knowledge of melanoma risk factors to differences in education levels. Other studies found that knowledge and behaviors related to sun and skin cancer protection were inadequate among students[21,22].

The results of this study show that the mean knowledge level of the control group is higher than that of the case group. Similarly, mean sun and skin cancer protection behaviors and attitudes towards sun protection are higher in the control group than in the malignant skin disease group. In the malignant skin disease group, knowledge about protection from the sun and skin cancer, behavior towards protection from the sun and skin cancer, and attitudes towards sun protection is lower than in the control group. A previous study

investigated melanoma patients' knowledge of melanoma risk factors and sun protection behavior and found that their knowledge and sun protection behavior were insufficient[21].

The average age of the group with skin malignancies was higher than that of the control group. It is known that the incidence of skin cancer increases with age[23]. The proportion of people living in rural areas in the malignant skin disease group is higher than in the control group. One of the most important risk factors for skin cancer is sun exposure. The fact that participants in the malignant disease group are more likely to live in rural areas can be explained by the fact that they are more exposed to the sun than people in urban areas, especially because they work in agriculture[24].

This study found that the rate of smokers (21.9%) and former smokers (23.8%) was higher in the group with malignant skin disease (45.7%) than in the control group (22.9%+3.8%=26.7%). Similarly, smoking has been shown to be associated with skin cancer[25]. Cigarettes, UV exposure, age, and fair skin color are among the most important causes of skin cancer[26]. There is a statistically significant difference between the mean level of health literacy in the malignant group and the control group. The mean level of health literacy is lower in the malignant group than in the control group. Health literacy is an important determinant of health-related behaviors such as following medical advice. More specifically, health literacy is related to attitudes and behaviors related to cancer prevention and detection. It has been reported that individuals with low health literacy are less likely to follow recommendations for screening for colorectal cancer, cervical cancer, and breast cancer[27-29]. Similar to our findings, previous studies have found inadequate health literacy and sun protection behavior for skin cancer[21,22,30].

A limited number of studies in the literature address health literacy, sun protection behavior, and skin cancer risk. In a related study, health literacy was reported directly related to sunscreen use and sun protection behavior. A study reported that health literacy was directly related to sunscreen use and sun protection habits. In another study, workers who worked outdoors were exposed to more sun, used less sunscreen, and had lower levels of health literacy than workers who worked indoors[31,32]. Many studies in the literature have shown that health literacy has a positive influence on health behaviors. Therefore, health literacy could play an important role in preventing skin cancer[22].

Inadequate health literacy increases the risk of becoming ill, decreases understanding of treatments, increases the cost of health care services, and negatively affects health-related quality of life. Adequate levels of health literacy increase the quality of life, increase the amount and quality of effective health care utilization, and decrease the cost of health care services[33]. According to the research, people who know enough about health care make better decisions about how to improve and protect their health[34].

There are some limitations to our study. First, this study was conducted with a small sample and in a single center. Therefore, our results may not generalize to all skin cancer patients in Turkey. In addition, the accuracy of the responses is unknown, and there may be self-reported bias.

CONCLUSIONS

The study is the first to evaluate the knowledge of sun and skin cancer protection, sun and skin cancer protection behaviors, attitudes towards sun protection, and health literacy of patients with malignant skin diseases and healthy controls in Turkey. The results of the present study show a statistically significant influence of health literacy, smoking, UV exposure, live in rural areas, co-morbidity, occupation, gender, age, level of knowledge about protection from the sun and skin cancer, and behavior about protection from the sun and skin cancer on the likelihood of skin cancer. Higher knowledge levels could positively impact adherence to skin cancer prevention measures and reduce skin cancer-related morbidity and mortality.

The results of our study may contribute to the development of educational programs. To increase the level of health literacy and behavior about protection from the sun and skin cancer importance should be given to education in general and health education in particular. In at-risk groups, the social security system recommends that the cost of sunscreen and sunglasses be covered. The working hours and conditions of those who work outdoors should be designed to minimize the negative effects of the sun. Since the risk of skin cancer increases with age and smoking, it may be recommended to conduct screening programs at certain periods and smoking cessation programs. Media tools like TV, radio, newspapers, social media, websites, and phone apps should be used more effectively to teach people how to protect themselves from the sun and skin cancer.

Author contributions:

M.T. and M.A. designed the study; R.Y.G. and S.Ö. collected data; M.T. and G.İ. analysed data; M.T., M.A. and G.İ. wrote the manuscript. All authors read and approved the final manuscript.

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There is no conflict of interest in this study.

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