Skin Cancer and Family Income: an Ecological Study

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Câncer de Pele e Renda Familiar: um Estudo Ecológico

Cáncer de Piel y Rendimiento Familiar: un Estudio Ecológico

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ABSTRACT

Introduction: Recently, there has been an increase in the incidence of skin cancer. Solar radiation, family history, immunosuppression, fair skin and age are risk factors for the disease. **Objective:** To correlate skin cancer mortality with several socioeconomic variables. **Method**: An ecological study using the Solar Heating at Affordable (ASBC) Project Solar Radiation Incidence Worksheet, with indicators of living conditions from the 2010 Census. All the collected data were exported to SPSS 14.0, a tool where the correlation (Spearman correlation coefficient) was analyzed and the variables were compared. **Results:** Statistically significant associations between the mortality coefficient for malignant skin cancer, with mean family income (r=-0.316, p<0.006) were found, indicating that as high the income, lower is the mortality by malignant neoplasm, occurring the same with the proportion of avoidable deaths in children younger than 4 years (r=-0.292, p<0.01) and the proportion of avoidable deaths between 5 and 74 years (r=-0.372, p<0.001). The proportion of the population earning less than ½ minimum wage (r=0.232, p<0.05) indicates that as high the population proportion with income lower than ½ minimum wage, higher will be the mortality by malignant neoplasm, similar to the proportion of the population earning less than ¼ of the minimum wage (r=0.229, p<0.05). **Conclusion:** Although is a public health issue closely related to income, skin cancer needs initiatives targeted to primary and secondary prevention of the disease.

Key words: Skin Neoplasms/mortality; Skin Neoplasms/economics; Income; Solar Radiation/adverse effects.

RESUMO

Introdução: Recentemente, houve crescimento da incidência do câncer de pele. Radiação solar, história familiar, imunossupressão, pele clara e idade constituem fatores de risco da doença. **Objetivo:** Correlacionar a mortalidade do câncer de pele com variáveis socioeconômicas. **Método:** Estudo ecológico, utilizando a planilha de dados da incidência de radiação solar do projeto aquecedor solar de baixo custo (ASBC), e indicadores de condições de vida do Censo de 2010. Os dados foram exportados para o *SPSS* 14.0, para analisar a correlação (coeficiente de correlação de Spearman), e as variáveis foram comparadas. **Resultados:** Associações estatisticamente significantes ocorreram entre o coeficiente de mortalidade por câncer maligno de pele com a renda familiar média (r=-0,316, p<0,006) indicando que, quanto maior a renda, menor a mortalidade por neoplasia maligna, ocorrendo o mesmo com a proporção de óbitos evitáveis em menores de 4 anos (r=-0,292, p<0,01) e a proporção de mortes evitáveis entre 5 e 74 anos (r=-0,372, p<0,001). A proporção da população ganhando menos de 1/2 salário-mínimo (r=0,232, p<0,05) indica que, quanto maior a proporção populacional com renda inferior a 1/2 salário- -mínimo, maior será a mortalidade por neoplasia maligna, similar à proporção da população ganhando menos de 1/4 de salário-mínimo (r=0,229, p<0,05). **Conclusão:** Sendo um assunto de saúde pública intimamente relacionado à renda, o câncer de pele ainda carece de ações de prevenção primária e secundária.

Palavras-chave: Neoplasias Cutâneas/mortalidade; Neoplasias Cutâneas/economia; Renda; Radiação Solar/efeitos adversos.

RESUMEN

Introducción: Recientemente, ha habido un aumento en la incidencia de cáncer de piel. La radiación solar, historia familiar, inmunosupresión, piel clara y la edad constituyen los factores de riesgo para esta enfermedad. **Objetivo:** Correlacionar la mortalidad por cáncer de piel con varias variables socioeconómicas. **Método:** Se realizo un estudio ecológico usando la base de datos de la incidencia de la radiación solar del proyecto calentador solar de bajo costo (ASBC), adicionando los indicadores del censo de 2010 relativos a las condiciones de vida. Todos los datos recolectados fueron exportados a SPSS 14.0, herramienta que analizó la correlación (coeficiente de correlación de Spearman) y comparar todas las variables de la base de datos. **Resultados:** Fueran encontró asociaciones estadísticamente significativas entre el coeficiente de mortalidad debido al cáncer maligno de la piel y el ingreso familiar promedio (r=-0,316, p<0,006), lo mismo ocurre con la proporción de muertes prevenibles en niños menores de 4 años de edad (r=-0,292, p<0,01) y la proporción de muertes prevenibles entre 5 y 74 años (r=-0,372, p<0,001). La proporción de la población que gana menos de 1/2 salario mínimo (r=0,232, p<0,05) indica que cuanto mayor es la proporción de la población con ingresos por debajo de 1/2 salario mínimo, mayor es la mortalidad por neoplasia maligna, similar a proporción de la población que gana menos de 1/4 del salario mínimo (r=0,229, p<0,05). **Conclusión:** A pesar de ser un problema de salud pública y estrechamente relacionado con los ingresos, el cáncer de piel todavía carece de acciones encaminadas a la prevención primaria y secundaria de la enfermedad.

Palabras clave: Neoplasias Cutáneas/mortalidad; Neoplasias Cutáneas/economía; Renta; Radiación Solar/efectos adversos.

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INTRODUCTION

Skin cancer is the most common malignant neoplasm worldwide[1,2] and its incidence has been reaching an epidemic level. It can be classified in melanoma skin cancer and non-melanoma skin cancer[3,4]. Melanoma skin cancer despite the elevated mortality represents but 4% of skin cancers and low lethality non-melanoma skin cancer corresponds to 90% of skin cancers[5,6].

In 2018 it was estimated nearly 1.04 million new cases of non-melanoma skin cancer and the occurrence of 65 thousand deaths[7]. In this same period the appearance of 287 thousand new cases of melanoma skin cancer was also verified[8], seven thousand in Brazil alone and 60 thousand deaths caused by the disease, two thousand only in Brazil. Among the risk factors, exposure to ultraviolet light stands out (most of all, cumulatively)[9-11].

There are evidences that outdoor exposed workers have more odds of developing skin cancer than those who are not extensively exposed to ultraviolet light[10]. It was also seen that outdoor workers would have low education and affirmed they felt insecure to understand medical instructions – which would hamper the adherence of prevention measures of this cancer as the use of sun-blockers[12]. The prolonged sun exposure at work, a reality for many Brazilians, increases the vulnerability to non-melanoma skin cancer[13,11].

For each year of the triennium 2020-2022, 83,770 new cases of non-melanoma skin cancer are expected for men and 93,160 for women. For melanoma skin cancer, the estimates are 4,200 new cases in men and 4,250 in women[14].

In addition, analyzes of a Brazilian study evaluating the relation between cancer diagnosis and socioeconomic aspects reveal that, despite the innumerous epidemiologic elements that cause cancer, demographic and socioeconomic aspects are relevant characteristics too for cancer diagnosis and incidence[15]. With this, individuals with lower income have poor access to health and physicians, which strongly hamper the diagnosis of cancer.

Because of the increase of the incidence of skin cancer and costs for the government, not only in Brazil but worldwide, it is important to know the risk factors and move to prevent the appearance of this pathology and its social determinants. Thus, the objective of the present study consists in calculating and evaluate statistically the association between the mortality rate by malignant skin cancer and mean family income and the relation between avoidable deaths and family income.

METHOD

Epidemiological, descriptive (ecological) study utilizing the spreadsheet of data incidence of the low-cost solar heater (ASBC)[16], was obtained relating solar radiation (median per year). Among the 314 municipalities listed in an Excel® spreadsheet some indicators of the life conditions were added (from the Census of 2010) such as: proportion of avoidable deaths in 4-years old children, mean family income, proportion of illiterates, proportion of avoidable deaths from 5 to 7 years old, rate of mortality for external causes, rate of child mortality, proportion of population with income under ½ minimum wage (MW), proportion of the population with income under 1.4 MW, proportion of unemployed in addition to the rate of mortality by skin cancer (skin malignant carcinoma). All the data about the conditions of life were obtained from the Department of Computer Information System of SUS (DATASUS).

The Excel® spreadsheet was further exported to the Statistical Package for the Social Sciences (SPSS 14.0) where it was utilized the correlation analysis (Spearman correlation coefficient), comparing all the variables.

RESULTS

For a total of 314 municipalities it was possible to obtain the reading of median of the solar radiation and it failed to hold significant correlation with skin cancer (Table 1).

However, it was found statistically significant association between the rate of mortality by skin malignant cancer with mean family income (r=-0.316, p<0.006) indicating that as high is the income, lower is the mortality per malignant neoplasm and the same occurred with the proportion of avoidable deaths in younger than 4 years old (r=-0.292, p<0.01) and the

Table 1. Correlation between skin malignant cancer and socioeconomic variables

Variable analyzed	Correlation coefficient	p-value
Mean family income	-0.316	0.01
Proportion of avoidable deaths (≤4 years)	-0.292	0.01
Proportion of avoidable deaths (5 to 74 years)	-0.372	0.001
Population proportion earning less than 1/2 MW.	0.232	0.05
Population proportion earning less than 1/4 MW.	0.229	0.05

Caption: MW = minimum wage.
Source: Sociedade do Sol[16].

proportion of avoidable deaths between 5 and 74 years (r=-0.372, p<0.001). The proportion of the population earning less than 1/2 MW (r=0.232, p<0.05), indicates that an increase in the population proportion with income under ½ MW was associated with a higher mortality per malignant neoplasm and the same occurred with the population earning less than 1/4 MW (r=0.229, p<0.05).

DISCUSSION

It was found a reverse association between family income and the rate of mortality by skin cancer. That is, for individuals with high family income, it was found lower mortality by this type of neoplasm. The relation of family income and avoidable deaths is indirectly proportional, the higher the income, there will be a decrease in avoidable deaths. It is important to remind that early diagnosis is an essential tool of referral for timely treatment, which reduces substantially the mortality and increases the proportion of avoidable deaths. In secondary prevention, there are also damages for the lower classes in relation to the stages of diagnosis as quite often they take more time in public institutions and are chronologically organized in 1) suspicion in outpatient consultation; 2) referral to the dermatologist; 3) biopsy; 4) hematological analysis; 5) diagnosis; and 6) treatment. Any delay in one of these stages can be crucial and define the life or death of a patient.

There is no unanimity in the literature about the incidence of cancer in socioeconomic classes (SEC). Regardless of studies concluding that social determinants are highly relevant in cancer incidence, affecting most of all the low SEC negatively[17], there are also studies that demonstrate high incidence of skin cancer in upper social classes[18]. Therefore, it is notorious the difficulty of understanding the impact of social factors in the unveiling of new cancer cases. This can be explained since, on the one hand, individuals of high socioeconomic classes have access to physicians more easily while of low SEC have higher incidence of cancer due to lack of prevention measures. It also needs to be taken into consideration the higher risk of cancer in outdoor workers[12] – who frequently belong to lower socioeconomic classes – and work as street sweepers, construction aides, gardeners, law enforcement offices, farmers, physical education teachers, for instance. The unprotected and excessive exposure to solar rays most of all in the work environment is also a risk factor for skin cancer, which tends to increase the incidence of diseases in this social stratum.

Regardless of discrepancies in incidence, the rate of mortality was significantly higher in lower socioeconomic classes. This relation has been detected in the literature, patients of lower socioeconomic classes diagnosed with melanoma have worse prognosis than those with the same diagnostic from high socioeconomic classes[19]. This can be explained by the difference that these classes have in accessing health services and the probability of diagnosis, access to better treatment or even prevention measures as sun-blockers.

There is no legislation in Brazil specifically for this question. Only Bills that are in processing at the Congress, as, for instance, the Bill 3,730/2004[20], which disposes about the obligation of free distribution of sun-blockers at the National Health System (SUS), a very important Bill because it may have direct impact in primary skin cancer prevention[20,21]. This is less accessible to lower classes individuals as sun-blockers are expensive and are not provided by SUS[22]. Consequently, these individuals have more odds of skin cancer and take more time to diagnose it, which is directly related to worse prognosis and eventually death.

CONCLUSION

The finding of the statistically significant association between the rate of mortality by malignant skin cancer and average family income related to its high incidence, allows to classify it as a relevant public health problem. In addition, the analysis that the family income and avoidable deaths hold a directly proportional relation corroborates the importance of reducing social disparities. Had this been done, the access to health would have been extended as well as the prevention, early diagnosis or treatments related to this cancer, most of all for the lower classes.

Given the magnitude of the issue, it deserves attention since primary care as prevention and protection against excessive sun exposure, a practice still poorly disseminated among the lower classes. Because of their reduced access to sun-blockers or scarce orientation about behavioral measures that reduce radiation damages, primary prevention of this cancer remains scathed. The delay of the diagnostic of this infirmity is another obstacle to secondary prevention. Exactly due to the inexistence of a health public policy for skin cancer in Brazil, as opposed to other types of cancer, the medical-hospital network is ill-prepared to provide the population forms to fight this neoplasm satisfactorily. With this, there is less access to prevention, diagnosis and occasionally to treatment in the public network, the main source of care for the lower socioeconomic classes.

Considering the upper classes have better access to health in the country, the reduction of the social disparities is a relevant strategy to fight skin cancer, mainly to diminish the rate of mortality of this neoplasm in the lower classes.

DECLARATION OF CONFLICT OF INTERESTS

There is no conflict of interests to declare.

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CONTRIBUTIONS

Maurício de Andrade Pérez participated of the conception, gathering and analysis of the data and critical review with intellectual contribution. Lara Gonçalves Mesquita, Sihamme Fraxe Diniz, Larissa Karkow Pérez, Fernanda Tebaldi Henriques de Queiroz, Laura Artioli de Moraes e Souza, Thaynã Amaral e Siqueira Pavani and Carolina Padilha Tavares participated of the wording and critical review with intellectual contribution. Lucas Bonacossa Sant'Anna participated of the wording, collection, analysis and/or interpretation of the data and critical review with intellectual contribution. All the authors approved the final version to be published.

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