Temas em Saúde
Volume 18, número 4
ISSN 2447-2131
João Pessoa, 2018

Artigo

OCCUPATIONAL RISK OF SKIN CANCER, DUE TO PHOTOEXPOSITION, IN ROCK EXTRACTION WORKERS

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ABSTRACT - Skin cancer is very frequent in the world and in Brazil, according to INCA (2016). Annually, the National Cancer Institute registers 135 thousand new cases of skin cancer (SOCIEDADE BRASILEIRA DE DERMATOLOGIA, 2016a). The main agent that causes skin cancer is the ultraviolet radiation from the Sun (ZINK, 2014). People who work outdoors, such as farmers, construction workers or rock extraction, fishermen, among others, can receive a dose of ultraviolet radiation six to eight times greater than workers from closed places (CEBALLOS, 2014). **Objective:** to demonstrate the relation of the occupational risk with the incidence of skin cancer in workers of rock extraction of the towns Itaperuna-RJ, Santo Antonio de Pádua-RJ and Pirapetinga-MG. **Justification**: prolonged photoexposure of this group. **Methodology:** we developed a cross-sectional study, using a semi-structured questionnaire. The sample was composed of rock extraction workers. **Results:** relevant results were found on the questions inherent to workers. **Discussion:** the habits of workers together with

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Volume 18, número 4
ISSN 2447-2131
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working conditions are risk factors for the development of skin conditions. **Conclusion:** the workers studied form a group at risk of skin cancer.

Keywords: Occupational risk, Photoexposure, Rock extraction, cancer.

RESUMO - O câncer de pele é bem frequente no mundo e no Brasil, segundo o INCA (2016). Anualmente o Instituto Nacional do Câncer registra 135 mil novos casos de câncer de pele (SOCIEDADE BRASILEIRA DE DERMATOLOGIA, 2016a). O principal agente causador do câncer de pele é a radiação ultravioleta proveniente do sol (ZINK, 2014). Pessoas que trabalham ao ar livre, como agricultores, trabalhadores da construção civil ou de extração de rocha, pescadores, entre outros, podem receber uma dose de radiação ultravioleta seis a oito vezes maior que trabalhadores de locais fechados (CEBALLOS, 2014). **Objetivo:** demonstrar a relação do risco ocupacional com a incidência de câncer de pele em trabalhadores de extração de rocha das Cidades de Itaperuna-RJ, Santo Antonio de Pádua-RJ e Pirapetinga-MG. **Justificativa**: prolongada fotoexposição desse grupo. **Metodologia:** desenvolvido um estudo transversal, por meio de um questionário semiestruturado. A amostra foi composta de trabalhadores da extração de rocha. **Resultados:** Foram encontrados resultados pertinentes as questões inerentes aos trabalhadores. **Discussão:** Os hábitos dos trabalhadores juntamente com as condições de trabalho são fatores de risco para o desenvolvimento de patologias de pele. **Conclusão**: os trabalhadores estudados formam um grupo de risco de câncer de pele.

Palavras-chave: Risco ocupacional, Fotoexposição, Extração de rocha, Câncer.

INTRODUCTION

Skin cancer has a high incidence. Annually in Brazil, the National Cancer Institute registers 135 thousand new cases of skin cancer (SOCIEDADE BRASILEIRA DE DERMATOLOGIA, 2016a).

This study aims at demonstrating the relationship of occupational risk with the incidence of skin cancer in workers from the Itaperuna-RJ, Santo Antonio de Pádua-RJ and Pirapetinga-MG cities. Justifying the theme, given the prolonged photoexposure of this group.

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Malignant neoplasms of the skin can be divided essentially into the groups: melanoma and non-melanoma (BARDINI et al, 2012). In Brazil, it is estimated the occurrence of 3.000 new cases in men and 2.670 in women in 2016, corresponding to rates of 3,03 new cases per 100.000 men and 2,59 for every 100 thousand women. Nonmelanoma is more frequent, with an estimated 80.850 new cases in men and 94.910 in women; with the rate of 81,66 new cases per 100.000 men and 91,98 new cases per 100.000 women (INCA, 2016).

The non-melanoma type is composed mainly of 70% basocellular and 25% squamous cell carcinomas (BARDINI et al, 2012). Among skin cancers, the non-melanoma type, although it is the most frequent, as noted in the previous paragraph, is what causes lower mortality in Brazil, because it presents a high cure rate when detected early. This type usually occurs in people over the age of 40 years and is relatively rare in children and black skinned people. The preferred targets are people with fair skin, sensitive to the action of the sun or with previous skin diseases (GARDENAL, 2014).

Squamous cell carcinoma (or squamous cell carcinoma) are often more aggressive than basal cell carcinoma, being more prone to metastasis (BARDINI et al, 2012). Squamous cell carcinoma is a malignant tumor derived from keratinocytes (ZINK, 2014). It manifests in squamous cells, which make up most of the upper layers of the skin. Squamous cell is twice as common in men as in women. Excessive and chronic exposure to the sun is the main risk factor for its development, with some cases associated with chronic wounds and scars on the skin, use of antiretroviral drugs in transplanted organs and exposure to certain chemical agents or radiation (SOCIEDADE BRASILEIRA DE DERMATOLOGIA, 2016a). There are also studies that relate squamous cell carcinoma to the presence of human papillomavirus (ZINK, 2014). It is most commonly found in areas exposed to the sun, such as the face, arms, ears, scalp, neck etc. (SANTOS, 2016). Usually it is reddish in color and in the form of bruises and sores that are thick and scaly, which do not heal and bleed occasionally; may look similar to warts (SOCIEDADE BRASILEIRA DE DERMATOLOGIA, 2016a). The cure rate of this type can reach 95% when detected and treated early (ZINK, 2014).

Basal cell carcinoma tends to present slow growth, is the least aggressive, and rare metastases occur (BARDINI et al, 2012). It is a malignant tumor originating from non-keratinizing cells that form the basal layer of the epidermis. It has low lethality and can be cured if detected early. They appear more often in areas more exposed to the sun, such as face, ears, neck, scalp, shoulders and back. There are other factors that trigger it, although most of the lesions are related to excessive exposure to ultraviolet radiation (ZINK, 2014). It usually arises, according to Santos (2016), in the form of an ulcerative

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nodule (a pink-colored papule that grows slowly for months or even years and subsequently ulcerates).

Cutaneous melanoma is the most aggressive type of skin cancer, with a worse prognosis and less frequent type of cancer (SANTOS, 2016). It originates in melanocytes, cells that produce melanin (pigment that gives color to the skin). Usually, they appear in areas of the body most exposed to solar radiation (BRAZILIAN DERMATOLOGY SOCIETY, 2016a). Its most important cause is intermittent and excessive exposure to the sun, especially in people with light and sensitive skin (SANTOS, 2016). Heredity is related to the development of melanoma. Melanoma usually looks like a pin (nevus) or a sign on the skin, in brownish or blackish tones, which usually change color, shape or size, and can bleed. Cure can be obtained in more than 90%, when there is early detection of the disease (SOCIEDADE BRASILEIRA DE DERMATOLOGIA, 2016a).

In order to identify the signs suggestive of melanoma, the ABCDE rule, which is based on the observation of nevi characteristics (INCA, 2016), is used as a guide. Santos (2016) divides as follows: A - Asymmetry; B - Irregular edges; C - Varied color; D - Diameter greater than 6 mm; E-evolution: lesions that change size, color or have pruritus. A 2006 publication of the International Agency for Research on Cancer highlights the limitations of this rule when applied to small lesions, as small melanomas may not have such clear characteristics. Similarly, benign melanocytic nevi may have atypical characteristics, reducing the sensitivity of the rule, but still, it is a method used, which aids in screening (INCA, 2016).

The main cause of skin cancer is ultraviolet radiation from the sun (ZINK, 2014). Chronic (cumulative) sun exposure is mainly associated with squamous cell skin cancer, while in childhood exposures with a history of one or more sunburn are associated with basal cell and melanoma (INCA, 2016). Ultraviolet rays induce skin cancer by three mechanisms: direct DNA damage, leading to a genetic mutation; production of activated oxygen molecules, which result in damage to cellular DNA and other molecular structures; and localized blockage of the anticancer immunosuppression of the body's natural defenses. In basal cell carcinoma, ultraviolet radiation is able to induce genetic mutations in the cellular DNA by modifying the p53 and patch genes, which are genes that suppress carcinogenesis. In addition, it generates inflammation in the skin resulting in an increase in the production of prostaglandins that induce the synthesis of cyclooxygenase 2, which also contributes to the origin of basal cell carcinoma (ZINK, 2014). The characteristics of ultraviolet radiation are: UVA related to skin photoaging, and has a carcinogenic effect (potentiates the effects of UVB). UVB is

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the main responsible for erythema and sunburn, accounting for 65 to 70% of the carcinogenic effects of solar radiation. (BAU, 2012).

Other factors that increase the risk of having skin cancer include: family or personal history of skin cancer; Immune system weakened by diseases or use of immunosuppressants (eg, azathioprine and cyclosporine), in transplanted individuals, for example, the presence of atypical and numerous nevi (pre-malignant melanoma lesions), exposure to chemicals (arsenic, tar, charcoal, etc.), smoking, and alcoholism. Skin color, eyes and light hair are also reported as a risk factor (INCA, 2016).

The skin can be characterized as to its coloration and reaction to the sun exposure, denominated this classification of phototype (BAU, 2012). The best known classification of cutaneous phototypes is the Fitzpatrick scale, shown in figure 1 (SOCIEDADE BRASILEIRA DE DERMATOLOGIA, 2016b). They are classified from I to VI, according to Fitzpatrick's classification (BAU, 2012). This division considers each person's ability to sunbathe under sun exposure and their sensitivity and tendency to turn red under exposure to the sun's rays (SOCIEDADE BRASILEIRA DE DERMATOLOGIA, 2016b).

Figure 1: Fitzpatrick's Classification.

Fototipos	Descrição	Sensibilidade ao sol
I – Branca	Pele muito branca, cabelo em geral ruivo. A pele queima facilmente e dificilmente se bronzeia.	Muito sensível
II – Branca	Pele branca, cabelos loiros e olhos claros. A pele queima facilmente e bronzeia moderada e uniformemente.	Sensível
III – Morena clara	Pele branca, cabelos castanhos escuros ou pretos. A pele queima e bronzeia moderada e uniformemente.	Normal
IV – Morena moderada	Pele clara ou bege, incluindo pessoas orientais. A pele queima pouco, bronzeia fácil e moderadamente.	Normal
V – Morena escura	Pele parda escura ou marrom médio (pessoas mulatas). Queima raramente, bronzeia muito e mancha com facilidade.	Pouco sensível
VI – Negra	Pele totalmente pigmentada (negra). Queima muito raramente, bronzeia muito e mancha com facilidade.	Resistente

Source: (RIGEL et al, 2011).

Phototypes I and II are related to an increased risk of skin cancer (SOCIEDADE BRASILEIRA DE DERMATOLOGIA, 2016a).

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Considering the average working hours in Brazil of 39,4 hours per week, outdoor workers such as farmers, construction workers or rockworkers, fishermen, among others, can receive a dose of ultraviolet radiation six to eight times larger than workers from enclosed sites (CEBALLOS, 2014).

All people have endogenous mechanisms that protect the skin from sun damage, which varies in proportion to skin type and decreases as the number of hours of sun exposure increases during life (BAU, 2012). Among the mechanisms are the increase in epidermal thickness, pigmentation, mechanisms of repair of deoxyribonucleic acid (DNA) lesions, induction of cellular apoptosis, increase of cellular inhibitors of metalloproteinase and antioxidants. Over time, these mechanisms can be supplanted, allowing changes to be made due to the action of ultraviolet radiation, leading to photoaging (DAAMS et al, 2014).

Currently, skin cancer is the most common form of cancer and has prevention (BARDINI et al, 2012). Avoiding excessive sun exposure and protecting the skin from the effects of radiation are the best prevention strategies. The main recommendation is to avoid exposure to the sun, especially at times when the rays are most intense (between 10am and 4pm); use sunscreen with SPF 30 or more, wear sunglasses with UV protection, protective clothing, wide-brimmed hats, umbrellas and parasol (INCA, 2016).

MATERIALS AND METHODS

The present proposal is a longitudinal, observational descriptive study with qualitative and quantitative approaches. The study was carried out in the year of 2017 with workers in ornamental rock extraction in the municipalities of Itaperuna (RJ), Santo Antônio de Pádua (RJ) and Pirapetinga (MG).

The sample consisted of 38 interviewees who worked in various functions related to rock extraction. The volunteers who participated accepted the research methodology, signing the Informed Consent Form (TCLE), the procedures will be analyzed by research ethics committee according to resolution nº 466, of December 12, 2012 of the National Health Council , respecting the ethical integrity of volunteers.

All the individuals who did not provide time for the execution and participation of the procedures proposed by the researchers and those who did not agree or somehow had no interest in finalizing the project questions were excluded from the analysis.

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The instrument used for the evaluation was a questionnaire composed of 22 questions, adopting the following topics: gender, age, educational level, occupation, sun exposure habits, incidence and classification of skin lesions, family history of skin cancer and daily habits such as alcohol consumption, smoking, and exposure to chemicals.

After the research was carried out by the collaborating students of the study, the collected data were treated and consolidated, thus allowing the expected results to be obtained and later the pertinent analyzes.

RESULTS

After the treatment of the obtained data, it was possible to verify the results of the research. Of the 38 workers interviewed, it was observed that all were males of predominant brown color (57.9%) with education until elementary school (86.8%). The volunteers' work schedule was 8 hours a day for 5 days a week.

Table 1 shows the hours workers interviewed are exposed to the sun daily.

Table 1 – Hours of sun exposure during the daily work day

Amount of hours	Absolute Frequency	Relative Frequency
Less than 1 hour	6	15,8%
1 - 3 hours	23	60,5%
3 - 5 hours	5	13,2%
5 - 7 hours	2	5,3%
7 - 9 hours	2	5,3%
More than 9 hours	0	0,0%
Total	38	100,0%

Source: Elaborated by the authors

Table 2 presents the distribution of the main hours of sun exposure of respondents during their workday.

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Table 2 – hours of sun exposure of respondents during their workday

Exposure Time	Absolute Frequency	Relative Frequency
Until 10 a.m.	5	13,2%
10 a.m. to 12 p.m.	26	68,4%
12 p.m. to 2 p.m.	4	10,5%
2 to 4 p.m.	3	7,9%
From 4 p.m.	0	0,0%
Total	38	100,0%

Source: Elaborated by the authors

Table 3 presents some general information referring to the health of the interviewees as well as their family history.

Table 3 – General information about the workers

Ocorrence	Yes		No	
	Absol. Freq.	Relat. Freq.	Absol. Freq.	Relat. Freq.
Smoker	25	65,8%	13	34,2%
Alcoholic	32	84,2%	6	15,8%
Scar of Burns	8	21,1%	30	78,9%
Exposure to chemicals	0	0,0%	38	100,0%
History of Skin Cancer in the Family	24	63,2%	14	36,8%

Source: Elaborated by the authors

Table 4 demonstrates the habits of workers against sun exposure and their skin care.

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Table 4 – Habits of workers against sun exposure

Type of Protection	Yes		No	
	Absol. Freq.	Relat. Freq.	Absol. Freq.	Relat. Freq.
Long sleeved shirt	13	34,2%	25	65,8%
Trousers	38	100,0%	0	0,0%
Gloves	28	73,7%	10	26,3%
Closed Shoes	38	100,0%	0	0,0%
Hat or cap	31	81,6%	7	18,4%
Tied cloth on the head	0	0,0%	38	100,0%
Umbrella	8	21,1%	30	78,9%
Sunblock	0	0,0%	38	100,0%

Source: Elaborated by the authors

When questioned about the occurrence of any long-term skin lesion or inflammation, 5 (13.2%) of the volunteers claimed to present such a situation. Among the occurrences 4 (80%) were spots that had a different staining area without altering the skin plane and 1 (20%) was a papule that characterized a solid lesion, less than 1cm.

Among the 5 volunteers who presented cutaneous lesions, 3 (60%) presented only 1 lesion and 2 (40%) reported having a total of 2 lesions. Everyone claimed they did not know how long the first injury appeared and they performed in specific places such as the back, arms and hands. Asked about the coexistence with the lesions, some interviewees claimed that some of the lesions presented pruritus, among the highlighted alterations, some were staining, others did not notice changes.

The table below shows the skin profile of the volunteers according to the classification.

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Table 5 – Skin phototype of the volunteers according to the Fitzpatrick Classification

Classif.	Features	Absol. Freq.	Relat. Freq.
I	White; always burning; never tans; very sensitive skin. in the sun.	0	0,0%
II	White; always burning; tan very little; sensitive skin to the sun.	0	0,0%
III	Light brunette; burning (moderately); tans (moderately); normal skin sensitivity to the sun.	13	34,2 %
IV	Moderate brunette; burning (little); always tans; normal skin sensitivity to the sun.	9	23,7 %
V	Dark brunette; burning (rarely); always tans; skin that is not sensitive to the sun.	9	23,7 %
VI	Black; never burns; fully pigmented; skin insens. to the sun	7	18,4 %

Source: Elaborated by the authors

DISCUSSION

This study presents important factors about the sun exposure in which the workers of the extraction of rocks are submitted in their daily activities. Many of these factors are considered to be aggravating in the development of skin lesions, photoaging of the skin and the appearance of skin cancer.

All workers interviewed were men, mostly with brown skin and with education until elementary school. They have an 8-hour workday, during the 5 days a week. However, the majority (60.5%) reported that they spend 1 to 3 hours of this workday in direct exposure to the sun, and it is also verified that the main time of this sun exposure is between 10 and 12 hours (AM).

Due to the working conditions described, these workers are subject to numerous problems caused by sun exposure. As an immediate effect, burns are verified and as late symptoms, wrinkles, lesions, freckles, stains, texture, squamous masses and tumors.

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It is observed that a large number of volunteers consume alcoholic beverages (84.2%) and use tobacco (65.8%) regularly. In addition, (21.1%) of the interviewees had some burn scar and 63.2% reported having had some history of skin cancer in the family.

Given these data, there is an imminent risk of several pathologies associated with sun exposure along with alcohol intake and smoking. Likewise, the risk of skin neoplasias is evident, given the high number of cases found in the families of the workers involved.

Observing the habits of the workers in front of the solar exposition submitted daily, it is verified that simple measures of protection are not practiced, since no volunteer declared to use sunscreen during his working hours and the use of long sleeve shirts is habit of only 34,2% of the workers.

Individuals exposed to the incidence of solar radiation on a daily basis, at times with radiation peaks and underutilization of basic protection factors, may potentiate the process of photoaging and neoplastic processes. In this way, the population studied becomes a risk group for the development of skin diseases, premature aging besides the appearance of several types of cancer.

Other important data collected in the research performed were the presence of some lesions, in addition to the burn scars previously mentioned. However, it can not be stated in this study that the skin changes presented were acquired as a result of the activities they perform, since the direct practice of these professionals was not the object of this research. Nonetheless, these identified changes may develop into more severe forms, especially in the face of intense exposure and the few protective skin care workers are subjected to.

In Fitzpatrick's classification it was observed that in addition to the workers who presented the phototypes IV, V and VI, they were the majority (65.8%). This result is positive, since darker skins have higher resistance to ultraviolet irradiation due to high concentrations of melanin, especially in the more exposed areas. However, this factor should not be a reason for underutilization of sun protection factors, since the accumulation of Ultraviolet Radiation can lead to aging and the appearance of wrinkles and consequently to the onset of skin neoplasias.

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CONCLUSION

As demonstrated by the review of the literature, skin cancer still presents a high incidence in Brazil, the sun exposure entails numerous direct and indirect consequences. Various types of skin cancer can be highlighted among these consequences, whether they are melanoma or non-melanoma.

Through the present study, it was possible to conclude that the workers of the ornamental rock extraction present a group of risk for pathologies related to the skin, among them the neoplasias. Some aspects that evidence this fact have been verified, such as: high solar exposure at times of radiation peaks, associated with the use of equipment and minimal accessories such as long-sleeved blouse and sunscreen.

Considering the scenario, the companies that work in this field, thinking about the physical and social well-being of the worker, should promote awareness campaigns about the use by employees of measures that prevent direct exposure in addition to trying to relocate the exposure times , thereby avoiding employee submission at peak radiation times. Companies should also promote the basics highlighted for employee safety, including a long-sleeved shirt, hat or cap, and sunscreen with the appropriate skin protection factor and individual sun exposure.

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