

Skin Cancer-Sun Knowledge and Sun Protection Behaviors of Liver Transplant Recipients in Turkey

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Published online: 8 September 2017
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Abstract The aim of this study was to compare liver transplant recipients (LTRs) with the general population regarding their knowledge of skin cancer, sun health, sun protection behaviors, and affecting factors. This cross-sectional study was conducted in Turkey between March 2016 and September 2016 with 104 LTRs and 100 participants from the general population group (GPG). The mean age of the LTRs was 53.2 ± 11.8 and that of the GPG was 42.7 ± 14.5 . The LTRs' skin cancer and sun knowledge were significantly lower than in the GPG, but there was no difference between the two groups in terms of their sun protection behavior scores. The most commonly used sun protection behaviors of LTRs were not being outside and not sunbathing between 10 a.m. and 4 p.m., wearing clothing that covers the

skin, and avoiding the solarium. Behaviors commonly practiced by the GPG were wearing sunglasses, wearing sunscreen with a sun protection factor of 15 or higher before going outside, wearing sunscreen at the beach, while swimming or doing physical activity outside, and reapplying it every 2 h. Results of our study will contribute to the development of education and training programs for LTRs on skin cancer. The results also demonstrated the importance of practicing adequate sun protection behaviors which will certainly impact their future health.

Keywords Liver transplantation · Cancer · Skin · Knowledge · Sun protection behavior

Electronic supplementary material The online version of this article (<https://doi.org/10.1007/s13187-017-1279-3>) contains supplementary material, which is available to authorized users.

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Introduction

The incidence of skin cancer continues to increase both in the general population [1] and in the organ transplant recipients (OTRs), an important at-risk group [2]. The most common neoplasm in organ transplant patients is non-melanoma skin cancer [2–5]. Non-melanoma skin cancer, including squamous cell carcinoma and basal cell, is an extremely common neoplasm in organ transplant recipients [4], and it has increased a hundredfold in transplant recipients compared to the general population [2, 6].

Risk factors for skin cancer in solid organ transplant recipients include the use of calcineurin inhibitors, immunosuppressive drug use for more than 10 years, and a family history of skin cancer [2, 3]. Risk factors in liver transplant recipients (LTRs) are alcoholic liver disease, the presence of hepatocellular carcinoma, combined liver/kidney transplantation [7], male gender, advanced age, red hair, and brown eyes [8]. Yet, one of the

modifiable factors in the prevention of skin cancer in OTRs is reducing their exposure to ultraviolet radiation (UVR) [4]. To effectively educate OTRs about skin cancer prevention, adequate and up-to-date information and training on UVR protection needs to be provided [3, 9, 10]. Measures to reduce UVR exposure include wearing sun-protective clothing, avoiding the midday sun between 10 a.m. and 4 p.m., and applying sunscreen [4, 9]. To prevent skin cancer in OTRs, patients should be provided with training on ways to reduce UVR exposure. They should also be instructed on skin self-examinations, and their awareness of skin cancer should be raised [3, 4, 11–16].

Studies have reported that OTRs with high-level sun protection knowledge used sunscreen more effectively [17], and the training they received on this issue reduced their incidence of skin cancer [18]. Studies conducted in North America, Australia, Europe, and Iran have reported that OTRs had a low level of knowledge about sun protection and sun protection behaviors [12, 19–24]. Other studies have indicated that OTRs' sun-protective clothing behavior was better than that of the general population [19]. Furthermore, female OTRs were more informed about skin cancer [23], displayed better sun-protective clothing behavior [24], and used sunscreen more effectively [21–24].

In a limited number of studies conducted in Turkey and other countries with OTRs, sun protection knowledge and sun protection behaviors were assessed with questionnaires; however, these studies have not been verified for validity and reliability [12, 19–24]. Thus, it is clear that future studies should be conducted using valid and reliable measurement tools. The aim of the present study was to compare LTRs' knowledge of skin cancer and sun and their sun protection behaviors with those of the general population. The study also investigated the factors affecting knowledge of skin cancer and sun and sun protection behaviors of both LTRs' and general population.

Methods

Participants and Setting

The present study was a cross-sectional, comparative study. The convenience sampling method was used. The sample was composed of patients who were followed up in the liver transplant clinics of the two university hospitals in Izmir, the third largest city of Turkey. The inclusion criteria required that patients be over 18 years of age and to have undergone liver transplantation at least 1 year before. Patients with a history of skin cancer, a speech or hearing problem which prevented communication, and those who were hospitalized were excluded from the study.

The general population group (GPG) for this current study consisted of adults who presented to a primary health care center in the city center of Izmir to receive healthcare services. Other participants included adults who were attending courses in the city center which were organized by the municipality. Courses included painting, woodworking, tailoring etc. While being over 18 years old was the inclusion criterion, persons with a history of skin cancer, a speech and hearing problem which prevented the person from communicating, and intake of immunosuppressive drugs were the exclusion criteria. The study was carried out between March 2016 and September 2016.

In the present study, data related to LTRs were collected from patients who presented to the organ transplant outpatient clinics of the two university hospitals for routine follow-ups and agreed to participate in the study. The data related to those in the GPG were collected from the adults who agreed to participate in the study. To prevent participants from being influenced by their previous responses, they were asked to first complete the Socio-Demographic and Clinical Characteristics Survey, then the Sun Protection Behavior Questionnaire, and finally the Skin Cancer and Sun-related Knowledge (SCSK) Scale. The researchers encouraged the participants to fill in the measurement tools independently and informed them that their responses would be kept confidential. The administration of questionnaires took about 20 min.

Data Collection Questionnaires

The study data were collected using the Socio-Demographic and Clinical Characteristics Survey, the Sun Protection Behavior Questionnaire, and the Skin Cancer and Sun-related Knowledge (SCSK) Scale.

Socio-demographic and Clinical Characteristics Survey

A 13-question survey (1 open-ended and 12 multiple choice) was developed by the researchers which was to be filled out by all participants in the LTR and GPG groups. Questions were related to socio-demographic characteristics (age, gender, marital status, educational status, employment status) and skin cancer characteristics (family history of skin cancer, smoking, history of sunburn in the previous year, skin type, eye color, presence of freckles and moles on the face and upper extremities, knowledge of the effect of the sun exposure on the development of skin cancer). Additional four questions (two open-ended and two multiple choice) were related to other characteristics of LTRs (time of transplantation, knowledge of organ transplant-induced skin cancer, having training on post-transplant sun exposure, type of the immunosuppressive drug used).

Sun Protection Behavior Questionnaire

The questionnaire developed by the researchers included 13 items to determine how frequently the participants practiced sun protection behaviors (wearing a hat, using an umbrella, staying in the shade when outdoors, etc.) during sunny days in the spring and summer months. Sun protection behaviors were rated on a 5-point scale ranging from 1 to 5 (never = 1, rarely = 2, sometimes = 3, often = 4, always = 5). The scores for sun protection behaviors were obtained by adding up the scores of the 13 items. High scores indicated positive behaviors.

The SCSK Scale

The participants' knowledge of skin cancer and sun health were assessed with the SCSKS, which was developed by Day et al. [25]. Participants answered questions related to skin cancer and sun health in five domains (sun protection, tanning, skin cancer risk factors, prevalence of skin cancer, signs of skin cancer). The scale, which has the one-factor structure, contains 15 true/false questions and 10 multiple-choice questions. The correct option is scored 1 for each item, and the wrong option is scored 0. The total score obtained by adding up the item scores varies between 0 and 25 points. A high score indicates a participant's high level of knowledge. Ozturk Haney et al. performed the validity and reliability of the Turkish version of the scale. The content validity index (CVI), internal consistency reliability index (KR-20), and test-retest reliability coefficient ($n = 34$) values of the Turkish version of the SCSK were 93.71%, 0.51, and 0.52, respectively ($p < 0.001$) [26].

Statistical Analysis

Using the G Power 3.0.10 program, and based on a low effect size (0.2) in two groups, the sample size of the study was calculated as 150. The probability of the type I error was 0.05 and the probability of the type II error was 0.80. The data were analyzed using the SPSS version 16.0. The p value of 0.05 was considered statistically significant. Data on the participants' socio-demographic and clinical characteristics were assessed with the descriptive statistics (numbers, percentages and means, etc.). Socio-demographic and clinical characteristics of the participating LTRs and the participants in the GPG, their sun protection behaviors, and skin cancer and sun knowledge scores were compared using the chi square (χ^2) and t test. Multiple regression analysis was performed to determine the sun protection behaviors of both groups and the factors affecting skin cancer and sun knowledge scores.

Results

Characteristics of Participants

The number of LTR patients enrolled in the liver transplant outpatient clinics of the two university hospitals was 1562. The study was conducted with 104 patients, who met the inclusion criteria. The number of adults who were enrolled in the primary healthcare center and courses was approximately 4000. Of the adults who presented to the health center and attended the courses at the time of the study, 100 individuals volunteered to participate and were included in the study. In the end, the study included 204 participants (104 LTRs and 100 individuals in the GPG).

Descriptive data for the LTRs and participants in the GPG are presented in Table 1. The number of participants who were older, male, married, had lower education, smoked less, had less history of sunburn in the previous year, dark eyed, had fewer freckles or moles on upper limbs, and face was higher for LTRs than those in the GPG ($p < 0.05$). The number of LTRs who stated that exposure to the sun would cause skin cancer was fewer than for participants in the GPG, and the difference between the groups was statistically significant ($p < 0.05$). There was no difference between the LTRs and those in the GPG in terms of occupational status, family history of skin cancer, and skin type ($p > 0.05$). The mean post-transplant period was 7.82 ± 4.39 years for the LTRs (ranging from 1 to 20 years). Of the LTRs, 20 (19.2%) stated that organ transplantation would not increase the risk of skin cancer, 68 (65.4%) had not received training on the effect of sun exposure after the transplant, 28 (26.9%) had received training from a doctor, and 40 (38.5%) were taking tacrolimus as immunosuppressive therapy.

Comparison of Behaviors and Knowledge of LTRs with GPG Participants

There was no statistically significant difference between the sun protection behavior score of the LTRs (41.26 ± 8.86) and that of those in the GPG (41.76 ± 8.97) ($t(202) = -0.39$, $p > 0.05$). Based on the number of "always" and "very often" responses regarding sun protection behaviors, the most common sun protection behaviors used by the LTRs compared to those in the GPG were as follows: not being outside between 10 a.m. and 4 p.m. (52.9, 36%), not sunbathing between 10 a.m. and 4 p.m. (54.8, 37%), wearing clothing that covers the skin (46.2, 26%), and avoiding solariums (88.5, 72%), and these differences were also statistically significant ($p < 0.05$). Furthermore, the most common sun protection

Table 1 Characteristics of the participants

Characteristics	LTRs (<i>n</i> = 104), <i>n</i> (%)	GPG (<i>n</i> = 100), <i>n</i> (%)	<i>p</i>
Age overall, mean (SD)	53.2 (11.8)	42.7 (14.5)	< 0.001*
< 40, <i>n</i> (%)	15 (14.4)	40 (40.0)	< 0.001**
40–49, <i>n</i> (%)	17 (16.3)	26 (26.0)	
50–59, <i>n</i> (%)	36 (34.6)	22 (22.0)	
60+, <i>n</i> (%)	36 (34.6)	12 (12.0)	
Gender, <i>n</i> (%)			
Female	31 (29.8)	68 (68.0)	< 0.001**
Male	73 (70.2)	32 (32.0)	
Marital status, <i>n</i> (%)			
Married	88 (84.6)	69 (69.0)	0.006**
Single	16 (15.4)	31 (31.0)	
Education, <i>n</i> (%)			
Primary	60 (57.7)	22 (22.0)	< 0.001**
Secondary	23 (22.1)	30 (30.0)	
University	21 (20.2)	48 (48.0)	
Occupational status, <i>n</i> (%)			
Full-time indoor job	65 (62.5)	67 (67.0)	0.446
Part-time indoor job	32 (30.8)	30 (30.0)	
Full-time outdoor job	7 (6.7)	3 (3.0)	
History of skin cancer in the family, <i>n</i> (%)			
Yes	3 (2.9)	7 (7.0)	0.150
No	101 (97.1)	93 (93.0)	
Smoking, <i>n</i> (%)			
Yes	10 (9.6)	40 (40.0)	< 0.001**
No	94 (90.4)	60 (60.0)	
History of sunburn in the previous year, <i>n</i> (%)			
Yes	3 (2.9)	10 (10.0)	0.038**
No	101 (97.1)	90 (90.0)	
Skin type, <i>n</i> (%)			
I	3 (2.9)	9 (9.0)	0.085
II	12 (11.5)	15 (15.0)	
III	24 (23.1)	29 (29.0)	
IV-VI	65 (62.5)	47 (47.0)	
Eye color, <i>n</i> (%)			
Blue-green	8 (7.7)	22 (22.0)	0.003**
Brown	83 (79.8)	74 (74.0)	
Black	13 (12.5)	4 (4.0)	
Presence of freckles, <i>n</i> (%)			
Yes	11 (10.6)	26 (26.0)	0.004**
No	93 (89.4)	74 (74.0)	
Presence of moles on upper limbs and face, <i>n</i> (%)			
Yes	36 (34.6)	72 (72.0)	< 0.001**
No	68 (65.4)	28 (28.0)	
Does sun exposure cause skin cancer? <i>n</i> (%)			
Yes	63 (60.6)	81 (81.0)	0.004**
No	9 (8.7)	2 (2.0)	
I do not know	32 (30.8)	17 (17.0)	

**t* test; **chi-square test, *p* < 0.05

behaviors reported by the participants in the GPG compared to the LTRs were as follows: wearing sunglasses (71.0, 45.2%), wearing sunscreen with a sun protection factor (SPF) of 15 or higher before going outside (40.0, 14.4%), and wearing sunscreen at the beach or while swimming and doing physical activity outside and reapplying it every 2 h (37.0, 16.3%). These differences were also statistically significant ($p < 0.05$). There were no differences regarding other protection behaviors (wearing a hat, using an umbrella, checking moles and unusual changes in the skin regularly, etc.) between the LTRs and individuals in the GPG ($p > 0.05$). The GPG participants had higher skin cancer and sun knowledge scores (14.21 ± 3.00) than did the LTRs (10.98 ± 4.64) ($t(202) = -5.92, p < 0.001$).

Factors Related to Sun Protection Behaviors in the LTR and GPG Participants

The results of multiple regression analysis given in Table 2 indicate that independent variables were significantly associated with sun protection behaviors both in the LTRs ($R = 0.50$) ($F(13) = 2.302, p < 0.05$) and in the GPG ($R = 0.56$) ($F(13) = 3.022, p < 0.05$). In the LTRs, the independent variables accounted for 25.0% of the sun protection behaviors and the only variable affecting sun protection behaviors significantly was the knowledge of the effect of the sun exposure on the development of skin cancer. In the GPG, the independent variables explained 31.4% of the sun protection behavior. Independent variables significantly associated with the sun

protection behavior were gender, marital status, educational status, employment status, and the presence of freckles. Other independent variables were not the determinants of sun protection behavior ($p > 0.05$).

Factors Related to Skin Cancer and Sun-Related Knowledge of LTR and GPG Participants

According to the results of multiple regression analysis in Table 3, the relationship between the independent variables and knowledge of skin cancer and the sun was significant among the LTRs ($R = 0.69$) ($F(13) = 6.297, p < 0.001$), but insignificant among the GPG participants ($R = 0.17$) ($F(13) = 1.415, p > 0.05$). In the LTR group, the independent variables accounted for 47.6% of the knowledge of skin cancer and sun; educational status and knowledge of the effect of the sun on the development of skin cancer were the significant variables affecting the knowledge of skin cancer and sun.

Discussion

To our knowledge, this is the first study which compares LTRs’ knowledge of skin cancer, sun health, and sun protection behaviors with those of the general population in Turkish society. In the present study, the comparison of LTRs’ knowledge of skin cancer and sun health, and sun protection behaviors with those in the GPG during the same period, provided an opportunity to compare the participating LTRs’ skin cancer

Table 2 Multiple regression analysis of factors affecting sun protection behaviors in the groups

	LTRs (n = 104)			GPG (n = 100)		
	β	t	p	β	t	p
Constant		3.142	0.002		4.069	0.000
Age	0.07	0.752	0.454	0.01	0.123	0.903
Gender	-0.00	-0.006	0.995	-0.02	-2.298	0.024*
Marital status	0.07	0.767	0.445	-0.20	-2.016	0.047*
Educational status	0.19	1.897	0.061	0.20	2.035	0.045*
Employment status	0.06	0.561	0.576	0.27	2.867	0.005*
Family history of skin cancer	-0.11	-1.109	0.270	-0.06	-0.628	0.531
Smoking	-0.02	-0.259	0.796	-0.11	-1.228	0.223
History of sunburn in the previous year	-0.05	-0.492	0.624	0.13	1.282	0.203
Skin type	-0.03	-0.267	0.790	0.05	0.474	0.636
Eye color	0.10	0.909	0.366	-0.05	-0.492	0.624
Presence of freckles	-0.08	-0.842	0.402	-0.22	-2.321	0.023*
Presence of moles	-0.06	-0.653	0.516	0.10	1.108	0.271
Knowledge of sun exposure would cause skin cancer	-0.32	-3.094	0.003*	-0.17	-1.799	0.075
	$F = 2.302; df = 13; p = 0.011; R^2 = 0.250; R = 0.500$			$F = 3.022; df = 13; p = 0.001; R^2 = 0.314; R = 0.560$		

* $p < 0.05$

Table 3 Multiple regression analysis of factors affecting skin cancer and sun-related knowledge in groups

	LTRs (<i>n</i> = 104)			GPG (<i>n</i> = 100)		
	β	<i>t</i>	<i>p</i>	β	<i>t</i>	<i>p</i>
Constant		2.278	0.025		2.130	0.036
Age	− 0.00	− 0.110	0.913	− 0.18	− 1.507	0.136
Gender	− 0.01	− 0.204	0.839	0.01	0.177	0.860
Marital Status	0.04	0.560	0.577	0.03	0.346	0.730
Educational status	0.25	3.013	0.003*	0.27	2.466	0.016
Employment status	0.14	1.589	0.116	− 0.04	− 0.457	0.649
Family history of skin cancer	− 0.01	− 0.211	0.833	0.10	0.953	0.343
Smoking	0.02	0.224	0.823	− 0.09	− 0.932	0.354
History of sunburn in the previous year	− 0.09	− 1.040	0.301	0.11	0.970	0.335
Skin type	− 0.11	− 1.166	0.247	0.06	0.463	0.645
Eye color	0.03	0.345	0.731	0.02	0.189	0.851
Presence of freckles	0.02	0.252	0.802	0.03	0.371	0.712
Presence of moles	− 0.09	− 1.115	0.268	− 0.05	− 0.545	0.587
Knowledge of sun exposure would cause skin cancer	− 0.47	− 5.501	0.000*	− 0.04	− 0.442	0.660
	<i>F</i> = 6.297; <i>df</i> = 13; <i>p</i> = 0.000; <i>R</i> ² = 0.476; <i>R</i> = 0.690			<i>F</i> = 1.415; <i>df</i> = 13; <i>p</i> = 0.169; <i>R</i> ² = 0.420; <i>R</i> = 0.176		

**p* < 0.05

awareness, knowledge, and behaviors with general knowledge and behaviors.

The results demonstrated that the LTRs' knowledge level was lower than that of the GPG participants and that the sun protection behaviors used frequently by both groups were different. A previous study comparing LTRs to the general population determined that the general population used sunscreen, avoided direct solar radiation, and that those over the age of 45 years wore protective clothing more frequently [19]. In the present study, the participants in the GPG used sunscreen more frequently too, but the organ transplant patients preferred to avoid the solarium, to wear sun-protective clothing, and to avoid outdoors or sunbathing between 10 a.m. and 4 p.m. when the sun is intense. This difference may be related to the fact that the mean age of the LTRs in the study was higher than that of those in the GPG (the mean age difference was 10.5 years between groups). In addition, the LTRs tended to sunbathe less. In this study, younger participants in the GPG practiced sun protection behaviors such as applying sunscreen and wearing sunglasses frequently while outdoors. Another study reported similar results [27]. These findings may be associated with the GPG participants' tendency to sunbathe more.

Previous studies have demonstrated that factors such as fair skin, advanced age, sun exposure, genetic predisposition, and long-term immunosuppressive drug use (3–7 years) increased the risk of developing squamous cell carcinoma (SCC) in OTRs [28, 29]. In the present study, although the LTRs mostly had dark skin, less family history of skin cancer, and less

history of sunburn in the previous year, they were at high risk for the development of skin cancer since they were advanced in age and were long-term immunosuppressive drug users (the mean post-transplant period was 7.82 ± 4.39 years). The results of the present study showed that the participating LTRs' awareness of skin cancer and sun protection was poor. Of the LTRs, 19% reported that organ transplants did not increase the risk of skin cancer and 65% did not receive information or training on the effects of post-transplant sun exposure. The latter values are comparable to those of Seukeran et al. [30] (54%) and Firooz et al. [12] (60%). Because the risks of skin cancer are increasing, studies suggest that all OTRs should be trained on these risks as well as sun protection methods [31, 32]. The results have shown that information or training for these patients during the early post-transplant period did not include prevention behaviors or skin cancer awareness information. Previous studies have indicated that risky behaviors of these patients were affected by many factors such as risk perception, stress, and new medical regimens [12, 19, 30].

The study results revealed that the most important determinant of skin cancer and sun-related knowledge and sun protection behaviors in LTRs was the patient's level of education and knowledge concerning sun exposure as a risk factor for developing skin cancer. The results are consistent with previous studies showing that LTRs who had received training on skin cancer and sun protection displayed positive behavior changes such as doing skin self-examination and applying sunscreen [10, 12]. In other words, the results demonstrate the importance of skin cancer and skin health education and

training for LTRs to maintain and improve their skin health. In the GPG, adults who were female, married, had a high education level, worked outdoors, and had freckles displayed more positive sun protection behaviors. Similarly, previous studies have reported that women applied sunscreen more frequently and suffered from sunburn less [19]. In addition, individuals who were married, had higher education, had sun-sensitive skin types, or worked outdoors used protective methods more often. Their tendency to protect themselves against sun exposure and their awareness of causes and symptoms of skin cancer and survivability of skin cancer were high [33–35]. Perceived barriers and facilitators of adults with these demographic characteristics can influence their sun protection behaviors [36]. Therefore, identifying perceived barriers and facilitators of adults may be an effective method to improve their sun protection behaviors.

Limitations of Study

The potential limitations of the present study are that we used a survey which determines the frequency of using positive sun protection behaviors. Due to social desirability, some famous protection behaviors such as the use of sunscreen or sunglasses may have been mentioned more frequently by the participants. Secondly, the hospitalized LTRs were excluded from the study. Therefore, LTRs who had better health status and who had the opportunity to be outdoors more may have participated in the study. Thirdly, although the participating LTRs and GPG had different backgrounds, results cannot be generalized to all LTRs and GPG in Turkey.

Conclusions and Implications

After comparing the skin cancer and sun knowledge and protection behaviors of Turkish LTRs and the GPG, the results of the present study provided substantial and important information the Turkish LTRs' knowledge level about skin cancer and sun health, which was considered inadequate. Their skin cancer and sun-related knowledge levels were lower than those of the GPG. Also, sun protection behaviors displayed by the LTRs were different from those displayed by the GPG. Further, better knowledge and higher skin cancer awareness are important predictors for using positive sun protection behaviors [37]. So, efficient health promotion strategies to increase sun health knowledge and skin cancer awareness in LTRs will facilitate the implementation of sun protection measures.

The prevention and early diagnostic interventions of skin cancers of LTR patients remain a high priority for healthcare providers. The results demonstrate the importance of skin cancer and skin health education and training for LTRs to

maintain and improve their skin health and the most effective methods of prevention. After the LTRs' post-transplant acute phase has been completed, it will be particularly important to educate those who are long-term immunosuppressive drug users on the most accurate and up-to-date information about sun protection behaviors. Identification of perceived barriers and their facilitators at the beginning of the training programs may also be an effective method to improve their sun protection behaviors.

Compliance with Ethical Standards To conduct the study, written permission was obtained from the Ethics Committee of the Dokuz Eylül University, the hospitals and primary health care center where the study was to be conducted, and the municipality. After the purpose and the design of the study were explained to the participants, their written consent was obtained and the study was carried out with those who volunteered.

Ethics Statement This study was reviewed and approved by the Dokuz Eylül University Ethical Committee.

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