

Skin cancer prevention: children's health education on protection from sun exposure and assessment of its efficiency

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Summary. *The aim of the study was to assess schoolchildren's knowledge on sun exposure, the peculiarities of behavior in the sun, and the possibility of altering these indicators via education program. The study of the efficiency of the self-designed educational program "Let's know the sun better" included 213 fifth grade pupils (113 boys and 100 girls) from Kaunas city schools; the pupils were differentiated into two groups: the experimental (n=106) and the control (n=107) groups. The method employed was anonymous questionnaire-based inquiry. The data of the inquiry applied before the application of the educational programs showed that schoolchildren's behavior in the sun is careless: 40.4% of the studied schoolchildren experienced severe sunburns; 54.0% of children spend three and more hours on the beaches, most frequently between 11 am and 3 pm. Not all schoolchildren use sun protection measures. Most frequently they only have bathing suits (70.0%), baseball caps (56.8%), and sunglasses (57.7%). Out of the studied schoolchildren 18.8% use sunscreen, but only 7.3% of them know how to use it properly. The second inquiry was performed after the schoolchildren were able to apply the recommendations of the educational program "Let's know the sun better" in practice during the summer. The data of this inquiry showed that the knowledge, attitudes, and the peculiarities of behavior in the sun in the experimental group were better compared to the control group. Significantly more schoolchildren in the experimental group (44.1%), compared to the control group (8.5%), used sunscreens properly ($p<0.05$) and knew which sunscreen is the most suitable (respectively, 42.3% and 20.6%; $p<0.05$); in addition to that, the children in the experimental group more frequently wore long-sleeved shirts on the beaches (21.0% and 7.5%, respectively; $p<0.05$), wide-brimmed sunbonnets (37.1% and 10.4%; $p<0.05$), and sunglasses (61.9% and 44.3%; $p<0.05$). The findings of the study proved both the necessity and the efficiency of the prepared educational program.*

Introduction

During the last decade the prevalence of skin cancer has increased worldwide, including Lithuania. In 2002, 1,900 of new cases of skin cancer were registered in Lithuania, whereas the number of such cases in 1979 was only 705 (1, 2). Of all the newly diagnosed malignant tumors, skin cancer makes 14.7% in women and 9% in men (2). This is related to people's careless behavior in the sun (1–6).

Eighty percent of lifetime sun exposure is experienced up to 18 years of age. Intensive sun exposure in childhood is a significant risk factor for developing skin cancer (4, 5, 7).

The presumption on the relationship between the development of cutaneous melanoma and severe sunburns in childhood has been assuredly proven in a number of epidemiological studies. Studies performed in the USA, Australia, and Israel showed that people who emigrated to regions with intensive sun being adults develop melanoma less frequently than those who emigrated in their childhood (8). A study performed in the Nordic countries showed that people who traveled to southern countries run a higher risk of developing skin melanoma (9). Caucasian children and adolescents living in Australia have several times more simple and atypical pigmented lesions than those liv-

ing further off from the equator (10). A higher risk of developing skin melanoma is indicated in fair blue-eyed people who are predisposed to severe sunburns, as well as in those who have freckles, those living closer to the equator, those who once or several times experience severe sunburns, and those spending their holidays in hot climate zones (11).

According to the findings of epidemiological studies on sun effect on children and adolescents performed in Kaunas city (12), 76.9% of all subjects experienced sunburn every year, and one-third (26.7%) of the subjects more than once experienced severe sunburns accompanied by pain, skin reddening or a more intensive inflammatory reaction. A half of all the studied people visited beaches at noon. The majority of the subjects did not use any sun protection due to a lack of knowledge and erroneous attitudes to sun tanning.

It is forecasted that melanoma is going to become the most dangerous tumor of the 21st century due to its rapid metastasis and a rising morbidity of increasingly younger people. Health education including dissemination of knowledge on protection from harmful sun exposure may help avoid this unfavorable prognosis. Most countries have national skin cancer prevention programs, either in the stage of creation or actual implementation (13, 14). These programs are aimed at developing healthy behavior in the sun since childhood in order to avoid skin cancer in the future.

On the basis of the "Kidskin" program developed by the Cancer Council of Western Australia Inc. (14), a program called "Let's know the sun better" aimed at protection from harmful sun exposure was developed. This is the first program of such kind in Lithuania.

The aim of this article was to familiarize with the prepared educational program "Let's know the sun better" for children protection from harmful sun exposure designed for the 5th-6th grade pupils and to present the evaluation of the efficiency of this program.

Educational program "Let's know the sun better"

The aim of the program: to teach children suitable behavior in the sun.

Objectives:

1. To provide knowledge on the positive and negative effect of the sun.
2. To increase children's, teachers', and parents' motivation for protecting themselves from the harmful effect of the sun.
3. To acquaint schoolchildren with sun protection measures.

4. To develop sun protection skills.

The educational program for children "Let's know the sun better" was created with respect to the recommendations of the educational program "Kidskin" (14) created by the WHO and Cancer Council of Western Australia Inc.:

- Teaching of children about sun protection should start at the earliest age possible. Since harm from sun exposure increases with every unprotected sunbathing and accumulates throughout life;
- When sunlight is the strongest (i.e. from 11 am till 3 pm), it is recommended to stay inside, and seek shade if one is outdoors;
- Avoidance of reflecting surfaces. Sand, snow, and water can reflect more than 50% of all sunlight;
- People are recommended to wear a wide-brimmed sunbonnet, long-sleeved shirt with high collar, and sunglasses with UV filtering;
- Children with a higher risk (fair-haired, blue-eyed, prone to severe sunburns, and freckled) should use sunscreen daily;
- Unprotected skin should be covered with sunscreen. The protective factor of the sunscreen (SPF) should be not lower than 15. Sunscreen should be used together with other sun protection measures.

The classes are oriented to 10–13-year-old (4th–6th grade) schoolchildren. Children of this age are willing to learn new things and thus it is easier to arouse their interest. The program is recommended before summer vacations, during which the children will spend much time outdoors during the highest intensity of sunlight.

The material presented in the program "Let's know the sun better" emphasizes the importance of sun protection and stimulates safer children's, their parents', and teachers' behavior in the sun. This material consists of individual exercise books and recommendations for teachers.

The implementation of this educational program involves five classes (Table 1). The first three classes familiarize schoolchildren with solar benefits and harm, as well as with the composition of the skin and sun protection measures. After the theoretical part, the schoolchildren perform practical exercises in class and at home. The completed exercise is evaluated using a sign in the form of a sun. These classes take place during the lessons "Nature and a person". During the fourth class that makes part of the physical training lesson, the practical skills that the schoolchildren acquired during the first three classes are consolidated. Such skills include the determination of the shadow, suitable sun protection measures, clothing, etc. the fifth

Table 1. Overview of the program

Topic of lessons	Content	Form of classes
Class 1. The sun – a friend or an enemy?	A. Theoretical part „The sun – a friend or an enemy?“ B. Class work C. Homework D. A letter to parents E. Evaluation with the sign of the sun	Lesson of nature or biology
Class 2. Let's know our skin	A. Theoretical part „Let's know our skin“ B. Class work C. Homework D. Evaluation with the sign of the sun	Lesson of nature or biology
Class 3. Protection from the sun	A. Theoretical part „Protection from the sun“ B. Class work C. Homework D. Evaluation with the sign of the sun	Lesson of nature or biology
Class 4. Consolidation of practical skills	A. Consolidation of skills on determining the shadow, choosing suitable clothing and protection from the sun B. Teacher's example	Physical training lesson
Class 5. Closing up of the program	A. Selection of the nicest exercise album „Let's know the sun better“ B. Children's responses and proposals on the educational program C. Mastering of skills D. Teacher's example	Class meeting. A trip outside the city, closing up of the school year.

class is dedicated to the closing-up of the program. During this class the pupils organize the best drawing competition under the topic “Let’s know the sun better”, and the verification of practical skills is performed during a trip outside the city.

Presumably, the implementation of the program will:

- Help form the children’s correct attitude towards the importance of sun protection;
- Acquaint the schoolchildren with sun protection means and measures;
- Teach the children proper behavior in the sun;
- Stimulate the children to encourage their parents and friends to protect their skin from the sun;
- Encourage the children to contradict those who invite staying in the sun without any protection.

Material and methods

The effectiveness of the program was evaluated empirically through implementing it in two randomly selected Kaunas city secondary schools. Further on these schools are referred to as the experimental group. For the comparison, another two secondary schools were randomly selected as a control group. These schools were identical concerning the size and the form of education; they were selected from the

same city districts as the schools in the experimental group. All fifth grade pupils in the selected schools were invited to participate in the study. School principals and supervising instructors recognized the necessity of the study and agreed to participate in it.

The study was performed in two stages. The first stage of the study was performed during May 2002, prior to the beginning of summer vacations. At the beginning of this stage, an inquiry of pupils from both the experimental and the control group schools was performed. In total, 213 fifth-grade pupils (113 boys and 100 girls) were questioned. Among the participants, 106 children were from the experimental group, and 107 – from the control group. The inquiry was anonymous. During the inquiry, we used a self-designed questionnaire consisting of 30 questions. The aim of the inquiry was to find out what the schoolchildren know about positive and negative effects of the sun, and what their attitude to sunbathing and tanned people is. In addition to that, we also aimed at gathering information on what sun protection measures the children apply, how much time they spend on the beaches, at what time, etc. After the inquiry, the experimental group schoolchildren underwent four weeks of classes within the framework of the educational program “Let’s know the sun better”.

The second stage of the study was carried out during September 2002, after summer vacations. During this stage, a repeated inquiry of the same schoolchildren (already sixth-grade pupils) was performed. The aim of the inquiry was to evaluate the changes in the knowledge acquired during the implementation of the program, and to find out to what extent this knowledge was used for sun protection during summer vacations. In this inquiry 211 schoolchildren participated.

The obtained findings were analyzed using SPSS (version "11.5 for Windows") computer software. The analysis was performed for the verification of the statistical hypotheses on the changes in the knowledge and behavior of schoolchildren in the experimental and the control groups due to the implementation of the program. The statistical relationship between qualitative changes was studied using the contingency table method while applying the χ^2 criterion. The level of statistical significance was set at 0.05.

Results

The evaluation of the schoolchildren's sun-related knowledge, behavior, and sun protection at the beginning of the program

The generalization of the results of the first inquiry showed that schoolchildren's, especially boys', behavior in the sun is careless. More than eighty percent (81.2%) of the questioned children annually camp at lakes and at the sea, and visit beaches. Fifty four percent of all children spend three and more hours on the beach, this tendency being more frequent among boys

(63.7%) than among girls (43.0%) ($p < 0.05$). In 93.9% of cases, children stay on the beaches from 11 am till 3 pm, when the sunlight is strongest and more dangerous. Forty percent of schoolchildren had experienced severe sunburns – boys twice as frequently as girls (52.2% and 27.0%, respectively; $p < 0.05$). The inquiry also showed a discrepancy between the children's knowledge and behavior – most schoolchildren had sufficient knowledge about harmful effects of the sun, but their behavior was contrary. For instance, 80.8% of schoolchildren knew when solar intensity is the highest, but it was during these hours that they spent most time on the beaches.

Schoolchildren do use sun protection measures, but not always the right way. Frequently children do not wear clothes and headgear that would offer them the best sun protection. Closed-neck and long-sleeved shirts are worn in only 4.7% of cases. Most frequently worn headgear is a cap (83.1%). Only 10.8% of schoolchildren wear sunbonnets (3.5% of boys and 19.0% of girls; $p < 0.05$). Most children (70.0%) on the beaches wear only bathing suits. In most cases (56.8%), they wear baseball caps; wide-brimmed sunbonnets are worn by only 5.6% of children. The rest do not cover their heads at all. Fifty eight percent of children wore sunglasses on the beaches; however, more than a half (55.5%) of the questioned children did not know whether their sunglasses have UV filters. Almost twenty percent (18.8%) of the questioned schoolchildren nearly always use sunscreens. Girls use sunscreens more frequently than boys (accordingly,

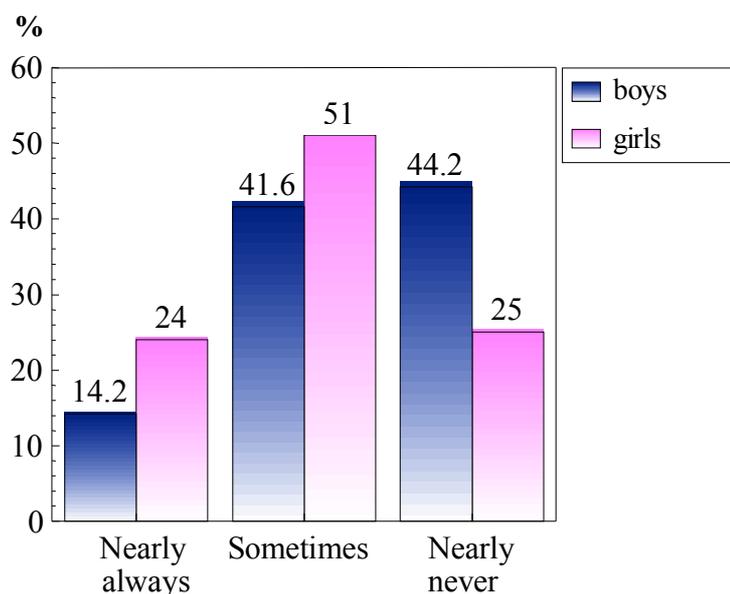


Fig 1. Dependency of sunscreen usage (%) on schoolchildren's sex
 $\chi^2=11.1$; $lls=3$; $p < 0.05$.

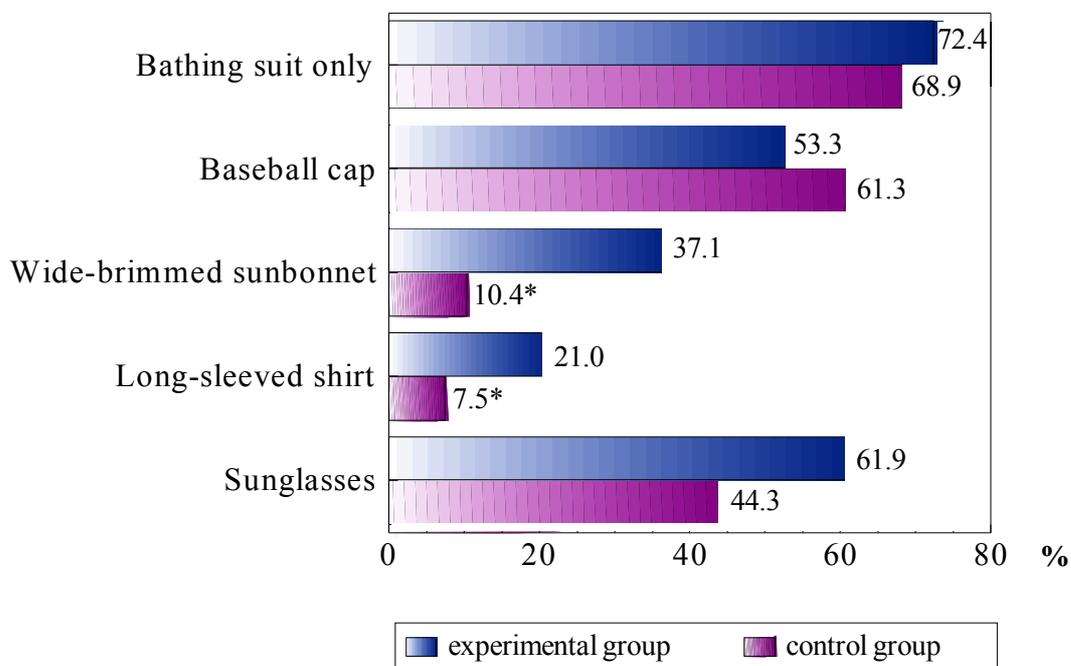


Fig. 2. Comparison of children's clothing on the beaches between the experimental and the control groups

* $p < 0.05$ when comparing the experimental and the control groups.

24.0% and 14.2%; $p < 0.05$) (Fig. 1). However, the majority of schoolchildren did not know how to use sunscreens properly (only 7.3% of children knew that).

The questionnaire showed that children do know about the harm the sun may cause to human health. However, their knowledge is not sufficient in all aspects, or their attitude is wrong. Two-thirds (66.7%) of children knew that prolonged staying in the sun may result in skin cancer, 80.8% of the children correctly knew that sunlight is the most intensive from 11 am till 3 pm, all respondents, 64.8% stated that they liked sunbathing. The majority of children (86.9% of girls and 70.8% of boys) stated that they found suntanned people nice. However, only 38.1% of boys and 40.0% of girls stated that being tanned is healthy.

The change in schoolchildren's knowledge and sun-related behavior after the completion of the program. The findings of the second inquiry showed that the way schoolchildren spent their summer vacations was nearly the same in both groups. For instance, 94.3% of children in the experimental group and 89.6% of children in the control group spent the summer at lakes or at the sea ($p > 0.05$). Children from both groups preferred wearing only bathing suits while being there (respectively, 72.4% and 68.9%; $p > 0.05$). During the period of the highest sun intensity, 41.0% of children from the experimental group and 55.7% of children from the control group spent three or more hours on the beaches ($p < 0.05$). However, while on the beach, children from the experimental group

Table 2. Sunscreen usage among schoolchildren in the experimental and the control groups

Group of schoolchildren	Used sunscreen when coming to the beach (%)	Used sunscreen when going outside (%)	Used sunscreen half an hour before going outside and repeatedly every 2 hours when being outdoors (%)
Experimental	51.6	4.3	44.1
Control	90.2	1.2	8.5
Both groups	69.7	2.9	27.4

$\chi^2=30.8$; $lls=2$; $p < 0.001$.

bewared the sun more, compared to schoolchildren from the control group. They more frequently wore wide-brimmed sunbonnets (37.1% and 10.4%, respectively; $p < 0.05$), shirts with closed necks and long sleeves (21.0% and 7.5%, respectively; $p < 0.05$), and sunglasses (61.9% and 44.3%, respectively) (Fig. 2).

When being outdoors during sunny days, nearly twice as many children from the experimental group tried to stay in the shade, compared to children from the control group (correspondingly, 26.7% and 13.2%; $p < 0.05$). Meanwhile, children in the control group tried to stay in the sun as long as possible (correspondingly, 19.8% and 7.6% in the control and in the experimental groups; $p < 0.05$).

Children in the experimental group were more prone to use sunscreens constantly (34.6%) than children in the control group (30.8%) ($p > 0.05$). In addition to that, children in the experimental group more frequently (44.1%) than children in the control group (8.5%; $p < 0.05$) used sunscreen correctly (0.5 hours before going outside and every 2 hours when being outdoors for a longer time) (Table 2). Also, more children in the experimental group knew, which sunscreens are recommended by physicians, compared to children in the control group (correspondingly, 42.3% and 20.6%; $p < 0.05$).

Evaluation of the knowledge of both groups about the best sun protection means and measures showed that the knowledge in the experimental group was better. For instance, 89.4% of schoolchildren in the experimental group knew that closed-neck and long-sleeved shirt was the best clothing on a sunny day; 92.3% of children knew that it was recommended to wear sunglasses, and 96.1% of children knew that it was recommended to wear wide-brimmed sunbonnet. The corresponding percentage of correct answers in the control group was 29.9%, 61.7% and 38.3% ($p < 0.05$).

Children were asked why the skin in the sun becomes darker. The correct answer (i.e. because the skin produces a pigment called melanin) was given by 89.4% of children in the experimental group, and only by 30.8% of children in the control group ($p < 0.001$). In the experimental group 76.9% of children correctly stated that fair-haired and blue- or green-eyed people's skin in the sun always becomes red, and 77.8% of them correctly indicated that the skin of dark-haired brown-eyed people becomes brown under sunlight. Meanwhile, the percentage of correct answers in the control group was, correspondingly, only 21.5% and 45.8% ($p < 0.05$).

Teachers provided great assistance in the implementation of the program. In the experimental group 89.3% of children said that the majority of knowledge

on sun protection was obtained from teachers who were in charge of this program; while children who did not participate in the program (the control group) stated that the majority (91.5%) of this knowledge was obtained from their parents.

Discussion

The national cancer prevention program should necessarily devote special attention to skin cancer prevention whose primary task should be children's and their parents' health education (1, 15).

The preformed study showed that schoolchildren's behavior in the sun is careless. We suppose that the main reason for such behavior might be children's insufficient knowledge concerning harmful effects of sunlight and ways to avoid it, as well as parents' and teachers' insufficient attention to children's behavior during sunny summer days. The reason may as well be that adults themselves lack knowledge about the sun and its effect on health.

Other scientists also point out that young people, especially adolescents and young women, are careless in the sun – they tend to sunbathe frequently and rarely use sun protection measures (16). These risk factors are significantly associated with the doubled prevalence of skin melanoma in adolescents during the last decade and a higher prevalence of this tumor among women than among men (17).

Despite the fact that risk factors for cutaneous melanoma are well known, and purposeful prevention is implemented, a significant part of population in many countries fails to avoid intensive sun exposure. It has been determined that in France 89% of children over one year of age have experienced severe sunburns at least once (18); in England during the summer this percentage reaches 48% of children (19), and in Sweden 93% of young people during the last decade have experienced severe sunburns (8). Every summer 75-91% of children and adolescents sunbathe on the beaches (20). Every year 4-34% (in Sweden – even 50%) of young people visit solarium (7, 16, 18).

In the previous studies performed in Lithuania (5, 12) it has been noticed that sun-related behavior is age dependent. Adolescents, compared to other age groups of children, two times more frequently sunbathe on the beaches, experience severe sunburns, and ignore sun protection measures. The frequency of severe sunburns (26.7%) in our country is not high, compared to other European countries. Severe sunburns are most frequent in sun-sensitive children with skin types I and II, and with freckles and lentiginos. Light color of the eyes and skin, and the number of

pigmented nevi are not significantly associated with the risk for severe sunburns. It has also been noticed that parents with a higher level of education and those who are better informed about skin cancer, better protect themselves and their children from the sun. Adolescents' level of knowledge in this respect is low, and their behavior, especially that of girls, is careless. One-third of the studied children (27.9%) used sunscreen. Adolescent girls used sunscreen more frequently (31.6%), compared to boys (8%). The majority of the studied subjects did not use sunscreen because of erroneous attitudes rather than because of low living standards.

The presented data clearly show that it is expedient to implement wide-scale education of the society (primarily of children) in order to decrease the risk for skin cancer. However, there are also more cautious views (21). Some authors claim that there have been no clear changes in the mortality from skin cancer despite the success of all European campaigns in informing people about sun-related risk, general attitudes, and behavior (22).

Our health education program "Let's know the sun better" was successfully implemented in several Kaunas city secondary schools. The evaluation of its usefulness to children during summer vacations showed that its effectiveness was sufficient: there has been an improvement in schoolchildren's knowledge on harmful effect of the sun and ways of sun protection, and those children's behavior outdoors during the summer was safer than that in the control group.

On the basis of study results, we recommend to include topics on the harmful effect of sunlight and

sun protection into the secondary school curricula (e.g. during biology and health education lessons). These topics should be addressed in the third trimester, before summer vacations. The prepared program "Let's know the sun better" should be applied in the fifth and the sixth grade. It is expedient to publish this program as a separate issue and implement it in all state schools.

We also think that children's protection from the sun should be started at the youngest age possible, and thus it is expedient to prepare a similar program designed for preschool children, and implement it in kindergartens.

Conclusions

Fifth- and sixth-grade pupils' knowledge about sun protection is poor, and their behavior in the sun is careless. The implementation of the designed educational program "Let's know the sun better" improved the schoolchildren's knowledge about the harmful behavior of the sunlight and ways of sun protection; as a result, during the summer the schoolchildren's behavior in the sun was safer than that in the control group. National cancer prevention program should pay special attention to skin cancer prevention aiming at children's education on protection from the sun. It is recommended to include topics on the harmful effect of the sun and sun protection measures into the secondary school curricula; these questions should be addressed in the third trimester, before summer vacations. The educational program "Let's know the sun better" is recommended for fifth- and sixth-grade schoolchildren.

Odos vėžio profilaktika: vaikų mokymo, kaip saugotis žalingo saulės poveikio, programa bei jos veiksmingumo įvertinimas

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Raktažodžiai: odos vėžys, profilaktika, saulės poveikis, apsauga nuo saulės, vaikai, sveikatos mokymas.

Santrauka. Darbo tikslas. Įvertinti moksleivių žinias apie žalingą saulės poveikį ir jų buvimo saulėje įpročius, taip pat apie vaikų mokymo, kaip saugotis žalingo saulės poveikio, veiksmingumą.

Autorių parengtos mokomosios programos „Pažinkime saulę“ veiksmingumo tyrime dalyvavo 213 (113 berniukų ir 100 mergaičių) Kauno miesto penktųjų klasių moksleivių. Tiriamieji suskirstyti į eksperimentinę (n=106) ir kontrolinę (n=107) grupes. Tyrimo metodas – anoniminė anketinė apklausa.

Apklaustos, vykusios prieš įgyvendinant mokomąją programą „Pažinkime saulę“, duomenimis, moksleiviai nelinkę saugotis saulės. Labai įdege buvo 40,4 proc. moksleivių. Paplūdimyje tris ir daugiau valandų praleidžia 54,0 proc. vaikų, dažniausiai nuo 11 iki 15 val. Ne visi moksleiviai naudoja apsaugos priemones nuo saulės.

Daugelis kaitinasi saulėje tik su maudymosi kostiumėliu (70,0 proc.), 56,8 proc. – nešioja kepurę su snapeliu, 57,7 proc. – akinius nuo saulės. Kremu nuo saulės tepasi 18,8 proc. moksleivių, bet, kaip taisyklingai jį naudoti, žino tik 7,3 proc. Antros apklausos, atliktos po to, kai moksleiviai vasaros metu galėjo praktiškai pritaikyti įgytas žinias, duomenimis, eksperimentinės grupės moksleivių žinios, požiūris ir buvimo saulėje įpročiai buvo geresni negu kontrolinės grupės moksleivių. Daug daugiau eksperimentinės (44,1 proc.) negu kontrolinės (8,5 proc.) grupės moksleivių tinkamai naudojo kremą nuo saulės ($p < 0,05$), žinojo, koks kremas geriausias (atitinkamai – 42,3 ir 20,6 proc.; $p < 0,05$), paplūdimyje vilkėjo marškinėlius ilgesnėmis rankovėmis (21,0 proc. ir 7,5 proc.; $p < 0,05$), nešiojo plačiabrylę skrybėlę (37,1 proc. ir 10,4 proc.; $p < 0,05$), akinius nuo saulės (61,9 proc. ir 44,3 proc.; $p < 0,05$). Tyrimo duomenys rodo, jog parengta mokomoji programa yra reikalinga ir veiksminga.

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