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ASSESSMENT OF KNOWLEDGE ABOUT THE EFFECTS OF UV RADIATION ON HEALTH AND HEALTH BEHAVIORS ASSOCIATED WITH SUNBATHING IN GYMNASIUM STUDENTS

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ABSTRACT

INTRODUCTION. The health behaviors or health-related behaviors is behavior (or activity) that are part of everyday life, affecting the health of the individual. An example of the behavior of health is also sunbathing, or exposing the body to excessive solar radiation dosage. It may be positive and negative effects on health.
AIM. Evaluation of knowledge about gymnasium students. The impact of UV radiation on health and health behaviors associated with sunbathing.
MATERIAL AND METHODS. The study was a diagnostic survey, with author's questionnaire. The sample was comprised students from classes II and III. A total of 312 questionnaires were collected among 181 girls and 131 boys. Used purposeful sampling. Results were considered statistically significant at $p < 0.05$.
RESULTS. There is a statistically significant relationship between the stated sunbathing to get a sun tan, and sex of the respondent ($p = 0.0002$). Definitely more girls (77.35%) admit that tans in the sun to get a tan as compared to boys (58.02%).
CONCLUSION. It is recommended that further research aimed at checking the causes and incidence of sunburn among young people. Consideration should be given to create and implement the appropriate health programs taking about tanning that could be implemented under the School Health Promotion Program, or to supplement this knowledge on subjects such as Biology or Nature.

Key words*: UV radiation, health education, health behaviour, sunbathing*

INTRODUCTION

Lifestyle, especially the combination of health behaviors and attitudes, is the most important factor conditioning individual health. Health behaviors or behaviors that are related to health are any actions (or activities) that are part of everyday life, affecting the health of the individual. They are the subject of relatively free individual choices and decisions (1). Health behaviors can also be specified as any human behavior relevant to health and disease (2).

An example of health behavior is sunbathing or exposing the body to intensified dosage of solar radiation. This can have both positive and negative effects on human health (3).

Sunbathing, in the opinion of many people, is an ideal way to relax, improve humor, or fight off autumn-winter depression. This occurs because UV (ultraviolet) radiation stimulates secretion of endorphins in the human organism, colloquially known as "happiness hormones". They can relieve pain and positively influence mood (3). UV radiation increases the activity of endocrine glands, simultaneously increasing metabolism. It affects the organism's mineral composition, primarily phosphor and calcium levels, as well as the production of vitamin D3 in the subcutaneous tissue (4). Vitamin D3 is involved in the absorption process of calcium and potassium and affects correct growth and maintenance of proper bone structure (5). In addition, it regulates cell growth in a number of organs and tissues, preventing uncontrolled division, which may limit the development of neoplastic diseases (6). Daily exposure to the influence of UV radiation required to produce adequate amounts of vitamin D3 is 15 minutes (with exposed face and hands) (4).

The first response of the skin to the harmful effects of sunlight is erythema which is the result of an inflammatory reaction. The shorter the length of the UV waves, the stronger is the erythema-producing effect (UVB has the strongest influence on the formation of erythema). Erythema formation also depends on the phototype of the skin, age, which body part is exposed to radiation, endo- and exogenous phototoxic substances, as well as photoprotective substances (7).

Photoaging of the skin is a long-term effect of the influence of ultraviolet radiation on skin (90% UVA and to a lesser extent - UVB). UVA radiation penetrates the epidermis causing it to undergo uncontrollable changes (8). Defects in pigmentation are the result of disorders in the activity of melanocytes. There is an increase in the number of pigment cells, which then often become enlarged, resulting in irregular pigmentation and in other cases the disappearance of the dye (discoloration) (9, 10).

Chronic exposure to rays of sunlight damages the skin structure. This damage can be the foundation for hyperkeratotic buildup, otherwise known as actinic keratosis. They can be the initial stage of development for malignant tumors of the skin (11). These can be divided into two main groups: basal-cell carcinoma (BCC) and squamous-cell carcinoma (SCC).

UV radiation causes damage to DNA (deoxyribonucleic acid). A very important role here is played by UVB radiation because it causes specific mutations of gene p53 – a tumor suppressor gene, whose mutations are associated with breast, colorectal, and lung cancer as well as leukemia (12). Basal-cell carcinoma is the most common type of skin cancer. Squamous-cell cancer is more malignant than BCC, it has a tendency for invasion and metastasis, however the incidence rate is about ten times lower (11). BCC and SCC represent 95% of all malignant skin cancers. It should be emphasized that early diagnosis and treatment of skin cancer can give even up to 100% chance of cure (13, 14).

Melanoma is the cause of nearly 75% of deaths caused by all malignant neoplasms of the skin combined. There has been a noticeable continuous increase in incidence among Caucasians (3-7% per year over the last 30 years) (9). In Poland in 2010 there were 6,6 reported cases per 100 thousand people (men: 6,4/100000; women: 6,8/100000; a total of 2545 cases per year (15). The standardized mortality rates in 2010 were 2,2 per 100 thousand among men and 1,4 per 100 thousand among women (15). In comparison with the average mortality rate for the European Union, Poland's is higher by about 20% (15). Among people under 20 years of age, melanoma is the cause of 1,3% cases, at the same time this is close to 7% of cancers occurring in the age group of 15-19-year-olds overall (16). In the high risk group we can also find: people with phototype I skin according to *Fitzpatrick* with a large number of melanocytic lesions (over 100 lesions in 64,7% of patients with melanoma); adults who experienced numerous sunburns during childhood (17); the elderly who are occasionally subjected to exposure of intense sunlight radiation resulting in sunburns (18).

The harmfulness of sunbathing is widely known. However, there is a lack of studies evaluating the health behaviors of society in this area. It is possible to observe rising trends among young people in relation to tanning. Most risky behaviors associated with excessive sun exposure increase with age, in particular among females.

The aim of the study was to assess the state of knowledge of middle school students on the impact of UV radiation on health as well as their knowledge on health behaviors associated with sunbathing.

METHODS AND MATERIAL

The study was conducted using a diagnostic survey. The instrument used was a questionnaire designed by the authors of this study. The questionnaire consisted of questions regarding 1) health behaviors associated with sunbathing (frequency of sunbathing during the spring-summer season, time of day of sunbathing, hours spent in the sun during a single tanning session, applying sunscreen, use of supplements that aid in tanning, use of sunbeds, past sunburns); 2) reasons for sunbathing and going to tanning salons; 3) knowledge of the consequences of too frequent use of tanning beds; 4) incidence of skin cancer in the family; 5) sources of knowledge about tanning and solariums; 6) knowledge concerning the characteristics of people who should be mindful in particular of solar radiation (eg. complexion

type); 7) knowledge on characteristics of skin lesions which, for health reasons, should be examined by a doctor; 8) consumption of vegetables and fruits rich in beta-carotene; 9) requests for clarification of abbreviations UV and SPF as well as the concept of tanorexia; 10) classes in school during which the subject of the impact of UV radiation on human health was raised and the possible need of such classes; 10) year of birth and gender.

The survey was conducted from March to June 2015. Purposive sampling was used. The study population consisted of students in grades II and III of middle schools in Warsaw (174 persons, 55,8%), Józefów (88 persons, 28,2%), Kruszyn and Widzów (35 persons, 11,2%), as well as Grodzisk Mazowiecki (15 persons, 4,8%). The study involved 312 people, including 181 girls (58,01%) and 131 boys (41,99%). Individuals most often declared to be 14 years old (281 persons; 90%). The remaining children declared ages of 15 (27 persons; 8,7%), 13 (2 persons; 0,7%), 16 (1 person; 0,3%), and 17 (1 person; 0,3%).

For statistical analysis the STATISTICA package version 12 under Site License for staff and students of the Medical University of Warsaw was used. The chi^2 test was applied as well as an analysis of Spearman's rank correlation coefficient. Results were considered statistically significant at $p<0,05$.

RESULTS

Close to 64% of middle school students (199 persons) correctly expanded the acronym UV, however 36,2% (113 persons) did not know the meaning of the abbreviation.

Hypothesis 1: Girls more often indicate that an excessive amount of solar radiation has an impact on health.

Fig. 1.

Most respondents fully agree with the statement that an excessive amount of solar radiation has an effect on health (54,73%). Girls more often than boys indicate such reasoning ($p=0.0121$), although the difference between the two groups is not large. A greater group of boys (14,50%) than girls (7,18%) does not have an opinion on the subject. Close to 6,63% of girls tend to disagree and 1,66% girls fully disagree with the statement that excessive quantities of radiation have an influence on health. This might suggest lack of knowledge of young people in terms of the effect of ultraviolet radiation on human health.

Hypothesis 2: Tanning in the sun with the intention to acquire a tan is more common among girls than boys.

Fig. 2.

Most people sunbathe with the main purpose of obtaining a tan (67,69%). There exists a statistically significant relationship between declared sun exposure in order to obtain a tan and the gender of the respondent ($p=0.0002$). Significantly more girls (77,35%) admit that they sunbathe in the sun to gain a tan as compared to boys (58,02)%. Girls, especially at a young age, more often feel the pressure of society in relation to current canons of fashion. This can sometimes pose a threat to their health, as in the case of excessive sunbathing or weight loss. The impact of the public and media can remain undetected by young people, which may be corroborated by the graph below.

Hypothesis 3: Fashion and a desire to increase one's attractiveness are the main motives of sunbathing by girls.

Fig. 3.

There are no statistically significant differences between the group of girls and boys in terms of sunbathing due to prevailing fashion and a desire to increase one's attractiveness ($p>0.05$). In both researched groups (close to 45%) there is a prevailing lack of desire to sunbathe due to fashion and an aspiration of being attractive. Nearly 30,94% of girls and 29,77% of boys declare sunbathing as a result of current fashion and a desire to increase one's attractiveness.

Hypothesis 4: Boys get sunburns more often than girls.

Fig. 4.

There are no statistically significant differences between girls and boys ($p>0.05$) in the incidence of sunburns. A significant portion of respondents declares having experienced sunburns in the past (71,52%). In both groups there is a clear prevalent proportion of people who have suffered from sunburns. Among girls this equals close to 72%, while among boys approximately - 73%. Sunburns can lead to heat stroke, allergies, eye damage, photoaging of the skin, as well as tumor lesions.

Hypothesis 5: Girls enrich their diet with foods rich in beta-carotene more frequently compared to boys.

Fig. 5.

There are no significant differences in the frequency of diet enrichment with products rich in beta-carotene between the group of girls and boys ($p>0.05$). Vegetables and fruits rich in beta-carotene are most often consumed several times a week by both girls (46,41%) as well as boys (53,44%). Daily consumption of this type of product declares approximately 32,60% of girls and 27,48% of boys.

Hypothesis 6: Boys are less often aware that beta-carotene has protective functions against negative effects of tanning.

Fig. 6.

Boys (25,19%) and girls (25,97%), to a similar extent, are aware of the positive effects of beta-carotene on the effects of tanning ($p>0.05$). In both groups, among boys (17,56%) as well as among girls (16,57%), there prevails a lack of knowledge of the concept of beta-carotene and its functions. Nearly 38,67% of girls and 45,04% of boys do not have an opinion on the subject.

Hypothesis 7: Students, with a family history of skin cancer more frequently indicate that an excessive amount of solar radiation has an impact on health.

Fig. 7.

Students, who have a family history of skin cancer or declare knowledge in this area, are more often of the opinion that an excessive amount of solar radiation affects health (almost 50% of respondents).

DISCUSSION

The issue of awareness among young people regarding the risks resulting from excessive exposure to ultraviolet radiation, including the use of tanning salons is extremely important. According to information provided by the World Health Organization and IARC (International Agency for Research on Cancer), tanning beds are equally dangerous to human health as asbestos and tobacco. Persons under 35 years of age making use of tanning salons have a 75% higher probability of developing malignant melanoma, which is the most malignant skin cancer (19). According to the American Cancer Society, incidence of melanoma has increased progressively over the last 30 years. In 2014, 76100 new cases have been diagnosed (20).

Cosmetics with a UVA/UVB filter play an important role in skin cancer prophylaxis. In the study of *Torzewska* et al. nearly 51% of respondents admitted that they do not use any cosmetics before tanning in a solarium (21). Barely 10% of respondents always protect their skin lesions or beauty marks before sunbathing. This is a very low percentage of people who use this form of skin cancer prevention, even though 60% of respondents are informed that radiation-induced changes in pigmentation can lead to skin neoplasms (21).

In our study a group of girls numbering 55,25% and a group of boys numbering 54,20%, fully agree with the statement that an excessive amount of solar radiation has an effect on health. A study by *Knight* et al. demonstrated that the respondents' awareness of the health consequences does not deter them from using sunbeds (22). Almost 55% of the respondents completely agree with the statement that excessive solar radiation has a negative effect on health (22). In the study by *Torzewska* et al. it was shown that nearly 82% of the respondents were informed about the negative effects of UV radiation on health. The most common sources of knowledge in this area included the internet, television, media and also family and friends (21). A study by *Zalewska* et al. indicated that nearly 70% of the people questioned were able to correctly determine the negative impact of solar as well as artificial radiation, emitted by lamps in tanning salons, on the skin (23). The most common response was the acceleration of the skin aging process. Wider knowledge was demonstrated by women (68%), whereas barely 27% of men selected the right answer (23).

In the study of *Gałajda* et al. 88% of respondents agree with the statement that modern solariums do not reduce the risk of melanoma (24). In our study we found a smaller percentage of people (55%), in comparison with other, above-mentioned studies (which fall in the range of 55% to 88%), that are sufficiently informed about the negative effect of ultraviolet radiation on human health. Low awareness of children in middle school about the dangers of overexposure to UV radiation translates into adverse health effects, especially among those who frequent tanning salons.

In the conducted study the same amount of boys and girls (26% each) are aware of the protective effect of beta-carotene during tanning. Nearly 39% of girls and 45% boys do not have an opinion on this subject. In the study of *Zalewska* et al. only 26% of respondents correctly indicated the group of substances that sensitize the skin to sunlight (23). Both the above-mentioned studies show a surprisingly high percentage of people who lack knowledge about the use of beta-carotene among middle school students and adults. This justifies the need to create educational programs directed at all age groups, aimed at improving public awareness in this field.

Tanned skin, in some cultures, is considered a symbol of health and attractiveness. A study by *Geller* et al. showed that the main motive of going to tanning salons among children and adults is having friends who use them (25). Another reason is the belief that there is nothing wrong with burning your skin if you want to achieve a nice tan (25). It was also emphasized that tanned skin is more attractive than pale skin (25). In our study 30,94% of girls and 29,77% of boys expressed a willingness to sunbathe in order to improve their own attractiveness. In the study by *Geller* et al. only 30% of respondents considered that a dark tan adds beauty, attractiveness (25). There were no differences between the group of women and men in terms of indicating fashion and increasing ones attractiveness as the main motives of tanning (25).

Research by *Torzewska* et al. revealed that 36% of respondents use the solarium. More than half of these people went to a salon to get a nice tan, while 14% of respondents were guided exclusively by the prevailing fashion (21).

In *Lazovich's* study 49% of girls and 77,1% of mothers believe that tanned skin adds attractiveness (26). This study shows the difference between the opinions of girls and their mothers. Mothers decidedly want to get a tan. Despite the prevailing fashion trends linked to tanning, a negligible amount of people declared that it is the main reason for their use of sunbeds. The most common reason is a sense of attractiveness/charm after leaving the salon (26). The results obtained in our study, the study by *Geller* et al. (25), and the study by *Torzewska* et al. (21) are similar to each other and more optimistic than in the study by *Lazovich* et al. (26).

In our study, in both groups, the percentage of people who had suffered sunburns clearly dominated. Among girls it was 72%, while among boys 73%. The results of the study by *Geller* et al. (25) are similar to the results of our study. The percentage of people who have ever experienced sunburns amounted to 71%. Men and women suffered sunburns with the same frequency (25). In the study of *Lostritto* et al. nearly 39,3% women and 21,7% men had gotten sunburns at a tanning salon (27). It is surprising that a comparable amount of people that have experienced sunburns in the past, among both women and men (over 70%), was found in our study as well as in the study by *Geller* et al (25). We can see that this is a problem of the whole society, occurring from an early age. In addition, we note the presence of numerous burns after tanning in a solarium, which in the future will increase the total percentage of burns.

The World Health Organization points out the necessity of avoiding artificial UV radiation by young people of school age. It is disturbing that the number of cases of melanoma among young people in Poland is rising. In order to reduce the incidence of skin cancers, as well as diminish the scale of other negative consequences of excessive and overly intensive UV exposure of the skin, we should consider introducing (modeled on i.e. UK, France, Germany) a ban on usage of tanning salons by persons under 18 years of age. Poland does not have legislation that would regulate this issue.

SUMMARY AND CONCLUSIONS

1. Consequences of sunburns often have a significant impact on human health. Middle school students most likely do not have sufficient knowledge in this field. Numerous sunburns among the studied young adults could suggest inadequate use or lack of applying sunscreen. Continued research, aimed at examining the causes and frequency of sunburns among young people, is justified.
2. The age of middle school students is characterized by a desire to feel attractive. Young people often have a serious problem with accepting their own bodies as well as tolerating their skin color which is why they partake in anti-health activities that increase their feeling of self-worth. The introduction of programs developing self-esteem in young people, for example during pedagogical hours (*Polish: godziny wychowawcze*), should be considered.
3. The core curriculum of education in both elementary and middle schools contains only general issues on the topic of risks stemming from excessive exposure to ultraviolet radiation. Consideration should be given into creating and implementing appropriate health programs related to the matter of sunbathing, which could be realized as part of School Health Promotion Programs or as a supplement in classes such as Biology, Nature.

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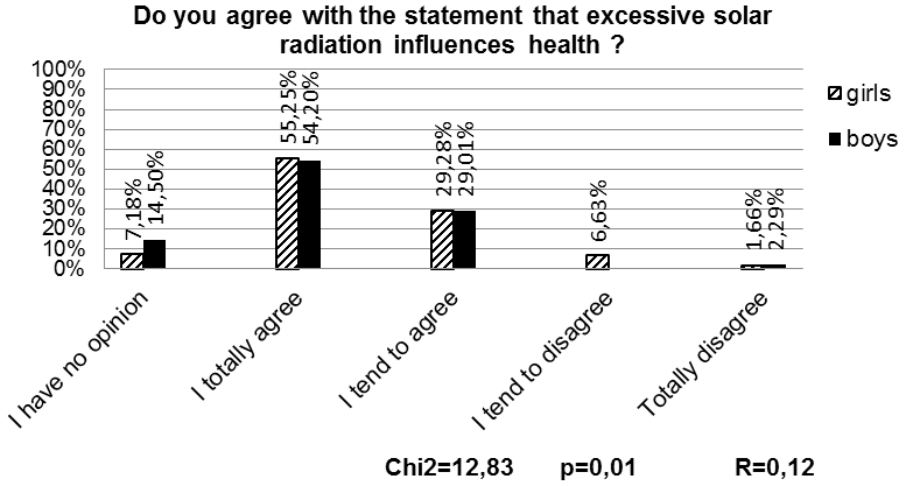

Fig. 1. Opinion about the impact of excessive amounts of solar radiation on health by gender (N=312) – results of the survey

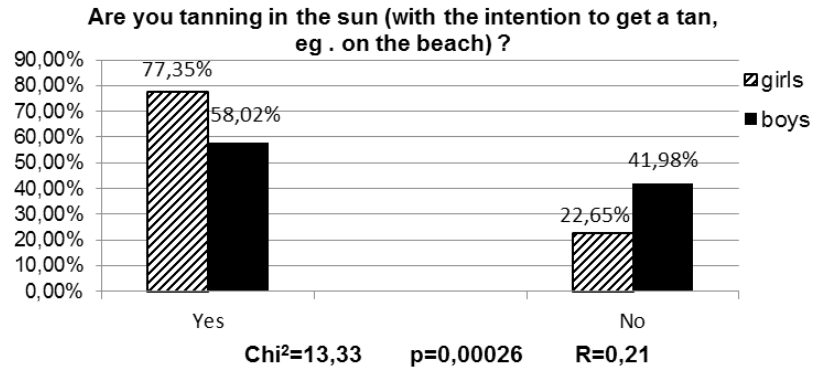

Fig. 2. The percentage of young people tanning with the intention of getting a tan by gender (N=312) – results of the survey

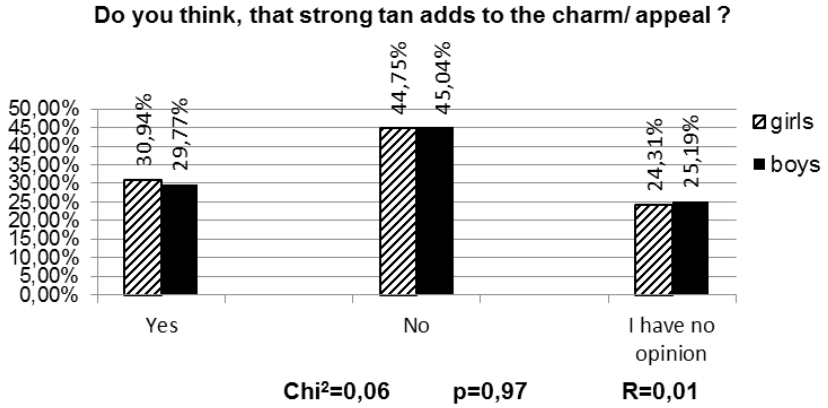

Fig. 3. The percentage of people sunbathing due to fashion and a desire to increase their attractiveness by gender (N=312) – results of the survey

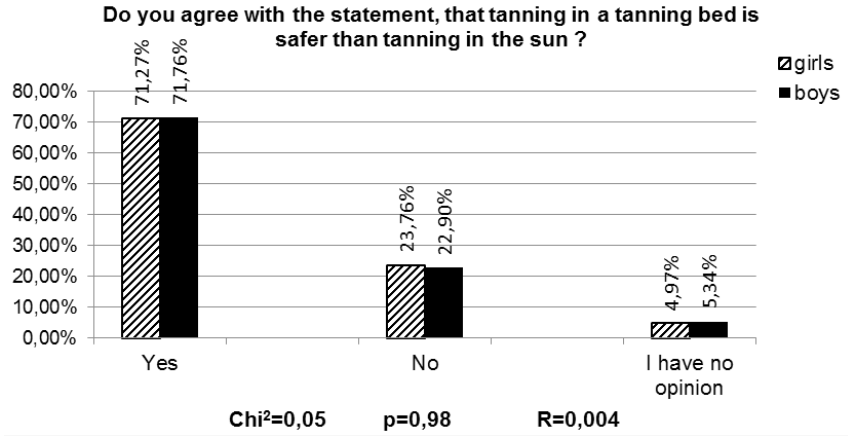

Fig. 4. The percentage of people that have suffered from sunburns by gender (N=312) – results of the survey

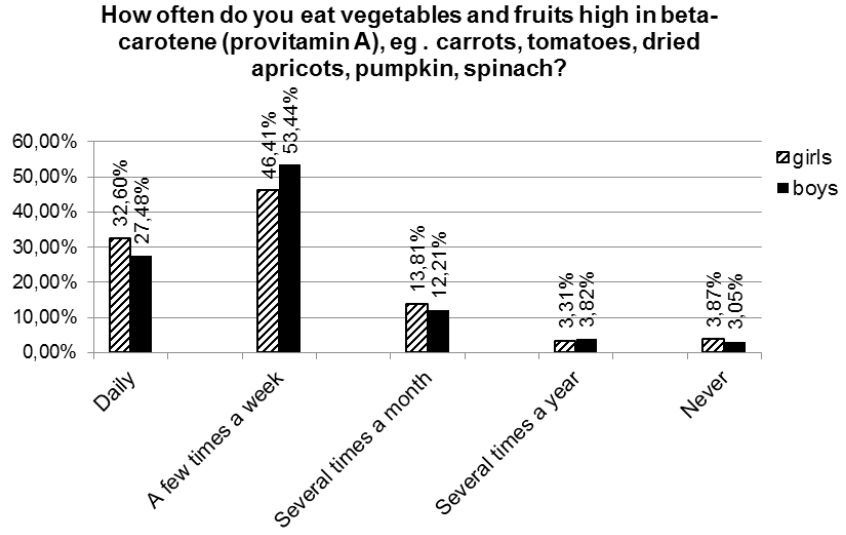

Fig. 5. The frequency of consumption of vegetables and fruits rich in β-carotene by gender (N=312) – results of the survey

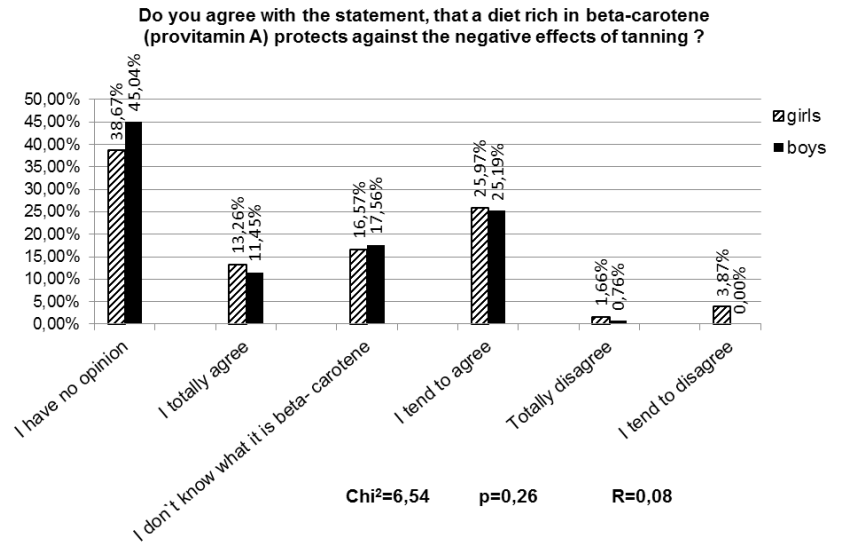

Fig. 6. Awareness of the protective function of β-carotene against the negative effects of sunbathing by gender (N=312) – results of the survey

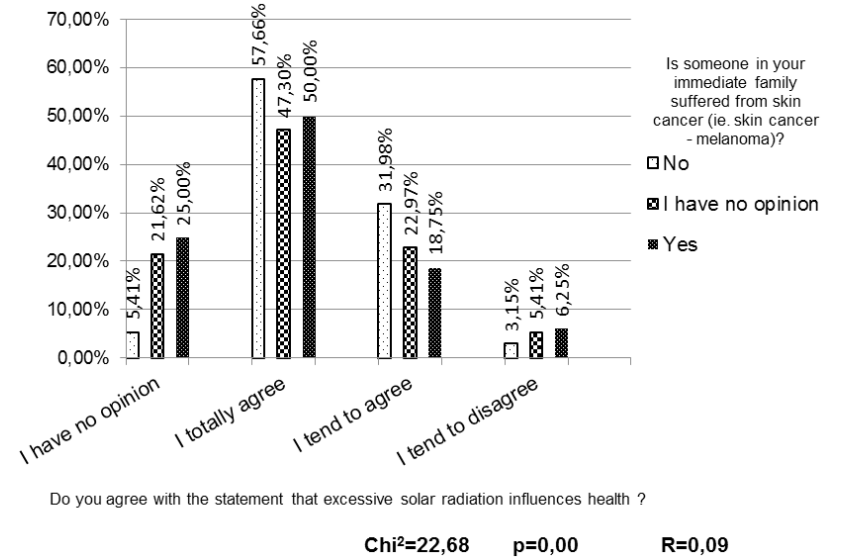

Fig. 7. Knowledge of the harmful effects of excessive amounts of solar radiation on health compared to the incidence of skin cancer in the family (N=312) – results of the survey