



## Youth's Awareness about Skin Cancer, with Particular Emphasis on Melanoma

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## Abstract

**Background:** Cancer is a health problem both in Poland and around the world due to its incidence and potential mortality. Melanoma is a malignant skin tumor that originates from melanocytes. It is the most important risk associated with UV radiation. An important topic is the promotion of knowledge of it among young people from an early age to prevent skin lesions. Skin disease prevention should be discussed at subsequent stages of school education. Children and adolescents should be aware of the negative effects of UV radiation.

**Objectives:** The study aimed to assess the level of knowledge and use of protection by primary and secondary school students regarding the occurrence and prevention of skin cancer, with particular emphasis on melanoma.

**Material and methods:** As many as 224 young people took part in the study. An original questionnaire was used, consisting of sociodemographic questions and questions checking young people's knowledge about skin cancer risk factors and skin disease prevention. The survey was voluntary and anonymous. To check the statistical significance of the obtained results, the significance level of  $p < 0.05$  was adopted.

**Results:** Skin problems occurred in 38.84% ( $N = 87$ ) of respondents. Most of the respondents (80.36%,  $N = 180$ ) do not use solariums and are aware that solariums are the main factor causing melanoma (81.70%,  $N = 183$ ). As many as 78.57% ( $N = 176$ ) of respondents claim that skin disease prevention has never been discussed at school and most young people (60.27%,  $N = 135$ ) do not know about dermatoscopic examination. Most students (70.54%,  $N = 158$ ) expressed their desire to expand their knowledge about skin diseases and their prevention.

**Conclusions:** Due to the limited knowledge of children and adolescents about skin cancers, including melanoma, as well as the common disregard among this group of preventive measures related to the broadly understood prevention

*of their development, further theoretical education and promotion of healthy behaviors that reduce the risk of the disease are necessary.*

**Key words:** *education, prevention, UV radiation, skin cancer, health*

## **Background**

Skin cancers are a major health problem due to their high prevalence in Caucasian populations and their associated potential morbidity and mortality [1]. Non-pigmented skin cancers include basal cell carcinoma (BCC) and squamous cell carcinoma (SCC). These are malignant tumors originating from keratinocytes.

Many factors contribute to the occurrence of these cancers, as well as melanoma, mainly UV exposure [2]. In the early 20th century, tanned skin (exposed to UV radiation) was associated with good health [3]. Around 1945, the first sunscreen products appeared on the market to protect skin against solar radiation [3]. Melanoma is a malignant skin cancer originating from melanocytic cells of the basal layer of the epidermis. It is referred to as a cancer of the young but can occur at any age. Melanoma accounts for 1.7 percent of diagnosed cancers worldwide [2]. Although melanoma accounts for only 1% of skin cancers, it is responsible for more than 80% of skin cancer deaths [3].

According to the World Cancer Research Fund International, 324.635 people will develop melanoma in 2020. The highest incidence was recorded in Australia, with 16.171 cases in 2020, 6.709 among women, and 9.462 among men, respectively. The occurrence as well as mortality have significantly increased in recent years in Poland as well as globally. Melanoma is the 17th most common cancer worldwide, ranking 15th among women and 13th among men [4]. The average age of a woman at receiving a diagnosis is 56 years and for men – 61 [5].

In Poland, melanoma ranks 9th in terms of occurrence among men and 10th among women. According to the WHO report, some 5.666 melanomas and other skin cancers were diagnosed in Poland in 2020, including 2.802 among women and 2.864 among men, respectively. Melanoma is the leading cancer diagnosis in developed countries and its occurrence is expected to continue to rise in the next decades [6]. Melanoma develops on the skin

and less commonly affects the mucous membranes of the intestines, mouth, genitalia, or eyeball. In women, it is most common on the limbs (57% of all cases) and in men on the trunk (43%) [5].

To diagnose the disease on time, the patient should pay attention to newly formed lesions on the skin. Melanoma is a tumor of varying color, irregular shape, uneven edges, uneven pigment distribution, and heterogeneous thickness, it may also be ulcerated but ulceration is a late symptom and also a worse prognostic factor [7]. This neoplasm metastasizes via both lymphatic and blood vessel routes. Melanoma can be subdivided into several clinical subtypes that differ in their presentation, demographics, and molecular profile. There are several varieties of melanoma: superficial spreading melanoma, lentiginous macular melanoma, subungual melanoma, and nodular melanoma [7].

Melanoma is very metabolically active, which results in the shedding of protein-like substances, enzymes, and cytokines into the bloodstream. Ultraviolet radiation is thought to be the cause of 60–70 percent of melanomas [8]. Risk factors for this neoplasm include exposure to natural radiation, i.e., sunlight, and artificial radiation, i.e., solariums, tanning beds, low pigment content of the skin, and genetic predisposition, e.g., FAMS (Familial Atypical Mole Syndrome) [9]. Dermatoscopy is mainly used for diagnosis. It is a non-invasive tool that allows the identification of specific morphological features in various skin cancers, significantly improving the early diagnosis of melanoma and non-melanoma skin cancer (NMSC) [1]. It is an examination of pigmented lesions under multiple magnification, the lesion suspected to be melanoma should be removed with a margin of healthy tissue (excisional biopsy) and sent for histopathological examination. If melanoma has been diagnosed, imaging studies should be performed to assess its progression: ultrasound (including regional lymph nodes), CT, X-ray, PET, MR, and bone scintigraphy, after ruling out spread-radicalization of margins and sentinel node biopsy. Assessment for the presence of BRAF mutation – in cases of disseminated or stage III melanoma – BRAF mutation is present in approximately 50% of melanoma patients; therefore, anti-BRAF drugs are used as complementary treatment [10]. In addition, targeted drugs such as vemurafenib and immunotherapy are used, especially in the treatment of advanced melanomas [11].

Due to the increase in the occurrence of skin cancer in recent years, prevention is particularly important [12]. The use of sunscreens all year round, wearing photoprotective clothes especially for children, the use of sunglasses with UV filters, and not using tanning beds, especially before the age of 30, are of key importance [13]. In addition, the American Cancer Society recommends thorough skin examinations every three years for those aged 20–40 years and annual examinations for those over 40 years of age [13]. It is also extremely important to promote awareness of photoprotection and skin cancer prevention among children and adolescents. It is worth noting that the Polish government is the only one to have introduced a total ban on advertising artificial tanning devices [14]. In addition, Australia, Poland, and Brazil introduced a total ban on tanning beds, not only for minors [15].

## **Objectives**

The study aimed to assess: the level of knowledge about the occurrence and prevention of skin cancer with particular emphasis on melanoma, and the undertaking of preventive behaviors in this area among primary and secondary school students.

## **Materials and methods**

An original survey questionnaire was used in the study, as there is no standardized and adapted Polish language version, a questionnaire for the study of sunburn prevention. The questionnaire consisted of questions describing the sociodemographic characteristics of the respondents and questions about sunburn prevention. The survey was conducted in November and December 2022 electronically via the online platform Google Forms. Before the survey, a pilot was used to validate the survey instrument. It showed that the questions were understandable and well formulated, and none of the 12 students assigned to test the tool made any comments on its design. Therefore, the results obtained during the pilot were included in the survey proper.

The inclusion criteria for the study were age and attendance at grade 8 of primary school, grade 1 of high school, or grade 3 of high school. The study included school children who were able to take care of their skin and took preventive measures on their own (without parental control or action). In the case of younger children, prevention was often used by parents, while in the group of adolescents, the influence of guardians was limited to providing tips and reminding about prevention rather than taking specific behaviors toward the child. As a result, the study allowed not only to describe the forms and frequency of skin lesions prevention but also to determine the level of internalization of preventive behaviors regarding healthy skin.

Before the study, requests were made to the principals of three schools (a primary school and two secondary schools) in the Upper Silesian area for permission to conduct the study. Consents were granted in all schools. Once consent was obtained, a link to the online survey and a request to share it via class emails was sent to the class teachers of the individual classes that were in line with the research objectives. The total number of pupils scheduled to take part in the survey was 290, of which completed questionnaires were received from 224. Thus, the participation rate was 77%, which should be considered a satisfactory result. However, the reluctance of boys to participate in the survey was observed (they were two times more likely to not fill in the questionnaire compared to girls).

Respondents were informed of the scientific purpose of the study and the anonymous and voluntary nature of their participation. Completion of the questionnaire was considered as consent to participate in the study.

The information collected in the survey was subjected to quantitative analysis. A description of the structure of the study sample was made using the number (N) and percentage distribution (%) of people characterized by a given characteristic. During the statistical calculations, the significance of differences between the two independent groups in terms of the ordinal variable was tested with the Mann-Whitney U test. Correlations between ordinal variables were verified using Spearman's rank order method. On the other hand, Pearson's  $\chi^2$  independence test was used to examine the relationship between the two nominal variables. Due to the large discrepancy between

the number of girls and boys participating in the study, statistical correlations related to the gender of the respondents were not calculated. The statistical analysis was calculated using the Statistica v.13.1 PL statistical package from StatSoft, Inc. A significance level of  $p < 0.05$  was adopted, indicating the existence of statistically significant differences or correlations.

## Results

A total of 224 people participated in the survey, of whom 83.48% (N = 187) were women and 16.52% (N = 37) were men. Slightly more than half of the respondents were students or pupils in the third year of high school (51.34%, N = 115), one in three respondents attended the first year of high school (32.14%, N = 72), while 16.52% of respondents attended the eighth grade of primary school (N = 37). Among the third year of high school, 110 students were adults.

### Skin conditions

Skin problems among male and female students occurred in 38.84% (N = 87) of the participants, and among these, acne was the most common problem (52.87%). Other skin problems faced by the surveyed adolescents were: moles (29.89%), scars (18.39%), naevus (13.79%), atopic dermatitis (12.64%), and burns (11.49%).

**Table 1.** The most popular skin problems among respondents

Skin problems among male and female students	
<b>Acne</b>	52.87%, N = 46
<b>Moles</b>	29.89%, N = 26
<b>Scars</b>	18.39%, N = 16
<b>Rashes</b>	14.94%, N = 13
<b>Naevus</b>	13.79%, N = 12
<b>Atopic dermatitis</b>	12.64%, N = 11
<b>Burns</b>	11.49%, N = 10
<b>Other</b>	11.49%, N = 10

Source: own elaboration.



Sunburn was experienced by as many as 58.48% of respondents. There was also no statistical correlation between the skin diseases experienced by young people and the age (school grade) of the respondents. The study showed that young people often spend their holidays in warm countries (54% of the surveyed students). However, the majority of respondents, both those going and those not going on holiday to warm countries, did not notice any changes to their skin, and the percentage of such cases in both groups was very similar (59.02% and 60.78%, respectively), and there were no statistically significant differences between the two groups in this respect:  $\chi^2(1) = 0.07$ ;  $p = 0.788$ .

The adolescents surveyed were also asked whether they had a family history of skin cancer. Skin cancer was present in 4.91% of the respondents' families.

**b. Individual preventive behavior is taken by young people**

The vast majority of respondents report that they observe their skin (89.73%, N = 201), but one in ten do not (10.27%, N = 23). Most of the young people surveyed did not notice any skin changes (59.82%, N = 134). Such changes were observed by 40.18% (N = 90) of respondents.

The majority of respondents (80.36%, N = 180) do not use a solarium. For the entire group of pupils surveyed, the rate of solarium use was 19.64%, N = 44. However, after taking into account the legislation prohibiting tanning in a solarium for minors, the result was 38%, N= 42 (this is the percentage of adult pupils attending a solarium). Among them, the group of male and female students who use a solarium once a month is dominant (65.91%, N = 59). 22.73% (N = 10) of the respondents used a solarium once a week, while 11.36% (N = 5) used it twice a week.

**Table 2.** Use of solariums by respondents

Using a solarium at least once in your life	
Yes	19.64%, N = 44
No	80.36%, N = 180

Source: own elaboration.

The overwhelming majority of respondents were aware that tanning beds are a major contributor to melanoma (81.70%, N = 183).

When asked whether they use protective creams with UV filters, respondents answered overwhelmingly in the affirmative (78.13%, N = 175). Almost half (47.32%, N = 106) of the youth surveyed declared that they always use UV sunscreen when out in the sun, 45.54% (N = 102) use it sometimes, and only 7.14% (N = 16) of the respondents do not use it at all.

**Table 3.** Use of sunscreen by respondents

Using sunscreen when exposed to the sun	
<b>Always</b>	47.32%, N = 106
<b>Sometimes</b>	45.54%, N = 102
<b>Never</b>	7.14%, N = 16

Source: own elaboration.

The use of sunscreen by the subjects was not dependent on their use of dermatological advice. The majority of respondents, both users and non-users of dermatological advice, applied sunscreen, with a higher proportion in the former group (82.88% and 73.45%, respectively). However, the difference noted did not reach statistical significance, as determined by Pearson's  $\chi^2$  test analysis:  $\chi^2(1) = 2.91$ ;  $p < 0.088$ .

One in four respondents (25.89%, N = 58) used tanning accelerators, their use being denied by 74.11% of the young people surveyed.

### **c. Professional prevention**

Among the adolescents surveyed, 78.57% (N = 176) said that the topic of skin disease prevention was not addressed at school (at any stage of education). At the same time, the majority of respondents (70.54%, N = 158), independent of age, expressed a desire to increase their knowledge of skin diseases and their prevention. The occurrence of any skin problems in the male and female students surveyed was not related to their willingness to learn more about skin diseases and their prevention, with a higher percentage of respondents with

skin diseases (74.71%) compared to the group without skin problems (67.88%). However, this difference was not statistically significant:  $\chi^2(1) = 1.19$ ;  $p = 0.275$ .

The majority of the surveyed adolescents (74.11%,  $N = 166$ ) expressed a willingness to encourage the closest family members to examine their skin and to urge their loved ones to be more careful about UV radiation.

The male and female students surveyed were generally not in contact with a dermatologist (40.18%) or had been on one visit (40.18%). One in five had used a dermatologist regularly (19.64%). Adolescents were asked if they knew what a dermatoscopic examination consisted of and the majority of adolescents (60.27%,  $N = 135$ ), regardless of age, did not know what dermatoscopy is for.

## Discussion

The issue of children and adolescents' knowledge of skin cancer is a complex one. Skin cancers are the most common human cancers [16]. The increasing occurrence of skin cancer, the high mortality rate, and the costly treatment require early recognition of its symptoms [17]. The factors mentioned clearly indicate the need to educate young people in the field of prevention. In our study, when asked about the occurrence of skin cancer in the family, 4.91% of the respondents answered affirmatively, while various skin conditions were reported by 38.84% of the students surveyed. The most common problems reported were acne, moles, scars. Although pigmentary characteristics such as skin, hair, eye color, freckles, and the number of common and atypical nevi do indeed influence susceptibility to melanoma, recommendations for prevention should be aimed at the whole population [18]. The earlier, both in terms of the age of those educated and the earliest stage of medical interventions at which such education is initiated, the sooner greater awareness of those educated will be achieved [19, 20].

Melanoma prevention includes adequate sun protection and checking skin nevi at the dermatologist's office [18]. However, the survey found that almost half of the students had never contacted a dermatologist. Only one in five students reported regular check ups with a doctor. It is worth considering

why children and adolescents do not always see a dermatologist for skin problems. One reason is the low availability of specialists in public health care in Poland – according to data from the Supreme Medical Chamber in 2023, 2.655 doctors practiced this specialization [21]. In contrast, psychological factors are more likely to explain the non-treatment of skin diseases. A study by Bozzoli and co-authors found that embarrassment, self-consciousness, aggression and frustration, problems with social and recreational activities, problems in personal relationships (dating or relationships with partners, close friends or relatives), and self-esteem were the most important predictors of patients' decision to see a dermatologist for treatment of skin lesions [22].

In addition to medical advice, children and adolescents are increasingly using advice available on the Internet, but this is not always verified and reliable information [23]. Young people observe their skin themselves, which was confirmed by 89.73% of those surveyed. However, most of them (59.92% of children and adolescents) did not notice worrying changes. This is because self-monitoring is not always effective [24].

In addition to check-ups with a dermatologist, an important element of melanoma prevention is the avoidance of UV radiation, which includes daily use of SPF cream and avoidance of tanning beds [25]. Our research indicates that the majority of respondents do not use tanning beds. However, it is worth noting that these data are not satisfactory, as in the group of adult respondents able to use a tanning bed, the proportion of tanning in a solarium is 38%. Indoor tanning (sunbeds, tanning beds) uses artificial ultraviolet radiation (UVR) to stimulate cosmetic tanning of the skin. In 2009, the World Health Organisation (WHO) International Agency for Research on Cancer officially classified indoor tanning as a human carcinogen [26]. The majority of interviewed students are aware that tanning beds are a major contributor to melanoma. Indoor tanning behavior may be driven by the motivation to have an attractive appearance, which is strongly influenced by gender and age, as well as several misconceptions, such as that a pre-holiday tan protects the skin, that sunbeds can be used to treat acne or to increase vitamin D levels, or that tanning is a healthy habit [26]. The desire to tan faster generates a demand for the use of tanning accelerators. More than a quarter of those

surveyed admitted to using them. The use of tanning accelerators can cause acne and rashes. In addition, they contain psoralens in their composition [27]. These are phototoxic substances and, in addition to significantly accelerating photoageing of the skin, cause phytophotodermatitis [28].

The topic of skin cancer prevention and screening and photoprotection is still not at a sufficient level in society. As many as  $\frac{3}{4}$  of the respondents say that this issue has never been discussed in their schools. The basic examination for assessing skin problems is dermatoscopy. It is a non-invasive technique that allows observation of structures, details, and also changes invisible to the naked eye on the skin under magnification [29]. More than two-thirds of respondents did not know this examination. Raising awareness among adolescents and increasing their knowledge of dermatoscopy and the consequent anti-cancer prophylaxis of skin diseases, in addition to the use of photoprotection, could contribute to reducing the incidence of skin cancer. Young people are willing to improve their knowledge of skin diseases, with more than 70% of respondents declaring this, and to undergo check-ups. These results suggest that the promotion of reliable information, especially in schools, on skin cancer prevention and photoprotection, including the use of sunscreen creams and the avoidance of prolonged and direct contact with the sun, should be widespread and systematic to increase awareness and knowledge of students and their families.

The benefits of the study include not only the description of preventive behaviors, but primarily concern the practical dimension of preventing skin cancer. The surveyed youth had the opportunity to talk to a nurse specializing in dermatological diseases during a meeting at a parenting lesson. Students eagerly asked questions and declared their willingness to visit a dermatologist's office to perform dermatoscopy. Therefore, the study conducted had practical implications. However, the limitation of the study is the difficulty in encouraging boys, especially from vocational and technical schools, to participate in a project on healthy skin and cancer prevention. Interest in prevention as a basic form of health care is still an unpopular area among young men, and body care is primarily related to attractive appearance, not health. Researchers, who would like to continue the analysis of preventive

activities undertaken by young people should pay attention to the existence of this stereotypical approach.

## Conclusions

Based on the survey, we can conclude that the knowledge of children and adolescents in Poland about skin cancer is still limited, so it is necessary to promote prophylactic measures in this area. Despite skin problems being common in this group, only a small percentage of the students surveyed are under the care of dermatologists. Awareness of protection against harmful UV radiation alone, which has a proven mutagenic effect in the pathogenesis of melanoma, seems to be quite high in this group, but in many cases, this does not correlate with actual preventive activity. It is, therefore, important to further educate children and adolescents not only on the theoretical aspects but also on the practicalities of everyday life. preventive actions should be conducted in a thoughtful manner in schools and kindergartens. There should be preventive programs covering deepening knowledge and shaping skills in the field of skin cancer prevention. Due to the poor knowledge of teachers and educators in the field of cancer prevention, nursing staff should be the one implementing the classes. In our opinion, a good solution would be to introduce health education classes from primary school. From September 1, 2025, the subject of „health education” is planned to be introduced in schools in Poland and we hope that it will bring the expected results. Children and youth should be also encouraged to look at their skin and skin diseases regularly and carefully and to attend regular dermatoscopic check ups with specialists, starting with visits to the pediatricians.

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