NON-MELANOMA SKIN CANCER AND OCCUPATIONAL RISK OF OUTDOOR WORKERS: INTEGRATIVE REVIEW

CÁNCER DE PIEL NO MELANOMA Y RIESGO OCUPACIONAL DE TRABAJADORES AL AIRE LIBRE: REVISIÓN INTEGRADORA

Amanda Portugal de Andrade Moreira1, Vera Maria Sabóia2, Crystiane Ribas Batista Ribeiro3

ABSTRACT

Objective: to analyze the scientific production about non-melanoma skin cancer, with a focus on prevention and occupational risk for outdoors workers. Method: it is an integrative review aimed at answering the question what is the importance of sun protection to reduce the risk of non-melanoma skin cancer emergence? Results: the final sample consisted of 34 articles, divided into six areas: ultraviolet radiation; non-melanoma skin cancer; skin cancer in outdoor workers; sun cream; the educational action of nurses and knowledge. International studies were highlighted and there was a growth in production over the past four years. Conclusion: the incidence of skin cancer can significantly decrease with the awareness of outdoor workers and reorientation habits. Descriptors: Skin Neoplasms; Health Education; Nursing; Ultraviolet Rays; Workers.

RESUMO

Objetivo: analisar as produções científicas sobre o câncer de pele não melanoma, com o foco na prevenção e no risco ocupacional dos trabalhadores ao ar livre. Método: revisão integrativa com vistas a responder à questão «Qual a importância da fotoproteção na redução do risco do surgimento de câncer de pele não melanoma?». A coleta dados foi realizada entre 08/12/13 a 12/02/14, utilizando os descritores neoplasias cutâneas, educação em saúde, enfermagem, raios ultravioleta, trabalhadores e educação da população, nas bases de dados: Lilacs, BDENF, IBEGS e Medline. Resultados: a amostra final foi composta por 34 artigos, divididos em seis eixos: radiação ultravioleta; câncer de pele não melanoma; câncer de pele em trabalhadores ao ar livre; protetor solar; a ação educativa do enfermeiro e conhecimento. Sobressaíram-se estudos internacionais e observou-se um crescimento nas produções nos últimos quatro anos. Conclusão: a incidência do câncer de pele pode diminuir significativamente com a conscientização de trabalhadores ao ar livre e a reorientação de hábitos. Descritores: Neoplasias Cutâneas; Educação em Saúde; Enfermagem; Raios Ultravioleta; Trabalhadores.

1Nurse, Master degree in Health Care Science by the Federal University Fluminense, Aurora de Afonso Costa Nursing School/EEAAC/UFF. Niterói (RJ), Brazil. E-mail: amandaportugal.uf@gmail.com; 2Nurse, Ph.D. in Nursing, Professor, Department of Nursing and Administration Fundamentals, Aurora de Afonso Costa Nursing School/EEAAC/UFF. Niterói (RJ), Brazil. E-mail: verasaboia@uol.com.br; 3Nursing at work, Master degree in Health Care Science, Professor, Foundation Support Technical School/FAETEC. Rio de Janeiro (RJ), Brazil. E-mail: crystiane.ribas@gmail.com
INTRODUCTION

Among the present chronic diseases in the world today, there are neoplasms configured as biological nature of disorder generated by cell mutations that modify the state of balance of the body. The increased incidence of skin cancer has become a world public health problem. The sun and exposure to ultraviolet rays (UV) have been implicated as a major causative factor in two-thirds of cases of skin cancer, especially among occupations with intense sun exposure.

The solar radiation and UV rays, in particular, are increasing around the world due to the thinning of the ozone layer. The increasing incidence of skin cancers over the past decades can be attributed to increased sun exposure linked to social, occupational and lifestyle of population.

The pathogenicity of this cancer is multifactorial, however, these factors can be modified and save lives through knowledge and awareness of the potential causes from re-directing behaviors and habits. The prevention, and early diagnosis of skin cancer are fundamental in reducing morbidity and mortality and its impact on public health.

Thus, it is important a survey appearing in the scientific literature on this topic. The aim of the study was to analyze the scientific production of non-melanoma skin cancer with a focus on prevention and occupational risk of outdoor workers in the 2003-2013 period.

METHOD

It is an integrative review study with data collection period between 12/08/13 to 12/02/14. The search was performed from the Virtual Health Library (BVS) with access to Databases Lilacs (Latin-American and Caribbean Library in Health Science), BDENF (Nursing database), IBRCS (Spanish Bibliographic Index of Health Science) and Medline by PUBMED (Medical Published - service of the U.S. National Library of Medicine).

Scientific research is a way to get answers or problems faced in everyday life. In this sense, the integrative literature review consists of a research method that allows gathering and synthesizing results of studies on a particular topic or issue in a systematic and orderly manner, contributing to the deepening of knowledge of the subject investigated. This relevant research analysis supports decision-making and improves clinical practice.

The descriptors used were Skin Neoplasms; Health Education; Nursing; Ultraviolet Rays; Workers; Population Education using the Boolean AND indicator, enabling to access to articles belonging to the intersection between the different descriptors.

To perform this searching, the following steps were taken: theme selection; establishment of guiding questions and objectives; establishment of inclusion and exclusion criteria of articles; selection of information to be taken from the selected articles; analysis and presentation of results and discussion. Thus, to guide this review, the following questions were elaborated: what is the importance of sun protection to reduce the risk of non-melanoma skin cancer emergence? How do health professionals, particularly nurses, have been working in the prevention of non-melanoma skin cancer in adults and elderly people? What special attention has been paid to the prevention of non-melanoma skin cancer in outdoor workers?

The inclusion criteria used in the search were adherence to the objective and the proposed topic; articles that addressed the type of non-melanoma skin cancer related to actinic exposure; articles published in Portuguese, English and Spanish; available online and full texts published between 2003-2013 since the last 10-15 years, there was an exponential increase in the prevalence of skin cancer worldwide, with an enormous amount of research literature on cancer skin in that time.

Exclusion criteria were articles published online in full by paying; addressed the melanoma skin cancer exclusively; articles focused on treatments; and research on the issue conducted with children and adolescents.

The association of descriptors for the searching in the databases occurred as follows: Health Education AND Skin neoplasms; Nursing AND Skin Neoplasms; workers AND Skin Neoplasms; workers AND Ultraviolet Rays; Population Education AND Skin Neoplasms. For articles selection, there was an initial reading of all those who met the inclusion criteria, with 32 articles obtained on the BVS portal and 54 in PUBMED portal, totaling 86 articles.

After critical and reflective reading of selected references, six articles were excluded from the search made in BVS and nine articles in PubMed because the subject distance, getting a new 71 articles. There were 37 articles excluded due to repetition in searching portals (BVS and PUBMED), in
databases (Lilacs, Medline, BDENF and IB ECS), or searching by descriptors, and then revealing a final sample of 34 articles selected, as can be seen from the following flowchart (Figure 1):

![Flowchart representing the selection of the productions, in 2014.](image)

**RESULTS**

In the selection of the references, it was possible to observe the predominance of publications about melanoma skin cancer and the ways of surgical treatments. There was a scarcity of publications on non-melanoma skin cancer, focused on prevention and occupational risk of professions exercised outdoors.

For analysis of the obtained content, they were organized on the database, year of publication, type of study carried out and essence of the presented contents.

Figure 2 shows the division of the articles according to the association in descriptors, searching portals and databases, highlighting the repetitions found according to BVS. It was decided not to perform the intersection of repeated articles in the different research portals (BVS and Pubmed).
Of the 34 selected articles, 2.9% (1 article) was obtained in 2013; in 2012, 23.5% (8 articles); in 2011, 23.5% (8 articles); in 2010, 8.8% (3 articles); in 2009, 20.5% (7 articles); in 2008, 11.7% (4 articles); in 2007, 5.8% (2 articles); and in 2004, 2.9% (1 article). It is observed a recent growth in production with advancing years, however, with a decrease in the last year, as seen in the Figure 3:

Figure 3. Distribution of productions according to the year of publication, 2014.

This exponential growth is due to the increased incidence of skin cancer in recent years and a clear designation as a public health problem worldwide.

Concerning to databases, there was a larger quantity of publications in MEDLINE database, both in the BVS portal (national) and in PUBMED portal (International), which reveals a greater production of international studies about skin cancer.

Given the analysis of the studied research methods, descriptive studies were highlighted with 5.8% (2 articles); analytical observational studies with 38.2% (13 articles); experimental studies with 8.8% (3 articles); almost experimental studies with 2.9% (1 articles); literature reviews with 8.8% (3 articles) and productions to the type of study not reported by the authors with 35.2% (12 articles). Among them, there were also highlighted some types of studies such as cohort study with 5.8% (2 articles), cross-sectional studies with 29.4% (10 articles), case studies control to 2.9% (1 article), epidemiological study with 2.9% (1 article); research participant with 2.9% (1 article) and randomized studies with 8.8% (3 articles).

Concerning the essence of the content and production of knowledge, there were in decreasing order knowledge and behaviors of sunscreen outdoor professionals with 29.4% (ten articles); knowledge and behaviors of sun
protection of the population with 20.5% (seven articles); educational interventions in the workplace for outdoor professionals with 17.06% (six articles); educational interventions for the population with 8.8% (three articles); incidence of skin cancer in workers with 5.8% (two articles); the knowledge of teachers and nursing students about the prevention of skin cancer forms with 2.9% (one article); cancer differential characteristics in black skin with 2.9% (one article); tracking risk of occupational skin cancer with 2.9% (one article); cost of preventing skin CA with 2.9% (one item); occupational carcinogen and cancer with 2.9% (one article); and solar radiation and skin cancer with 2.9% (one article).

After reading several productions, most frequent subjects and themes were identified and grouped according to their meaning, creating the following categories: Ultraviolet Radiation and UV Index; Non-melanoma skin cancer; Outdoor workers; Sun cream; Nurse and Focus operations in Knowledge, which are discussed below.

Ultraviolet radiation: fundamental aspects

The solar radiation at the top of the atmosphere contains a significant amount of ultraviolet radiation, with a smaller length than the visible light, however, with more power. Within this region, there are three different categories whose boundaries are defined by the length of its waves that are mainly characterized by their ability to affect living organisms: UVA radiation (with a wavelength of 315-400 nm - long wave) with the lower power of the three types of radiation. However, it was the one reaches the earth’s surface in greater proportion. UVB radiation (280-315 nm wavelength - medium wave) that it less reaches the earth’s surface than UVA, because part of it is absorbed in the atmosphere. The UVC radiation (wavelength range of 100-280 nm - short wave) is the one with most energy, but it is completely absorbed by the atmosphere, not reaching the earth’s surface.

UVA rays characterize most of the ultraviolet spectrum while being able to maintain this constant intensity throughout the year. For being the longest, they reach deeper areas of the skin and are responsible for producing changes such as spots, aging, and cancer.

UVB rays are the medium wave and are less able to penetrate the skin than UVA. However, they have a harmful potential much more important for the skin because, in biological systems, their main damage is in cellular DNA level. They are responsible for redness at the tanning and skin burns, as it influences the immune system and causing skin cancer. On the other hand, it is connected with the absorption of vitamin D by the body responsible for the levels of calcium and phosphorus organic fundamental to human health. However, for vitamin D absorption, it takes a maximum of 15 minutes of daily sun exposure at appropriate times and display only the areas of the face and arms. UVC rays are the most dangerous but are absorbed by the ozone layer before they reach the earth.

The intensity of UV radiation depends most on the time of the day, season and geographical location. The height also influences, for each 1,000 meters increasing the UV intensity increases from 10 to 12%; Latitude also influences because the closer from the equator, the stronger the UV radiation. Much of the demographic area of Brazil is located between the Tropic of Capricorn and the Equator, where the sun’s rays get more intensely due to proximity to the sun. In this region, the sun’s rays fall at a more perpendicular angle, making Brazil a tropical country and more intertropical area, one of the sunniest in the world.

The cloudiness is also an important factor because UV radiation is larger in totally clear skies because clouds reduce the amount of UV radiation, but this attenuation depends on the thickness and the dispersion of the clouds. Under certain conditions and for short periods of time, a few clouds may even increase the amount of UV radiation (usually occurs in the sky covered partially with a visible sun).

Reflections on the floor or certain surfaces also interfere because the surfaces can reflect or scatter UV radiation in varying degrees, for example, snow can reflect up to 80% of UV radiation, while the dry and white sand beach about 15%, and the foam of the sea water about 25%. The water also affects the intensity of UV radiation since about 95% of UV radiation penetrates the water, and 50% goes to a depth of 3 meters (important against false security to be in the water in summer periods).

The UV index (UVI) is a unit of measurement of levels of UV radiation for their effects on human skin, measuring the ability of UV inducing skin erythema formation. This Erythema is defined as the observable redness of human skin that occurs immediately after an effective dose of the ultraviolet radiation without prior exposure.

The UV index is considered extreme by the Brazilian Society of Dermatology, becoming an increasingly important concern for public...
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health because of the risk of skin burns (erythema), early aging and especially skin cancer.7

In a research conducted with 168 lifeguards, participants had to wear special bracelets and film in name tags, made of Polysulfone (UV radiation dosimeter) for two days. This procedure was designed to compare the safety practices and exposure to the sun, described by professionals as well as exposure to UVR with the findings of the bracelet and the recommended occupational exposure limits. More than 74% of the bracelets of the lifeguards showed UVR above recommended occupational exposure limits, where 39% received more than four times the limit and 65% of cases were enough to induce a burn.8

♦ Non-melanoma skin cancer: a public health problem

Skin cancer is defined by abnormal and uncontrolled growth of cells in the skin. These cells are arranged to form layers, and depending on the affected layer, different types of cancer area observed. The most common are basal cell carcinomas, which are formed in the basal cells of the epidermis and the squamous carcinoma, that are formed in squamous cells that make the skin surface.9 It is commonly divided into non-melanoma and melanoma, the first being more common in the country, accounting for about 1/5 of all new cases of cancer. However, due to its high rate of cure, their mortality rate is one of the lowest.10

In a study conducted in Londrina, Paraná, out of the 784 cases of patients with cancer raised the hospital registration forms of cancer, there were 181 cases of skin cancer where only one was melanoma and 180 were non-melanoma.11

Basal cell carcinomas (CBC) were 70% of skin cancer diagnoses, and focus preferably in adults above 30 years old; squamous cell carcinoma (CEC) with 20% of cases occur more frequently in males and older adults. The CBC is a malignant neoplasm of better prognosis, as it has very slow growth, with localized invasive capacity, without causing metastasis. The preferred location is the cephalic region, 27% of these cases in the nasal region, followed by the trunk and then the limbs.12

The characteristic lesion of the CBC is the pearl; that is translucent and bright papular lesion of straw-yellow color that may bleed and have a crust, or as a dry plate, rough and constantly peels off without healing.13 The CEC have local invasion and metastasis capacity, which varies according to the injury that led to it (mucosa, semi-mucosa or skin, in order of severity). The most affected areas are the most exposed to the sun such as the face and back of hands. The squamous cell carcinoma in early stage appears as a small papule that may progress to ulceration, crust and expand.14

In both cases, among the main risk factors, there is an excessive exposure to sunlight, especially ultraviolet radiation (UV). The UV radiation damages the DNA and the genetic material, producing free radicals, causing inflammation and weaken the immune response of the skin, leading to malignant cell mutations.12

While melanoma type is strongly related to intense episodes of acute sun exposure resulting in sunburn, it is estimated that 90% of non-melanoma skin cancer can be attributed to sun exposure associated with its cumulative exposure. This exhibition usually begins in early life. However, the average age at which cancer development occurs with 60 years old, reinforcing the relationship of the cumulative factor.11

Regarding signs and symptoms, the most common complaints related to skin cancer are: itching, hurting, bleeding or peeling off spots; sores that do not heal in four weeks; signs that change color, texture, size, thickness or line; lifting or circumscribed nodules and acquired skin that increases in size and has pearly appearance, translucent, reddish or dark.10

Besides the magnitude of the problem, there is evidence of the trend of increasing morbidity and mortality from skin cancer, which imposes its consideration as a public health problem, but doable for primary prevention control - protection against excessive exposure to sunlight - and secondary, making early diagnosis and timely treatment.9

♦ The Skin Cancer in Outdoor Workers: a frequent issue

Over the past two centuries, occupational skin cancer has occurred due to industrial exposure of men, more than women, for chemicals causing cancer such as polycyclic hydrocarbons and arsenic. Industrial processes have improved their control limiting that kind of exposure, but those individuals with outdoor occupations are still exposed to solar ultraviolet radiation without this being recognized as an industrial risk.14

Professionals working in outdoor activities, such as fishermen, farmers, and lifeguards, are approximately 20 times more likely to develop skin diseases compared to people who avoid this prolonged exposure1. In a survey conducted in Iowa, USA, with 148 workers of

ISSN: 1981-8963
DOI: 10.5205/reuol.8127-71183-1-5W.0912201533

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highways, 60% reported daily sun exposure between 7 a.m. and 10 a.m.\textsuperscript{15}

The intermittent exposure is an important factor in the types of melanoma and CBC, unlike CEC, whose continued exposure is more relevant. However, it has been considered that cumulative and excessive exposure during the first 10-20 years of life increases the risk of skin cancer\textsuperscript{12}. Considering the magnitude of the problem and the importance of work as a way to expose the risk factors, the Ministry of Health, through Ordinance 777/2004, established occupational cancer as a reportable injury.\textsuperscript{11}

Overall, the approaches of health phenomena related to work are still often relying on the idea of a workers’ passivity for adverse working conditions. However, occupational health problems can be analyzed from a new angle, considering that in a work situation, the harmfulness is present when the organization of labor reduces the worker’s possibilities to avoid exposure to the risk factor (whether formally recognized or not).\textsuperscript{16}

This information highlights the importance of outdoor workers know the risks and preventive forms of skin cancer, as this population group little protects from sunlight and has poor visibility demonstrated by recent studies on the subject since it was observed that most UV intervention studies are directed to people who tan by choice (for example on the beach or in tanning booths) and are based on the assumption that the appearance is the main motivation for UV exposure. This assumption is questionable for people whose jobs require exposing to the sun.\textsuperscript{15}

Despite avoiding UV exposure is ideal, it is not feasible for most outdoor workers. Thus, increasing the sun protection is the best solution\textsuperscript{17}. Thus, educational activities with these workers should strengthen the use of hats, sunglasses and light clothing with long sleeves.\textsuperscript{2}

\textbf{Sunscreen: preventing premature aging and skin cancer}

Another way of protecting the skin from URV action and its deleterious effects is the use of pharmacological substances, which absorb, refract and reflect ultraviolet radiation, protecting the epidermis and the dermis. This effect is called sunscreen, being fundamental in the prevention of aging and skin cancer.\textsuperscript{7} The use of sunscreen is one of the preventive measures that should be implemented among workers, bearing in mind that sunscreen is part of personal protective equipment for skin protectors.\textsuperscript{6}

The sun protection factor (SPF) displayed on the packaging of the sunscreen, indicates the relationship between the time a person can be exposed to sunlight using sunscreen before burning and the time it can be exposed to sunlight without burning and without using anything. That is if an individual whose time of sun exposure to burn is 20 minutes by using a sunscreen with SPF 15, his protection to the sun should be 15 times more without burning (a total of 300 minutes or five hours).\textsuperscript{4}

However, these data should be viewed with caution because the manufacturer's instructions should be followed and pay attention to factors that affect this action, such as skin type, amount applied and frequency of re-application, amount of product that is absorbed and dissipation of goods by water, sand and sweat.\textsuperscript{5}

A sunscreen with SPF 15 blocks most of the UV and increasing the SPF eases or blocks these rays. However, the time in which the sunscreen will continue to absorb UV rays will be greater the higher the SPF, decreasing the application frequency.\textsuperscript{2}

The public awareness level, especially for outdoor workers is fundamental to the correct use of SPF since individuals with understanding difficulty make misuse of the product hindering the use of their potentialities and effects.\textsuperscript{7} Inadequate protection occurs if the sun protection factor is very low compared to the duration or intensity of sun exposure and when insufficient or no application is made prior to sun exposure.\textsuperscript{17}

The barriers to the use of sunscreens preventive measures are also highlighted, such as the belief that people with dark skin (brown and black) do not run the risk of having skin cancer, it is not necessary to use protective measures; the hassle that sunscreen causes in the skin and discomfort caused by long sleeves in the heat. The authors also highlighted a cultural factor as a barrier that is present among men, feeling less masculine when using sunscreen.\textsuperscript{18}

\textbf{The Education Act of Nurses: a strategy for the prevention of skin cancer}

One of the functions of the nurse is the health education and should guide this particular group to minimize such risks since studies have shown that increasing the knowledge about the use of sunscreen is effective in raising awareness and promoting preventive health behavior.\textsuperscript{19} In this sense, the nurse should deepen their knowledge about the types of skin cancer, as well as clinical symptoms and preventive measures
because this content is slightly emphasized during the undergraduate nursing courses.

The nurse can act at different levels of health care avoiding skin cancer, developing action planning, coordination, and execution, which include nursing care, public and professional education. The nurse’s role in primary prevention should be focused on reducing population exposure to cancer risk factors, aiming to reduce the occurrence of this disease through health promotion, specific protection, and reorientation of attitudes and habits.19

Concerning outdoor workers, the nurse should guide them to protect themselves from reflective surfaces such as sand, snow, concrete and water; use body moisturizers after exposure to the sun; avoid substances that may increase sensitivity to the sun such as lemon and orange; use hats, sunglasses, shirt and cap; and guide about performing skin self-examination in the search for itchy, scaly, bleeding patches; and spots or signs that change in size, shape or color.19

Skin cancer: knowledge as an instrument of protection

In a study about knowledge of construction workers on skin cancer, the media appeared as the main means of disseminating information on health. Television was cited as the main vehicle these workers get information on preventing skin cancer.19 However, according to the results of a survey conducted in 2006, half of the reports talked about the importance of prevention of skin cancer, but only 24.1% provided explanations of the methods of prevention, and 93% of them, were not the main signs and symptoms addressed in each type of cancer.19

Despite media warnings, the sun protection is still not carried out properly. Actions in the workplace can be effective in reducing sun exposure and redirecting behaviors of outdoor workers, however, there are few reports of interventions in workplaces or consistent results.19

Cultural factors, insufficient knowledge, beliefs, religion, irreverence, overconfidence, and discredit are aspects that may favor the development of skin cancer.20 Incorrect beliefs about skin cancer, where the tan appeared as protector of skin damage were evidenced in an international systematic review study.20

A study of adults older than 55 years old, although the sunlight has been identified by most as the main cause of skin cancer, some of them had erroneous beliefs to believe it was contagious or caused by ingestion of oriental food or use of scented soap.20

This information highlights the importance of health professionals structure the program to prevent and guidance by the culture of the assisted population, adapting the content and vocabulary with the cultural background of each, especially when the target population is the secular origin. Thus, it will avoid the transmitting truncated information that will not be included and will not affect the prevention, early diagnosis and, consequently, decrease the morbidity and mortality of this disease.19

CONCLUSION

Studies have been conducted to test the effectiveness of interventions aimed at increasing awareness and shift workers to recognize the sun protection behaviors such as educational, informative videos, educational messages about sun safety and skin cancer, torpedoes with reminders by phone, including examinations of skin and supply of sunscreen and hat. However, very few have focused on the target population’s knowledge assessment studied before and after the interventions and concerned about the participation of this group in action preventive.

It was also possible to realize the scarce literature featuring educational activities on the outdoor workers in the workplace, although this form may be presented with the most effective to increase the knowledge of this group of workers and assist in redirecting considered risky habits for solar exposure.

Thus, there is the relevance of this issue because of its magnitude as a global public health problem and encourages the increase of research and publications aimed at the prevention of this cancer, contributing to reduce their incidence and morbidity and mortality. Also, it will encourage greater participation of nurses in preventive and educational measures since these professionals have health education as one of its functions.

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