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The Importance of Early Detection and Prevention of Atypical Skin Lesions and Another Risk Factors in a Younger Population

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Simple Summary: Although melanoma is much less common than other skin cancers, it has a higher mortality rate and is responsible for almost 73% of skin cancer-related deaths. Dysplastic nevum (DN) is known an important factor contributing to development of cutaneous melanoma. Early detection and monitoring are crucial for individuals with atypical nevi. The aim of the study was to to investigate the role of selected risk factors in the pathogenesis and incidence of skin cancers and the stage of advancement at diagnosis. Our study, involving a diverse group of patients, highlighted several key factors influencing the occurrence of atypical skin lesions. However, it highlights the significant correlation between the occurrence of atypical lesions and various clinical and demographic factors in a relatively young population. Our findings underscore the necessity for targeted prevention strategies and regular dermatologic screening, particularly for high-risk groups identified in this study.

Abstract: Background/Objectives: Skin cancer is becoming increasingly common due to increasing risk factors such as excessive UV radiation, genetic predisposition, fair skin, and a history of sunburn. Melanoma accounts for only 1% of cases but causes the majority of skin cancer deaths. Dysplastic nevi (DN) are important precursors of melanoma. The aim of this study was to investigate the influence of these risk factors on the pathogenesis, incidence, and stage of skin cancer.; **Methods**: The study included 591 patients aged 18 to 64 who visited the Clinic in 2022–2023 for skin examinations. Each patient completed a questionnaire regarding the risk factors for melanoma and atypical melanocytic nevi and then underwent a dermatoscopic examination of the whole body using a digital videodermatoscope. Statistical analysis of the collected data was performed.; **Results**: Dermatoscopic examination revealed a lesion suggestive of melanoma in 1,69% of the patients. Risk factors for developing melanoma included male gender, family history of melanoma, number of skin moles, sunburns in childhood, sun-dependent hobby, using tanning bed, using cream with low SPF, not avoiding sun exposure and co-occurrence of actinic keratosis.; **Conclusions**: Risk factors for melanoma and dysplastic nevi are still common among patients, but the situation has been improving over the years. Early intervention and education on sun safety can play pivotal roles in reducing the incidence of atypical moles and potentially preventing malignant transformations.

Keywords: dysplastic nevum; melanoma; risk factors; dermoscopy; prevention

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1. Introduction

The introduction should briefly place the study in a broad context and highlight why it is important. It should define the purpose of the work and its significance. The current state of the research Skin cancer is one of the most common malignancies worldwide, and its incidence continues to rise. Understanding the risk factors associated with skin cancer is crucial for both prevention and early detection. These risk factors include, but are not limited to excessive ultraviolet (UV) radiation exposure, genetic predispositions, fair skin, and a history of sunburns. Awareness and monitoring of these risk factors can significantly impact public health outcomes by enabling early interventions and reducing the burden of skin cancer. This publication aims to highlight the importance of recognizing and tracking skin cancer risk factors to enhance preventative strategies and improve patient prognosis.

Skin cancers can be divided into two groups: melanocytic skin cancers (MSC) and non-melanocytic skin cancers (NMSC). Risk factors for NMSC are diverse, encompassing individual characteristics and various environmental and occupational exposures. Host susceptibility factors, such as fair skin type, light or red hair, a tendency to sunburn, family history of skin cancer, and genetic polymorphisms, play significant roles in the development of these malignancies [1].

Approximately 80% of NMSC are BCC, which is the most common skin cancer and is derived from the basal cells. Intermittent ultraviolet radiation (UVR) exposure and UVR exposure during childhood are identified as the most prominent predisposing factors. SCC accounts for about 16% of skin cancer cases. There is a strong association between various factor and the incidence of SCC: cumulative habitual sun exposure, human papillomavirus, chronic scarring conditions, familial cancer syndromes, and environmental exposures, such as arsenic [2].

Melanoma is a malignancy arising from skin melanocytes and accounts for approximately 1% of all skin cancers, but is responsible for the majority of skin cancer-related deaths. Risk factors for the development of melanoma include: genetic factors, UV exposure, number of nevi, skin type, age, personal or family history of skin cancer, immune system suppression [3]. It is a growing public health problem, because incidence of melanoma is increasing worldwide, particularly in White populations [4].This increase is associated with increased exposure to sunlight, an increase in the number of immunosuppressed people and increased life expectancy.

In Poland, the incidence rate of melanoma is approximately 9.6 per 100,000. According to data National Cancer Registry of Poland, 3689 (1749 men and 1940 women) cases of skin melanoma were recorded in Poland and 1464 deaths due to it in 2019. It is estimated that in 2024 the number of cases will increase to 5129 and the number of deaths to 1964 [5]. Although melanoma is much less common than other skin cancers, it has a higher mortality rate and is responsible for almost 73% of skin cancer-related deaths [6]. [Carr]

Dysplastic nevum (DN) is known an important factor contributing to development of cutaneous melanoma. They may be present in large amount, in patients with atypical nevus syndrome or isolated without familiar occurrence. DN usually occurs in sun-exposed areas, especially upper limbs and trunk. The ABCD (E) criteria helps clinicians with making a diagnosis. The nevi is considered atypical when it is asymmetrical (A), has unequal borders (B), multiple colors (C), diameter >=5mm (D) and when it protrudes above the surface of the skin (E) [7].

The differentiation between atypical nevi and common nevi often relies on specific features observed under dermatoscopic examination, including the pigment network and brown globules. In atypical nevi, the pigment network tends to be irregular, with focal prominence and abrupt termination at the periphery in some areas. In common nevi, the pigment network is typically regular and fades gradually toward the periphery of the lesion. In atypical nevi, brown globules may exhibit varied sizes and shapes, with an irregular distribution. In contrast, brown globules in common nevi are usually uniform in size and shape, often with regular distribution, especially in the central area of the lesion [8]. Atypical moles can resemble melanoma and are often biopsied to rule out cancer. While having multiple atypical nevi can increase the risk of developing melanoma, the likelihood of any single atypical mole transforming into melanoma is low [9,10].

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Early detection and monitoring are crucial for individuals with atypical nevi due to their increased risk of melanoma. However, a dysplastic nevi is not a precursor to melanoma. This diagnosis should be used to promp healthcare providers to recommend closer monitoring and follow-up for patients [11]. In our center, dermatoscopic diagnosis of an atypical nevus qualifies for intensified dermatoscopy of skin lesions every 3-6 months. The aim of this study was to investigate the role of selected risk factors in the pathogenesis and incidence of skin cancers and the stage of advancement at diagnosis.

2. Materials and Methods

Approval for the study was obtained from the Ethics Committee (RNN/39/24/KE). The study was conducted under the EU project titled: Melanoma without secrets- examine the moles. Skin cancer prevention program. No. RPDL.10.03.02-10-A009/22. The project included a 591 patients aged from 18 to 64 who visited a Department of Dermatology and Venearology in 2022–2023 for skin examination. Each of patient completed a detailed questionnaire containing questions about the risk factors for the development of melanoma and atypical melanocytic nevi. Then, the patients underwent a whole-body dermatoscopic examination conducted with the aid of a digital video dermatoscope FotoFinder.

Statistical Analysis

To assess normal distribution we used the Shapiro–Wilk test. When data differed from-normal distribution as well as data had qualitative or quantitative characterisitcs were analysed them with non-parametric tests, including the Kruskal–Wallis ANOVA, Pearson's chi-squared and Mann–Whitney U tests. General descriptive statistics methods were also involved. Where applicable, we used a logistic regression model in multivariate analysis. Analysis of covariance (ANCOVA) was used to control for the effect of some covariables. The statistically significant p level was at <0.05.

3. Results

This Study group consists of 591 patients participated in EU program—393 women (66,5%) and 198 men (33,5%). Mean age of women was 46,3 (12,077 SD) and in men 45,2 (12,590 SD). The most common reasons for patients to undergo dermatoscopic examination was: „many moles, hyperpigmentations on the skin" (64,94%) , „preventive skin examination" (24,9%), „the mole has changed or a new skin lesion has appeared" (4,91%).

382 patients (64,74%) never performs skin self-examination, while 126 (21,36%) do it once every six months, 43 (7,29%) once a month, 30 (5,08%) once a week and 9 (1,53%) do it every day. In this group 25 (4,23%) patients reported family history of melanoma. Sunburns in childhood reported 267 patients (45,17%). Among the other risk factors for the development of melanoma: 39 (6,6%) patients reported regular using the tanning bed, 377 patients (63,79%) patients had hobbies related to spending time in the sun, 544 patients (92,05%) declared at least 1 year of work involving long periods of sun exposure.

Only 202 patients (34,18%) confirmed using the sunscreen always during intense exposure to the sun and 40 people (6,77%) never used it, whereas always wearing sunglasses was reported in 199 patients (33,67%) and sometimes in 291 patients (49,24%). 377 patients (63,79%) do not know the approximate number of moles on their body. In study group 471 of patients (79,70%) had never had dermatoscopic examination before. As a result of this examination, dermatologists diagnosed no neoplasm lesions in 509 patients (86,13%), lesion suggesting melanoma in 10 patients (1,69%), non-melanoma skin cancer in 20 patients (3,38%) and suspicious lesion in 52 patients (8,8%). The demographics are summarized in Table 1.

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Table 1. Summary of data collected as part of the study based on patient-completed questionnaires and dermatoscopic examinations.

Questions	Answears	Patients (N)
Sex	Female	N= 393 (66,50)
	Male	N= 198 (33,50)
Mean age [mean (SD)]	Female	46,3 (12,077)
	Male	45,2 (12,590)
Reasons for patients to undergo dermatoscopic examination	Many moles, hyperpigmentations on the skin	N= 384 (64,94)
	preventive skin examination	N=147 (24,90)
	the mole has changed or a new skin lesion has appeared	N=29 (4,91)
	family history of skin cancer	N= 12 (2,03)
	fair skin with blue/green eyes	N= 17 (2,88)
	weakened immune system	N= 2 (0,34)
Performance skin self-examination	No examination	N= 382 (64,74)
	Once every six months	N= 126 (21,36)
	Once a month	N= 43 (7,29)
	Once a week	N= 30 (5,08)
	Everyday	N= 9 (1,53)
Family history of melanoma	yes	N= 25 (4,23)
	no	N= 566 (95,77)
Using tanning bed	1-20/ year	N= 34 (5,75)
	>/=20 per year	N= 5 (0,85)
	no	N=552 (93,40
Hobbies related to spending time in the sun	yes	N= 377 (63,79)
	no	N= 214 (36,21)
Using the sunscreen during intense exposure to the sun	always	N= 202 (34,18)
	sometimes	N= 349 (59,05)
	never	N= 40 (6,77)
At least 1 year of work involving long periods of sun exposure	yes	N= 544 (92,05)
	No	N= 47 (8,95)
Dermatoscopy examination	No neoplasm lesions	N= 509 (86,13)
	A lesion suggesting non-melanoma skin neoplasm	N= 20 (3,38)
	A lesion suggestive of melanoma	N= 10 (1,69)
	Suspicious lesion	N= 52 (8,80)
Dermatoscopy examination before	Yes	N= 120 (20,30)
	No	N= 471 (79,70)
Knowledge about the number of nevi	Yes	N=214 (36,21)
	No	N= 377 (63,79)
Sunglasses	Always	N= 199 (33,67)
	Sometimes	N= 291 (49,24)
	Never	N=101 (17,09)
Sunburn in childhood	No	N= 324 (54,82)
	1-2 times	N= 207 (35,03)
	>2 times	N= 60 (10,15)

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3.1. Correlations

We have correlated the occurrence of atypical lesions in the dermatologic examination with selected clinical and demographic parameters of patients. Due to the relatively young population (18 to 64 years old) which the EU program was dedicated to, the number of cases of skin lesions suspected of SCC or BCC was so small, that we did not take it into account when conducting statistics.

Male gender predisposed to the development of atypical nevi OR= 1.996 [1.245; 3.201] p=0.004. The number of moles on the skin also influenced the risk of atypical moles. In the group of people with a larger number of moles (51-100 moles), the risk of their atypicality was higher OR= 2.305 [1.057; 5.027] p=0.036, when the number of moles exceeded 100 or more, the risk was even higher OR= 2.305 [1.057; 5.027] p=0.036.

The presence of actinic keratosis had a statistically significant impact on the co-occurrence of atypical moles on the skin OR= 3.074 [1.213; 7.786] p=0.018. Other risk factors such as: sunburn during sunbathe, sun dependent hobby, using tanning bed, not avoiding sun exposure statistically increased the risk of atypical lesions in patients. In the case of using a tanning bed, the risk depended on the frequency of using it. People who never used a tanning bed had no such risk, when they used it from 1-20/year they had a risk of OR= 3.849 [2.129; 6.959] p=0.000, while when this number exceeded 20 tanning sessions/year, the risk was OR= 5.512 [2.636; 11.525]p= 0.000.

Skin sun protection cream when the sun protection factor (SPF) was >40 was not associated with the risk of atypical moles, SPF 21-40 increased the risk of these moles, but the result was not statistically significant (OR=1.999 [0.945; 4.227] p=0.069). However, the use of SPF 20 or less was statistically significantly associated with a higher risk of atypical moles.

Table 2. Data compilation based on statistical analysis of the collected data based on patient-completed questionnaires and dermatoscopic examinations.

	All n (%)		Dysplastic nevi		OR [95%CI] p Adj. OR [95%CI] p
			No	Presence	
Gender	**Women—ref**	**393 (66.50)**	350 (68.76)	43 (52.44)	-
	Men	198 (33.50)	159 (31.24)	39 (47.56)	1.996 [1.245; 3.201] 0.004 3.146 [1.507; 6.566] 0,002
Number of lesions on skin	<25—ref	227 (38.47)	208 (40.86)	19 (23.46)	-
	25-50	229 (38.81)	206 (40.47)	23 (28.40)	1.222 [0.646; 2.312] 0,537 0.752 [0.312; 1.811] 0,525
	51-100	69 (11.69)	57 (11.20)	12 (14.81)	2.305 [1.057; 5.027] 0,036 1.894 [0.611; 5.874] 0,269
	>100	65 (11.02)	38 (7.47)	27 (33.33)	7.778 [3.936; 15.372] 0.000 4.735 [1.602; 13.989] 0,005
Presence of dysplastic nevi	*Numerical variable*	-	41 (8.06) Patients Mean 0.18 Max 10	61 (74,39) Patients Mean 1.80 Max 20	2.339 [1.823; 3.002] 0,000 1.880 [1.355; 2.608] 0,000
Actinic keratosis	No—ref	569 (96.28)	494 (97.05)	75 (91.46)	-
	Yes	22 (3.72)	15 (2.95)	7 (8.54)	3.074 [1.213; 7.786] 0,018 6.607 [1.315; 33.196] 0,022

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Sunburn during sunbathe	No—ref	223 (37.73)	211 (41.45)	12 (14.63)	-
	Yes	368 (62.27)	298 (58.55)	70 (85.37)	6.824 [2.704; 17.220] 0,000 4.130 [2.184; 7.812] 0,000
Sun dependent hobby	No—ref	382 (64.64)	345 (67.78)	37 (45.12)	-
	Yes	209 (35.36)	164 (32.22)	45 (54.88)	2.559 [1.594; 4.106] 0,000 2.365 [1.166; 4.798] 0,017
Tanning bed	No—ref.	476 (80.54)	430 (84.48)	46 (56.10)	-
	1-20 [years]	72 (12.18)	51 (10.02)	21 (25.61)	3.849 [2.129; 6.959] 0,000 3.666 [1.444; 9.306] 0,006
	>20	43 (7.28)	28 (5.50)	15 (18.29)	5.008 [2.494; 10.054] 0,000 5.522 [1.674; 18.215] 0,005
Sun expose limitation	Yes—ref.	385 (65.14)	356 (69.94)	29 (35.37)	-
	No	206 (34.86)	153 (30.06)	53 (64.63)	8.186 [3.673; 18.243] 0,000 4.252 [2.603; 6.947] 0,000
Skin sun protection cream	>40 [Factor] - ref	238 (40.27)	226 (44.40)	12 (14.63)	-
	<10	49 (8.29)	22 (4.32)	27 (32.93)	23.114 [10.295; 51.891] 0,000 26.262 [8.264; 83.456] 0,000
	10-20	106 (17.94)	82 (16.11)	24 (29.27)	5.512 [2.636; 11.525] 0,000 7.429 [2.698; 20.454] 0,000
	21-40	198 (33.50)	179 (35.17)	19 (23.17)	1.999 [0.945; 4.227] 0,069 3.540 [1.268; 9.885] 0,016

4. Discussion

Melanocytic nevi, dysplastic nevi and cutaneous melanoma are important interdisciplinary problems of modern medicine. Skin cancer is one of the most preventable cancers. This neoplasm develops on the surface of the body, so it can be most easily noticed and diagnosed. The risk factors for developing skin cancer are well known and relatively easy to eliminate. The most common screening test is dermatoscopy, which is easy to perform, inexpensive, safe and acceptable to patients. Moreover, if the cancer is detected at an early stage, treatment requires only local excision of the lesion [12].

Skin cancer prevention can be divided into primary, secondary and tertiary prevention. Primary prevention aims to reduce the risk of developing skin cancer by encouraging the avoidance of known risk factors, primarily UV radiation. Minimizing exposure to UV radiation during peak sunlight can prevent sunburn. If sun exposure can not be avoided, protective clothing, hats, sunglasses, and sunscreen are recommended [13]. It is not recommended to be exposed to the sun all day long, even when using a high SPF sunscreen. Although sunscreen prevents sunburn, it is not a surefire factor in preventing the development of melanoma [14]. However, there is no evidence that this approach directly impacts cancer morbidity and mortality [15].

Secondary prevention focuses on increasing screening to detect precancerous and cancerous lesions early [13]. Skin cancer screening has been shown to likely lead to the detection of more in situ and invasive skin cancers along with more thin invasive melanomas. Furthermore, a reduction in the incidence of thick melanoma and melanoma mortality has been observed [16]. Screening of the

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general population is not recommended. It is necessary to identify patients who are at higher risk of developing skin cancer and these patients should undergo screening [15]. Tertiary prevention aims to improve the prognosis for skin cancer patients by enhancing treatment, quality of life, and recovery [12].

Over the years, in Poland and throughout Europe, many campaigns and programs have been created to increase public awareness of skin cancer, risk factors and methods of prevention. One of the largest organisations in Europe is Euromelanoma, which raises public awareness of skin cancer, provides support for screening campaigns, educates on key preventive measures against skin cancer, risk factors and the importance of recognising abnormal lesions through self-examination [12]. There are also many melanoma prevention campaigns in Poland run by local organizations. One of them was the EU project titled: „Melanoma without secrets- examine the moles. Skin cancer prevention program" carried out in 2022-2023. The program was dedicated to the population of younger, working people.

Prevention of melanoma and other skin cancers in younger patients is critically important, particularly before they reach retirement age. Early preventive measures can significantly reduce the risk of developing these cancers later in life. This is because cumulative exposure to ultraviolet radiation, a major risk factor for skin cancer, often begins in childhood and adolescence. By encouraging protective behaviors such as using sunscreen, wearing protective clothing, and avoiding tanning beds from a young age, the risk of skin damage and subsequent cancer can be minimized.

Educating younger populations about the dangers of UV exposure and the importance of regular skin checks is essential. Early detection of abnormal moles or skin changes can lead to prompt treatment, improving outcomes and reducing the burden of cancer in later years. Moreover, instilling these habits early creates a foundation for lifelong skin health, contributing to overall well-being and reducing healthcare costs associated with treating advanced cancers. Focusing on prevention and education in younger populations ensures that individuals are equipped with the knowledge and tools to protect their skin, ultimately leading to lower incidences of melanoma and other skin cancers as they age.

The demographic structure of the study population showed that women are more likely than men to undergo preventive skin examinations (66,5% of the responders). Our observations are confirmed by the Central Statistical Office of Poland data. According to the report from 2023, women use preventive tests more often than men [17,18]. The average age of people reporting for the study was approximately 45,5 years old, which results from the group of people to whom the study was addressed.

The most popular reason for undergoing a skin examination among the study population was „Many moles, hyperpigmentations on the skin". An increased number of moles is a known risk factor for developing melanoma: 1.5 times higher risk in people with 11 to 25 nevi and doubles with every increase of 25 nevi [6]. The increased incidence of dermatoscopic examination in people with a large number of moles appears to be related to educational campaigns disseminating knowledge about risk factors. In the study by Dubbini et al. a similar question was asked and the most common answer given was preventive examination (51,5%) [19]. The study involved unselected population from Europe (Italy) was conducted from 2010 to 2019. In our study, this answer was decelerated only in 33% of cases. Despite many programs encouraging patients to perform self-examinations, the majority of our patients never do it.

In 2013, Góralska et. al. conducted a similar study in population of Poland [20]. The aim of this study was the assessment of risk factors for cutaneous melanocytic moles and melanoma in patients presenting to a dermatologist for control and assessment of patients' knowledge of these factors. In the study 99 patients (38 men and 61 women) aged 15-55 years were included. In order to compare the changes in the distribution of skin cancer risk factors over the last 10 years in Poland, we compared data collected in our study and those from the paper by Góralska et. al. (Table 3).

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Table 3. Comparison of the frequency of selected risk factors in our study (2024) and in the study by Góralska et al. (2023). For each feature, the statistical significance of the difference was calculated. The statistically significant p level was at <0.05.

Risk factors	Data collected in our study (2024) N=591	Data collected in study by Góralska et. al. (2013) N=99	test χ^2 P
Not avoiding sun exposure on sunny days	34.86%	76%	0,0001
Use of tanning bed	7.28%	10%	0,3466
Positive family history of melanoma	4,23%	9%	0,0422
Using sunscreen before sun exposure	93,23%	81%	0,0001
Sun dependent hobby	35.36%	47,5%	0,0207
Work involving long periods of sun exposure	8,63%	10%	0,1768

The data show that over the last 10 years the percentage of patients who do not avoid the sun on sunny days has decreased (34.86% compared to 76% of patients in the study by Góralska et al.—a statistically significant reduction $p < 0,005$) and the percentage of patients who use sun protection before planned sun exposure has increased (93,23% compared to 81% of patients in the study by Góralska et al.). This is probably the result of growing awareness of the side effects of intense exposure to UV radiation and the increasing popularity of sunscreens. The approach to sun protection has changed over the years. In the early 20th century, a tan was associated with health and vitality. Around 1945, the first sunscreen products appeared that protected against the sun's rays. Since then, the perception of sunscreens has changed: initially, they were intended to prevent skin burns during intense exposure to the sun. With the spread of information about skin cancer, sunscreens began to be used for preventive purposes. In recent times, the products have become heavily advertised and have become part of a lifestyle [21]. Łyko and colleagues evaluated sun protection among university students in Poland, among which 60,9% were students of medicine and 96.7% of the responders declared using photoprotection. Which indicates increased awareness among medical students [22].

SPF50 and greater blocks from 98% to 99% of UVB rays. Using sunscreens prevent DNA damage during exposure to solar simulated radiation (SSR) [22]. However the correct application density of SPF cream should be 2mg/cm^2, people usually apply 1/3 of this value. Therefore using sunscreens with SPF50 and more may help to obtain sufficient UV protection [23]. These data are in concordance with results of our study, because patients, who used sunscreen with SPF more than 40 did not have increased risk of atypical moles.

Over the years, habits regarding spending free time have also changed. Comparing the data from our study and Góralska's study, it can be seen that the percentage of patients with hobbies related to prolonged sun exposure has significantly decreased [20]. This is reported as a statistically significant reduction—$p< 0,005$. (Table 3). Long-term exposure to UV radiation is associated with skin complications, but also an increased risk of serious eye diseases, including cataracts, corneal degeneration, conjunctival degeneration, and retinal degeneration. A significant portion of UV radiation reaching the eyeball can be eliminated by using sunglasses that block UVR radiation up to 400 nm (filter 99–100% of UVR radiation) [24]. The results of our study show that patients are aware of the harmful effects of exposure to UV radiation on the eyes—only less than one fifth of patients reported that they never wear sunglasses. Recent studies showed that culture and sex may influence it, a cross sectional study in U.S. revealed that Caucasians and women were more likely to wear sunglasses [25]. Moreover, a systematic review showed that sunglasses were the most common choice of the sunprotection among outdoor workers [26]. Our study showed that in recent years the

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percentage of people with jobs involving long-term exposure to the sun has slightly decreased. Our data indicate that 8.63% of respondents reported working in conditions of high exposure to the sun, while according to Góralska et al., in 2013 this was 10% [20]. This difference, however, is not statistically significant (p>0,005).

Sunburn, resulting from excessive UV exposure, is the most significant clinical risk factor for melanoma, and the more burns the risk is greater [27]. Moreover, there is a link between childhood sunburn and the risk of both MM and NMSC, indicating that screening and prevention of childhood sunburn could aid in the early detection and reduced risk of MM and NMSC [28]. The comparative study among parents of U.S. adolescents between 1998-2004 showed that changed little between these years [29]. In 2004, 47% of people reported getting sunburned during the summer, which is lower than that results from of our group of patients (62.27%). Lately, a cross sectional study from US conducted between 2010 and 2020, has found that the prevalence of sun-protective behaviors and sunburn avoidance among US adults significantly increased [30].

Literature data indicate that that indoor tanning increases the risk of early melanoma and nonmelanocytic skin cancers. Furthermore, there is a dose-response relationship with first exposure at a young age and frequency of exposure [31]. Due to increasing knowledge about the harmful effects of UV radiation and the popularity of sun protection, the frequency of using solariums has decreased. While in 2013 10% of surveyed patients used solariums, among our respondents this number dropped to 7.28% [20]. Similar trends of decreasing use of solariums are observed all over the world.

Rodriguez-Acevedo et al. conducted a systematic review and meta-analysis of the prevalence of indoor tanning from 2009 to 2018 [32]. The collected data were compared with the results of a previous meta-analysis by Wehner et al. [33] The prevalence of past-year indoor tanning among adolescents from 2009 to 2018 was 6.5% (95% CI: 3.3–10.6) in the period 2013–2018 [32], compared with 22% (95% CI: 17.2–26.8) observed for the period 2007–2012 by Wehner et al. [33]. This was reported as a statistically significant reduction of 70%. In the years 2007–2012, the percentage of adults using solariums was 18.2% [33] , while in the years 2013–2018 it was 10.4%, which is not a statistically significant change.

Previous studies indicate that the family history of melanoma is a strong risk factor for melanoma development [3]. In the present study, 4,23% of patients reported a positive family history of melanoma. This is less compared to the data from study by Góralska et al., in which 9% of respondents declared a family history of melanoma [20]. This difference may be due to a larger percentage of people who have no family history of melanoma coming for preventive skin examinations, motivated by information campaigns rather than fear.

Risk factors for skin melanoma have been studied many times and are relatively well known. One of them is the presence of atypical moles on the patient's skin. Many retrospective studies have confirmed that the risk of melanoma increases from with the increase in the number of atypical moles [34–36]. On the other hand, sun exposure, along with genetic susceptibility, influences the risk of developing atypical moles [36]. Moreover, the incidence of atypical nevi in patients with Fitzpatrick skin types I and II is higher compared to those with skin types III and IV, which may support the role of UV radiation in increasing the risk of developing atypical nevi [37]. The results of our study indicate a significantly increased risk of developing atypical moles in patients who exhibited behaviors associated with an increased risk of sun exposure, i.e., sunburn during sunbathe, sun dependent hobby, no sun expose limitation, using tanning bed, and overlap with melanoma risk factors. UV radiation increases the risk of not only pigmented malignancies but also non-pigmented malignancies and solar keratosis. Similar risk factors for atypical moles and actinic keratosis explain the increased risk of their co-occurrence [38].

5. Conclusions

Our study, involving a diverse group of patients, highlighted several key factors influencing the occurrence of atypical skin lesions. Most participants sought dermatoscopic examinations due to concerns about numerous moles or changes in existing skin lesions, while preventive skin checks were also common. Alarmingly, a significant number of patients did not perform regular skin self-

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examinations, underscoring the need for better education on the importance of early detection. Risk factors such as family history of melanoma, childhood sunburns, regular use of tanning beds, sun-related hobbies, and prolonged occupational sun exposure were prevalent among the participants. Despite these risks, consistent use of sun protection measures, such as sunscreen and sunglasses, was notably low. Many patients were also unaware of the number of nevi on their skin and had never undergone a dermoscopic examination before participating in the study.

Our study highlights the significant correlation between the occurrence of atypical lesions and various clinical and demographic factors in a relatively young population. Notably, male gender emerged as a significant risk factor for developing atypical nevi. Additionally, the quantity of nevi on the skin was directly associated with an increased risk of atypical moles, particularly in individuals with more than 50 moles, where the risk doubled. The presence of actinic keratosis was another crucial factor, showing a threefold increase in the likelihood of co-occurrence with atypical moles. Lifestyle factors such as sunburn history, sun-dependent hobbies, and tanning bed usage were strongly linked to higher risks of atypical lesions. Specifically, frequent use of tanning beds dramatically elevated the risk. Interestingly, while the use of high SPF sunscreen did not correlate with atypical mole risk, lower SPF levels were significantly associated with higher risks. This underscores the importance of adequate sun protection in mitigating the development of atypical lesions.

These findings underscore the necessity for targeted prevention strategies and regular dermatologic screening, particularly for high-risk groups identified in this study. Early intervention and education on sun safety can play pivotal roles in reducing the incidence of atypical moles and potentially preventing malignant transformations.

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