Sun exposure and sun protection behaviors among teenagers and adults in Mexico City

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Abstract

Objective: To know the prevalence of sun exposure and protection behaviors in a group of adolescents and to compare them with a group of adults in Mexico City. **Material and methods:** Descriptive, cross-sectional study in students aged 16 to 18 years and in adults older than 18 years. **Results:** Seven-hundred and forty-eight students were surveyed; 60 % were females and 40 % males; 90 % seek shade, 70.1 % avoid exposing themselves to the sun from 10.00 to 16.00 hours and 30.6 % use sunscreen. Out of 620 adults, 67.5 % were women and 32.4 % were men; 82.6 % seek shade, 60.2 % avoid the sun from 10.00 to 16.00 hours and 48.1% use sunscreen; 72.9 % of adults and 80.8 % of adolescents are exposed to the sun due to domestic activities. **Discussion:** There is a similar trend in sun protection and exposure behaviors in adolescents and adults. The prevalence of sunscreen use in adults is high in comparison with adolescents.

KEY WORDS: Sun exposure behaviors. Sun protection behaviors. Photoprotection. Skin cancer prevention.

Conductas de exposición y protección solar en adolescentes y adultos de la Ciudad de México

Resumen

Objetivo: Conocer la prevalencia de las conductas exposición y protección solar en un grupo de adolescentes y compararlos con un grupo de adultos en la Ciudad de México. **Material y métodos:** Estudio transversal descriptivo en estudiantes de 16 a 18 años y en adultos mayores de 18 años. **Resultados:** Se encuestaron 748 alumnos, 60 % mujeres y 40 % hombres. El 90 % busca la sombra, el 70.1 % evita exponerse al sol de las 10 a las 16 horas y el 30.6 % usa filtro solar. De 620 adultos, 67.5 % mujeres y 32.4 % hombres, el 82.6 % buscan la sombra, el 60.2 % evita el sol de las 10 a las 16 horas y el 48.1 % utiliza filtro solar. El 72.9 % de adultos y el 80.8 % de adolescentes se exponen al sol debido a actividades domésticas. **Discusión:** Existe una tendencia similar en las conductas de protección y exposición solar en adolescentes y adultos. Es alta la prevalencia de uso de fotoprotector en adultos en comparación con los adolescentes.

PALABRAS CLAVE: Conductas de exposición solar. Conductas de protección solar. Fotoprotección. Prevención del cáncer de piel.

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Introduction

Chronic exposure to ultraviolet radiation is the most important risk factor for skin cancer, mainly keratinocyte cancer and melanoma.¹ In Mexico, skin cancer ranks second among the most common malignant neoplasms (13.6 %) and 87.2 % of reported cases developed the malignancy on sun-exposed bare skin, such as the face and upper extremities.^{2,3}

The World Health Organization (WHO) defines risk behavior as any exposure of an individual that increases the probability of suffering a disease or injury.⁴ In the case of skin cancer, risk behaviors are related to acute or chronic exposure to ultraviolet radiation. The recommendations to avoid skin damage secondary to sun exposure are: avoiding exposure between 10:00 and 16:00 hours; wearing dark colored clothes, synthetic fabrics with closed fibers, long sleeves; seeking the shade; using a hat or umbrella and applying sunscreen on a daily basis.⁵

Sun exposure behaviors can be measured using direct and indirect methods. The former measure exposure to ultraviolet radiation with a portable dosimeter, whereas the latter measure said exposure by applying self-administered questionnaires.

Although studies on exposure and protection behaviors related to the sun have been carried out, prevalence of these habits in the population of Mexico City has not been measured in recent years. Therefore, the purpose of this study was to determine the prevalence of sun exposure and protection behaviors in a group of adolescents and compare them with those of a group of adults living in Mexico City.

Material and methods

A cross-sectional study involving a survey was conducted among high school students and adults who attended the Dr. Ladislao de la Pascua Dermatological Center (CDP), in Mexico City. The study was carried out in two stages: 1) validation of the self-administered questionnaire, and 2) administration of the questionnaire to the target populations. The research protocol was approved by the Research and Research Ethics Committee of the institution.

Validation of the CONRESOL self-administered questionnaire

A systematic review of self-administered questionnaires for measuring sun exposure was carried out;

subsequently, the dimensions of the construct to be measured were identified, i.e. “exposure” and “protection”. The CONRESOL questionnaire was constructed based on a literature research and with the results of a survey of 101 participants (with an open-end questions technique to explore the terminology and content of the construct). The first version of the questionnaire was reviewed by a group of eight experts to validate items’ appearance and content, which gave rise to a second version. Subsequently, three pilot tests were carried out in order to evaluate the response scales by item, vocabulary comprehension and average answering time. For empirical validation, the 5th version of the questionnaire was used, which was answered in an average of 10 minutes and was applied to 350 participants. This sample size was calculated based on the number of items that were initially proposed. Items with a total correlation lower than 0.3, multiple squared correlation lower than 0.40 and high correlation between them (≥ 0.8) were eliminated, with the item with the best profile being selected. After this item reduction, a factor analysis was carried out for validation of the construct, with coefficients lower than 0.40 being excluded according to the explained variance percentage and the break point in the sedimentation graph. At the end, a dimension called “sun protection behaviors” and another called “sun exposure behaviors” were identified with three indicators. The final questionnaire was made up of 13 items, distributed in two dimensions: the first one with a scale where the days of the week these behaviors take place were asked and the second with a Likert-type response scale. Internal consistency of the instrument was 0.865 according to Cronbach’s alpha calculation.

Administration of the instrument to the target populations

The questionnaires were administered to two populations: a) students from the Vidal Castañeda y Nájera National High-School of the National Autonomous University of Mexico, and b) adults who attended the CDP. Demographic variables and those related to sun protection and sun exposure behaviors were measured with the questionnaire that was expressly validated for this study. CONRESOL inquires about sun-related habits of a typical week during the last month and is not sensitive to behavioral changes throughout the year, and neither does it provide information about a period of time of the surveyed subject’s life.

Sample size

For the CONRESOL questionnaire empirical validation calculation, the formula $n = k (10)$ was used, where k is the number of items of the preliminary instrument. To calculate target populations minimum sample size, the formula for estimating a proportion was used, assuming that at least 30 % of participants would carry out at least some sun-protection activity, according to observations reported in previous studies in other populations. For this calculation, an alpha value of 0.05 and an accuracy of 3 % were considered.

Statistical analysis

The capture, processing and statistical analysis of obtained data was carried out with the SPSS program, version 19.0. For qualitative variables descriptive analysis, proportions were calculated, and for quantitative variables, mean normal distribution and standard deviation were used. Subsequently, the prevalence of sun-related behaviors of both study populations were compared with the chi-square test, with statistical significance being considered when a p -value < 0.05 was obtained.

Results

Characteristics of the validation sample

Sociodemographic characteristics of the validation sample ($n = 350$) are the following: 68.9 % were females ($n = 241$) and 31.1 % were males ($n = 109$); 50 % of the sample was between 18 and 37 years of age (interquartile range of 24 years); highest level of education was college degree, in 35.4 %. Classification by occupation was: 23.3 % housewives, 20.3 % students, 14 % professionals, 14 % administrative employees, 14 % service workers and 14.4 % traders or vendors; 65.1 % of surveyed subjects lived in Mexico City, 20.6 % in the State of Mexico and 1.7 % in Hidalgo.

Prevalence of protective and risky behaviors

ADOLESCENTS

Seven hundred and forty-eight students were surveyed, out of whom 60 % ($n = 449$) were females and

40 % ($n = 299$) were males. Mean age was 16 years in 40.5 % of students. Regarding the prevalence of sun protection behaviors, the measure they most frequently carry out is seeking shade on sunny days, with 90 % ($n = 673$), while the least common is using an umbrella, with only 10.3 % ($n = 77$). Of the totality of surveyed students, 80.8 % ($n = 605$) referred having exposure to the sun while carrying out household chores such as washing clothes or cleaning the yard. On the other hand, the least prevalent sun exposure behavior was driving a vehicle, reported by 23.8 % ($n = 178$). The prevalence of the rest of protective and risky behaviors is shown in tables 1 and 2.

ADULTS

Six-hundred and twenty patients, 419 females and 201 males, were surveyed, which corresponds to 67.5 % and 32.4 %, respectively, with a median age of 39 years and a range of 18 to 60 years. For 40.3 % of the patients ($n = 250$) it was their first appointment, while for 59.6 % ($n = 370$), appointments were subsequent. The most common occupation was housewife, in 29.8 %, and patients' predominant level of education was high-school, with 40.6 %.

The sun protection behaviors patients referred performing most frequently were seeking the shade, reported by 82.6 % ($n = 512$), and avoiding the sun from 10:00 to 16:00 hours, reported by 60.2 % ($n = 373$). The least common protection measure was using an umbrella, with 26.2 % ($n = 162$). In this group, the main cause of sun exposure was outdoor household chores, with 72.9 % ($n = 452$), followed by outdoor sports activities, with 46.4 % ($n = 288$) (Tables 1 and 2).

Median time of sun exposure on a typical day was 2.4 hours (± 3 hours). Knowledge about the ultraviolet radiation index was inquired; only 3.4 % referred knowing it, and 1.9 % check it daily.

When the prevalence of sun protection and risk behaviors was compared between both target populations, statistically significant differences ($p < 0.001$) were found for all behaviors. Protection behaviors where a difference of at least twice was documented included the use of umbrellas and wearing a hat; both behaviors were more common in adults than in adolescents, 26.2 vs. 10.3 % and 44.8 vs. 14.8 %, respectively (Table 1). However, the largest differences were recorded in sun exposure behaviors, where sunbathing and outdoor sports activities are more prevalent in high school students in comparison with CDP patients (Table 2). Patients attending subsequent

Table 1. Sun protection behaviors in adolescents and adults

	Sun protection behaviors	High School n = 748 (%)	CDP n = 620 (%)
1	Use of sunscreen, SPF > 30, every 2 to 4 hours	229 (30.6)	298 (48.1)*
2	Seeking shade to avoid the sun	673 (90)	512 (82.6)*
3	Using an umbrella	77 (10.3)	162 (26.2)*
4	Wearing a hat	111 (14.8)	278 (44.8)*
5	Use of sunglasses	222 (29.7)	205 (33.1)*
6	Avoiding the sun from 10:00 to 16:00 h	524 (70.1)	373 (60.2)*

SPF = sun protection factor; CDP = Centro Dermatológico Dr. Ladislao de la Pascua.
 * Chi-square test, $p < 0.001$.

Table 2. Sun exposure behaviors in adolescents and adults

	Sun exposure behaviors	High School n = 748 (%)	CDP n = 620 (%)
7	Sunbathing	545 (72.8)	238 (38.4)*
8	Performing outdoor sports activities	572 (76.5)	288 (46.4)*
9	Working outdoors	444 (59.3)	252 (40.6)*
10	Driving a vehicle	178 (23.8)	212 (34.2)*
11	Riding a bike	292 (39.0)	132 (21.3)*
12	Going to the beach	262 (35.0)	191 (30.8)*
13	Performing outdoor household chores (hanging clothes, sweeping the yard, washing)	605 (80.8)	452 (72.9)*

CDP = Centro Dermatológico Dr. Ladislao de la Pascua.
 * Chi-square test, $p < 0.001$.

Table 3. Sun exposure on weekends in adolescents and adults

Sun exposure behaviors	High School n = 748 (%)	CDP n = 620 (%)	Total
Have sun exposure on weekends	327 (43.8)	331 (53.4)*	658 (48.1)
Avoid sun exposure on weekends	420 (56.2)	289 (46.6)*	709 (51.9 %)

CDP = Centro Dermatológico Dr. Ladislao de la Pascua.
 * Chi-square test, $p < 0.001$.

appointments use sunscreen more often in comparison with first-appointment patients, 57.8 and 34.1 %, respectively ($p < 0.0001$); 43.8 % ($n = 327$) of the students and 53.4 % ($n = 331$) of adults have more sun exposure on weekends than from Monday to Friday (Table 3).

Discussion

There is a similar trend among adolescents and adults regarding sun exposure behaviors, both risky and protective. Both groups protect themselves from the sun by seeking shade, avoiding going out from 10:00 to 16:00 hours and using sunscreen. In contrast, the most prevalent risk behaviors in both groups were performing outdoor household chores and sports activities.

The use of sunscreen is one of the measures recommended by the WHO to avoid ultraviolet radiation exposure-associated morbidity. In our study, 30.6 % of adolescents used sunscreen, which is similar to observations in other countries, such as Argentina, where 26 % of adolescents use it regularly.⁶ However, this percentage is low compared to that reported by authors such as Castañedo-Cazares and Urasaki, who found that more than 20 % exposed themselves to the sun because they consider tanning to be healthy.^{7,8} In contrast, in adults we observed that 48.1 % use sunscreen regularly. This prevalence agrees with that published by Holman in Caucasian women, where 42.6 % used sunscreen regularly; although prevalence in men was similar to that reported in adolescents, which in their study was 18.1 %.⁹ This increase in the prevalence of sunscreen use in adults can be attributed to the fact that most diseases triggered by chronic sun exposure, such as skin cancer and photodermatitis, occur in adults; moreover, skin tolerance to intense and intermittent sun exposure decreases with age.

In addition to the use of sunscreen, there are other protective measures that should be promoted in the population, given that they are cost-effective. In this regard, in our study (in both populations), the most prevalent behaviors were seeking shade on a sunny day or avoiding the sun from 10:00 to 16:00 hours, which are measures that can be disseminated in the population, that would have an impact on sun exposure-associated morbidity and that would not represent a direct cost to the health system. The use of umbrellas had a low prevalence, but it was more common in adults than in adolescents (26.2 vs. 10.3 %, respectively). When comparing this measure with other populations, the use of umbrellas is a rare behavior, as shown by Şenel, who reports that 94 % of young people never use an umbrella on a sunny day.¹⁰

The sun protection recommendations issued by the WHO include checking the ultraviolet radiation index (UVRI) to plan outdoor activities.¹¹ Although this index can be consulted in the government atmospheric monitoring portal, only 3.4 % of respondents knew of its

existence and only 1.9 % check it regularly. This shows that, despite government efforts for publishing the UVRI, it is not widely known or consulted. The populations that check the UV index more often are those in which skin cancer has a high prevalence, as it is the case of Australia, where up to 93 % of individuals are aware of the UVRI, with television being the main means for its diffusion (80 %).¹² Some studies demonstrate that there is a directly proportional relationship between UVRI knowledge/use and the level of economic and educational development of a country.^{12,13} However, Sin et al.¹⁴ evaluated 400 French dermatologists personal and professional opinion about the UV index, out of whom only 12.1 % referred consulting it and carrying out sun protection measures based on it.

The main limitation of our study was the way sun exposure-related behaviors were measured, since it was through self-report and not by objective measurement, such as the use of a dosimeter. However, in population-based studies, these behaviors are explored using questionnaires. The other source of bias that impacts external validity of our data is that the sample cannot be considered representative of adults or adolescents from Mexico City, since adolescents belong to one of the high schools of the National Autonomous University of Mexico, the population of which corresponds to the geographic area the campus is located in, and adults were patients who required dermatological care. In the latter sample, the prevalence of behaviors related to sun exposure may be overestimating the population's reality; therefore, it is necessary to include questions about sun exposure in national health surveys in order to obtain results that can be extrapolated to our reality.

Finally, it should be pointed out that, given Mexico's population aging, an increase in the number of cases of keratinocyte skin cancer is expected, since its etiology is associated with the prolonged sun exposure that is directly correlated with age. It is proposed that interventions to prevent sun exposure-related morbidity and mortality should be multicomponent, i.e. actions that jointly involve the individual, the community and the government.¹¹ Some of the actions that should be carried out by the health system include those related to promoting health education since compulsory basic education, in addition to implementing environmental public policies that promote the creation of recreational spaces with shaded areas and the use of protective clothing by State workers whose occupation is outdoors.

Conclusions

Knowing the risky and protective behaviors that are usual in our population is useful for guiding individual or community-based interventions intended to reduce morbidity associated with sun exposure. Seeking shade on sunny days and avoiding exposure to the sun during radiation peak hours are prevention measures that involve no cost for the individual, in comparison with the outlay associated with the use of sunscreen, and should therefore be promoted.

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Conflict of interests

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Ethical disclosures

Protection of human and animal subjects. The authors declare that the procedures that were followed adhered to the ethical standards of the responsible committee for experimentation on human subjects and were in agreement with the World Medical Association and the Declaration of Helsinki.

Confidentiality of data. The authors declare that they have followed the protocols of their work center on the publication of patient data.

Right to privacy and informed consent. The authors have obtained informed consent from the patients and/or subjects referred to in the article. This document is in the possession of the corresponding author.

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