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IS THERE A SIGNIFICANT RELATIONSHIP BETWEEN EDUCATION LEVEL, INCOME, AND SUN EXPOSURE HABITS IN BRAZILIAN AND OLDER ADULTS?

[1]Priscila Ester de Lima Cruz, [2]Daniele Fernanda Felipe, [3]Brunno Cavalcanti Pontes Batista, [4]João Vitor Cunha de Macêdo, [5]Natália Quevedo dos Santos, [6]José Roberto Andrade do Nascimento Júnior & [7]Daniel Vicentini de Oliveira

ABSTRACT

Objective: To explore the relationship between education level, income, and sun exposure habits in Brazilian adults and elderly.

Methods: Utilized a cross-sectional design with 148 participants, employing questionnaires to gather sociodemographic data and sun exposure habits. Data analysis included descriptive and inferential statistics.

Results: Significant associations were found between daily sunscreen use and variables such as gender, education level, and monthly income, indicating that women, higher-educated individuals, and those with higher incomes are more likely to use sunscreen daily.

Conclusion: The study highlights the impact of socioeconomic and educational factors on sun protection behaviors, emphasizing the need for targeted health education to improve sun protection practices.

Keywords: Sunlight. Sun Protection Factor. Education level.

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[1]Universidade Cesumar - UNICESUMAR, Paraná, (Brasil). E-mail: priscilaestercruz@gmail.com Orcid id: https://orcid.org/0000-0003-2958-4786
[2]Universidade Estadual de Maringá - UEM, Paraná, (Brasil). E-mail: daniele.felipe@unicesumar.edu.br Orcid id: https://orcid.org/0000-0001-9028-0728
[3]Universidade Cesumar - UNICESUMAR, Paraná, (Brasil). E-mail: brunnocavalcanti94@gmail.com Orcid id: https://orcid.org/0000-0003-4936-609X
[4] Universidade Cesumar - UNICESUMAR, Paraná, (Brasil). E-mail: joaovitormcd8@gmail.com
[5] Universidade Cesumar - UNICESUMAR, Paraná, (Brasil). E-mail: natquevedo01@gmail.com Orcid id: https://orcid.org/0000-0003-4936-609X
[6]Universidade Federal do Vale do São Francisco - UNIVASF, Pernambuco, (Brasil). E-mail: jroberto.jrs01@gmail.com Orcid id: https://orcid.org/0000-0003-3836-6967
[7] Universidade Cesumar - UNICESUMAR, Paraná, (Brasil). d.vicentini@hotmail.com

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HÁ RELAÇÃO ENTRE O NÍVEL EDUCACIONAL E A RENDA COM OS HÁBITOS DE EXPOSIÇÃO SOLAR EM ADULTOS E PESSOAS IDOSAS BRASILEIRAS?

RESUMO

Objetivo: Explorar a relação entre nível educacional, renda e hábitos de exposição ao sol em adultos e idosos brasileiros.

Métodos: Utilizou-se um design transversal com 148 participantes, empregando questionários para coletar dados sociodemográficos e hábitos de exposição ao sol. A análise de dados incluiu estatísticas descritivas e inferenciais.

Resultados: Associações significativas foram encontradas entre o uso diário de protetor solar e variáveis como gênero, nível de educação e renda mensal, indicando que mulheres, indivíduos com maior escolaridade e aqueles com maiores rendas são mais propensos a usar protetor solar diariamente.

Conclusão: O estudo destaca o impacto dos fatores socioeconômicos e educacionais nos comportamentos de proteção solar, enfatizando a necessidade de educação em saúde direcionada para melhorar as práticas de proteção solar.

Palavras-chave: Luz solar. Fator de Proteção Solar. Nível de Educação.

HAY RELACIÓN ENTRE EL NIVEL EDUCATIVO Y EL INGRESO CON LOS HÁBITOS DE EXPOSICIÓN SOLAR EN ADULTOS Y PERSONAS MAYORES BRASILEÑAS?

RESUMEN

Objetivo: Explorar la relación entre el nivel educativo, ingresos y hábitos de exposición al sol en adultos y ancianos brasileños.

Métodos: Se utilizó un diseño transversal con 148 participantes, empleando cuestionarios para recopilar datos sociodemográficos y hábitos de exposición al sol. El análisis de datos incluyó estadísticas descriptivas e inferenciales.

Resultados: Se encontraron asociaciones significativas entre el uso diario de protector solar y variables como género, nivel educativo e ingresos mensuales, indicando que las mujeres, las personas con mayor educación y aquellas con ingresos más altos tienen más probabilidades de usar protector solar diariamente.

Conclusión: El estudio destaca el impacto de los factores socioeconómicos y educativos en los comportamientos de protección solar, enfatizando la necesidad de educación en salud dirigida para mejorar las prácticas de protección solar.

Palabras clave: Luz solar. Factor de Protección Solar. Nivel de Educación.

INTRODUCTION

Preserving skin health is one of the main objectives of dermatological care, not only because of its role as a barrier against external agents but also due to its psychosocial influence on quality of life (Deniz et al., 2020). The skin plays a central role in people's lives as its appearance is intrinsically linked to cultural and social factors, which can significantly affect self-esteem and self-image (Jiang, 2018; Borrico, 2019).

Various habits can compromise skin integrity and health, such as excessive use of medications, frequent washing with alkaline soaps that alter the skin's natural pH, as well as circulatory conditions, chronic issues, and infections that may stem from pathologies, medical treatments, or simply the natural aging process (Burr, 2019; Bouslimani, 2019; Santos, 2019).

Approximately 80% of facial aging is related to exposure to ultraviolet (UV) radiation. Thus, despite the cosmetic market emphasizing products to reverse signs of aging, prevention through consistent sun protection is the best defense against age-related skin changes (Araujo et al., 2023). Therefore, attention to skincare should be constant throughout all stages of life, with particular emphasis on middle age and older age.

Sun exposure habits and skin care can be influenced by various factors, including psychosocial, cultural, and socioeconomic aspects, self-image, and self-esteem (Nagae; Mitsutake; Sakamoto, 2023). Self-esteem plays a crucial role in mental health and well-being, directly influencing self-care practices and coping with daily situations (Santos, Amorim, Rodrigues, 2021; Nagae, Mitsutake, Sakamoto, 2023).

Skin changes resulting from aging, whether chronological or due to sun exposure, can significantly impact individuals' self-esteem and, consequently, their skin care practices (Silva; Rodrigues, 2020; Grimes; Gohara, 2018). UVA radiation can penetrate deeply into the inner layers of the skin, while the outer layer, the epidermis, primarily absorbs UVB radiation. Both can cause DNA damage, either directly or through the generation of reactive oxygen species. Therefore, it is crucial to use sunscreen to protect the skin from these damages (Portilho et al., 2022).

The use of sunscreen among adults in Canada is closely linked to factors such as education level, household size, and financial situation. Notably, individuals with higher education levels are more likely to adopt sun protection measures, including wearing protective clothing. Similarly, higher-income people are more likely to use sunscreen regularly (Sultana, 2020). However, despite these associations, the study reveals that the overall pattern of sun protection among respondents does not meet the ideal criteria. Only a quarter of participants

use a high level of sun protection. This group primarily comprises married women with higher education and financial stability who generally live with four or fewer family members (Sultana, 2020).

In light of this, there is a need to understand how socioeconomic and educational factors influence sun exposure behaviors and skin care. In Brazil, where sun exposure is intense and frequent due to the tropical climate, it is crucial to investigate whether education level and income are related to adopting sun protection practices and awareness of associated risks. Understanding these relationships within the Brazilian context can help guide more effective education and intervention strategies to improve skin health and reduce the risks of sun-related diseases, such as skin cancer and premature aging. Thus, this study aimed to analyze whether there is a relationship between education level income and sun exposure habits among adults and older adults.

METHODS

This quantitative, analytical, observational, and cross-sectional study was approved by the Research Ethics Committee of Universidade Cesumar under opinion number 5.944.099/2023.

Participants

The non-probabilistic sample, chosen non-intentionally and for convenience, consisted of 148 individuals, including 115 middle-aged adults (45 to 59 years) and 33 older adults (60 years or older) of both sexes residing in various regions of the country (South, Southeast, Central-West, North, and Northeast). Included were individuals who answered all the questions on the provided instruments, regardless of whether they received assistance with digital means where the questionnaires were available. Exclusion criteria encompassed individuals who were bedridden, hospitalized, and institutionalized, as well as people with albinism.

Instruments and Data Collection Protocol

To assess the sociodemographic profile and general health, a questionnaire developed by the authors was used, including questions about age, age group, sex, marital status, current and previous occupation, retirement or pensions, education, monthly income in minimum

wages (R$ 1,302.00 - referring to the year 2023), and housing (rural or urban). Current health perception, medication use, presence of polypharmacy, and habits such as smoking, healthy eating, and physical activity were also evaluated, along with the presence of chronic non-communicable diseases.

A second questionnaire, also developed by the authors, was used to evaluate skin care habits. This included questions about skin color and sensitivity to the sun (Fitzpatrick skin type scale), daily sun exposure duration (in hours), sun exposure timing (whether the individual avoids the sun between 10 AM and 4 PM), reasons for sun exposure (leisure, work, tanning, outdoor activities), and preventive and protective sun behaviors, such as using sunscreen, UV-protection sunglasses, clothing covering arms and legs, and hats.

Questions were included to assess the participants' knowledge about the potential damage of excessive sun exposure, criteria for purchasing or not purchasing sunscreen or other cosmetics, reasons for not using sunscreen, and occurrences of sunburn. The practice of a skincare routine, including cosmetics like soaps, moisturizers, facial and body sunscreens, and other treatment cosmetics, was also evaluated. Additionally, participants were asked whether they had had skin cancer.

Data collection was conducted via an online form provided free of charge by Google Forms. Interested participants signed and accepted the Informed Consent Form (ICF) within the online form. The link for the electronic questionnaire was distributed online through the researchers' social media platforms (WhatsApp, Instagram, Twitter, and Facebook). The online questionnaire was open for responses for 90 days (from March 2023 to June 2023).

Data Analysis

Data analysis was conducted using SPSS 25.0 software, employing descriptive and inferential statistical approaches. Descriptive measures, such as frequency and percentage, were used for categorical variables. Pearson's Chi-square test (X^2) was applied to compare the proportions of sociodemographic and health variables about prolonged sun exposure and daily sunscreen use. Binary logistic regression (both unadjusted and adjusted analyses) was used to examine the associations between sociodemographic and clinical variables (independent variables) with prolonged sun exposure and daily sunscreen use (dependent variables). For regression modeling, only variables with a significance level of 0.20 or less in the Chi-square test were considered for inclusion. The model adjustment was assessed using the Hosmer-Lemeshow test. A significance level of $p < 0.05$ was considered.

RESULTS

The study involved 148 participants, including 121 females and 27 males, aged between 30 and 82 years (M = 53.34; SD = 8.59). Data from Table 1 reveal a predominance of participants in the age range of 45 to 59 years (77.7%), who were in a relationship (67.6%), had completed higher education (67.5%), were white (62.8%), had a monthly income of more than two minimum wages (58.8%), and were not retired/pensioners (76.4%).

Table 1. Sociodemographic Profile of the Study Participants. Brazil (2023).

VARIABLES	***f***	**%**
Gender		
Female	121	81.8
Male	27	18.2
Age Group		
45 to 59 years	115	77.7
60 years or older	33	22.3
Marital Status		
Without partner	48	32.4
With partner	100	67.6
Education		
Incomplete/Complete Elementary	14	9.5
Incomplete/Complete High School	34	23.0
Complete Higher Education	100	67.5
Race		
White	93	62.8
Others	55	37.2
Monthly Income		
Up to 1 minimum wage	13	8.8
1 to 2 minimum wages	25	16.9
More than 2 minimum wages	87	58.8
Prefer not to say	23	15.5
Retired/Pensioner		
Yes	35	23.6

No	113	76.4

It is observed that the majority of participants reported not engaging in prolonged sun exposure (74.3%) and using sunscreen daily (58.1%). When comparing the proportions of sociodemographic variables among the study participants based on the presence of prolonged sun exposure during the day (Table 2), a significant difference was found only in terms of education level (p = 0.021) and monthly income (p = 0.022). It was observed that a higher frequency of individuals who do not engage in prolonged sun exposure had completed higher education (72.7%) and had a monthly income of more than two minimum wages (60.9%).

Table 2. Comparison of the proportions of sociodemographic variables according to the presence of prolonged sun exposure during the day. Brazil (2023).

Variables	**Prolonged sun exposure**		**X^2**	**p-value**
	No (n=110)	**Yes (n=38)**		
	f (%)	*f* (%)		
Gender				
Female	18 (16.4)	9 (23.7)	1.015	0.314
Male	92 (83.6)	29 (76.3)		
Age Group				
45 to 59 years	86 (78.2)	29 (76.3)	0.057	0.812
60 years or older	24 (21.8)	9 (23.7)		
Marital Status				
Without partner	32 (29.1)	16 (42.1)	2.183	0.140
With partner	78 (70.9)	22 (57.9)		
Education				
Incomplete/Complete Elementary	8 (7.3)	6 (15.8)	5.309	**0.021***
Incomplete/Complete High School	22 (20.0)	12 (31.6)		
Complete Higher Education	80 (72.7)	20 (52.6)		
Race				
White	72 (65.5)	21 (55.3)	1.256	0.262
Others	38 (34.5)	17 (44.7)		

Monthly Income				
Up to 1 minimum wage	6 (5.4)	7 (18.4)	5.290	**0.022***
1 to 2 minimum wages	18 (16.4)	7 (18.4)		
More than 2 minimum wages	67 (60.9)	20 (52.6)		
Prefer not to say	19 (17.3)	4 (10.6)		
Retired/Pensioner				
Yes	27 (24.5)	8 (21.1)	0.191	0.662
No	83 (75.5)	30 (78.9)		

*Significant difference – p<0.05: Chi-square test.

When comparing the proportions of sociodemographic variables among the study participants based on daily sunscreen use (Table 3), significant differences were found in terms of sex (p = 0.004), education level (p = 0.002), and monthly income (p = 0.033). It was observed that a higher frequency of individuals reporting daily sunscreen use was female (89.5%), had completed higher education (77.9%), and had a monthly income of more than two minimum wages (69.8%).

Table 3. Comparison of the proportions of sociodemographic variables according to sunscreen use during the day. Brazil (2023).

Variables	**Sunscreen use**		**X^2**	**p-value**
	No (n=62)	**Yes (n=86)**		
	f (%)	*f* (%)		
Gender				
Female	18 (29.0)	9 (10.5)	8.327	**0.004***
Male	44 (71.0)	77 (89.5)		
Age Group				
45 to 59 years	51 (82.3)	64 (74.4)	1.278	0.258
60 years or older	11 (17.7)	22 (25.6)		
Marital Status				
Without partner	17 (27.4)	31 (36.0)	1.224	0.269
With partner	45 (72.6)	55 (64.0)		
Education				

Incomplete/Complete Elementary	9 (14.5)	5 (5.8)	9.218	**0.002***
Incomplete/Complete High School	20 (32.3)	14 (16.3)		
Complete Higher Education	33 (53.2)	67 (77.9)		
Race				
White	34 (54.8)	59 (68.6)	2.924	0.087
Others	28 (45.2)	27 (31.4)		
Monthly Income				
Up to 1 minimum wage	9 (14.5)	4 (4.7)	4.545	**0.033***
1 to 2 minimum wages	15 (24.3)	10 (11.6)		
More than 2 minimum wages	27 (43.5)	60 (69.8)		
Prefer not to say	11 (17.7)	12 (14.0)		
Retired/Pensioner				
Yes	12 (19.4)	23 (26.7)	1.089	0.297
No	50 (80.6)	63 (73.3)		

*Significant difference – $p<0.05$: Chi-square test.

For the logistic regression analysis modeling, only variables with a significance level of 0.20 or less in the Chi-square test were considered for prolonged sun exposure during the day (Table 4) and daily sunscreen use (Table 5). Table 4 presents the factors associated with prolonged sun exposure during the day. In both the unadjusted and adjusted analyses for all variables in the model, none of the sociodemographic variables showed a significant association ($p > 0.05$) with prolonged sun exposure during the day.

Table 4. Factors associated with the presence of prolonged sun exposure during the day. Brazil (2023).

Variables	**OR crude**	**OR adjusted [CI 95%]**
Marital Status		
Without partner	1	1
With partner	1.773 [0.826-3.807]	1.734 [0.778-3.867]
Education		
Incomplete/Complete Elementary	1	1
Incomplete/Complete High School	3.000 [0.934-9.631]	2.688 [0.672-10.762]
Complete Higher Education	2.182 [0.926-5.142]	2.020 [0.679-6.009]
Monthly Income		
Up to 1 minimum wage	1	1
1 to 2 minimum wages	0.333 [0.082-1.347]	3.715 [0.734-18.797]
More than 2 minimum wages	0.256 [0.077-0.849]	1.345 [0.309-5.861]
Prefer not to say	0.180 [0.039-0.836]	1.774 [0.511-6.163]

*Significant association – $p < 0.05$: Binary Logistic Regression. Adjusted OR for all variables. OR = Odds Ratio; CI = Confidence Interval.

Table 5 presents the factors associated with daily sunscreen use. In the unadjusted analysis, the following factors individually showed a significant association with daily sunscreen use: sex ($p = 0.005$), education level ($p = 0.008$), and monthly income ($p = 0.010$).

Table 5. Factors associated with daytime sunscreen use. Brazil (2023).

Variables	**OR crude**	**OR adjusted [CI 95%]**
Gender		
Male	1	1
Female	3.500 [1.449-8.453]*	4.415 [1.625-11.995]*
Education		
Incomplete/Complete Elementary	1	1
Incomplete/Complete High School	1.260 [0.347-4.573]	0.589 [0.127-2.738]
Complete Higher Education	3.655 [1.134-11.175]*	1.592 [0.374-6.770]
Race		

White	1	1
Others	1,800 [0.915-3.539]	0.761 [0.334-1.733]
Monthly Income		
Up to 1 minimum wage	1	1
1 to 2 minimum wages	1,500 [0.361-6.230]	2.994 [0.559-16.027]
More than 2 minimum wages	5,00 [1.415-17.668]*	4.408 [1.029-20.849]*
Prefer not to say	2,455 [0.585-10.299]	2.439 [0.473-12.571]

*Significant association – $p < 0.05$: Binary Logistic Regression. Adjusted OR for all variables. OR = Odds Ratio; CI = Confidence Interval.

When the analysis was adjusted for all variables in the model, only the variables sex and monthly income remained significantly associated ($p < 0.05$) with daily sunscreen use. It is noteworthy that women and individuals with a monthly income above two minimum wages were, respectively, 4.415 times [95% CI = 1.625-11.995] and 4.408 times [95% CI = 1.029-20.849] more likely to use sunscreen daily compared to men and individuals with lower income or those who did not report their income.

DISCUSSION

This study aimed to analyze whether there is a relationship between education level income and sun exposure habits among Brazilian adults and older adults. Our results indicated that women and older adults with higher monthly incomes were, respectively, more likely to use sunscreen daily compared to men and older adults with lower incomes.

Older women, likely influenced by awareness campaigns and societal pressures related to aesthetics, generally show a greater tendency toward preventive sunscreen use (Collam et al., 2023). Additionally, the difference in sunscreen use between females and males can be attributed to traditional gender roles and social norms that shape beliefs and behaviors regarding sunscreen use (AlGhamdi, AlAklabi, AlQahtani, 2016; Al-Qarqaz, Marji, Bodoor, 2020).

Moreover, the cosmetics and skincare industry often targets women in marketing, further reinforcing this behavior. In contrast, men frequently view sunscreen as a product associated with female concerns, which may lead to lower adoption of this habit. Studies reveal that while men recognize the benefits of sunscreen, such as preventing sunburns and other adverse effects related to sun exposure, they are more likely to use it only after negative

experiences or during prolonged sun exposure (AlGhamdi, AlAklabi, AlQahtani, 2016; Al-Qarqaz, Marji, Bodoor, 2020; Al-Balbeesi et al., 2022).

Moreover, older adults with higher incomes may have easier access to skincare products, demonstrating a correlation between financial conditions and sun protection behaviors (Ullman et al., 2024). Factors such as working conditions, lifestyle, cultural norms, access to healthcare services, and social context can also play significant roles in these observed differences (Bahashwan, 2024). These results underscore the importance of adopting a multidimensional approach when developing awareness and health promotion strategies for various older population segments.

We observed a higher frequency of individuals who reported using sunscreen daily among those who are female, have completed higher education, and have a higher monthly income. Women, possibly influenced by social norms and skincare concerns, showed greater adherence to this preventive habit. The positive association with higher education indicates that higher education levels may be linked to increased awareness and understanding of the benefits of sun protection (Bahashwan, 2024).

Additionally, the relationship between higher monthly income and frequent sunscreen use suggests that access to financial resources may facilitate the purchase of these products (Chen, Chao, Mengzhen, 2024). These findings highlight the importance of considering socioeconomic and gender factors when developing health awareness and education strategies to promote regular sun protection practices.

For example, reapplying sunscreen is crucial to ensure continuous and adequate protection against sun damage. Sunscreen loses its efficacy after a few hours, and activities such as swimming, sweating, or towel-drying can remove the product. To maintain protection, it is essential to reapply sunscreen every two hours and always after swimming or drying off. Uniform application and adequate quantity help prevent sunburn and other sun-related damage (Norman et al., 2023).

According to Chen, Chao, and Mengzhen (2024), sunscreen use is strongly influenced by factors such as education level, economic condition, and awareness of the importance of skin protection. People with higher education levels tend to use sunscreen more frequently, with about 21.60% of those with a completed higher education applying sunscreen daily. In contrast, only 5.60% of those with less education use the product regularly.

The study has significant limitations. Firstly, the sample was selected non-probabilistically and out of convenience, which may affect the generalizability of the results to the broader Brazilian population. Additionally, the study relied on self-reported data from

participants regarding their sun exposure habits and sunscreen use, which may introduce response bias and not accurately reflect actual behaviors. Another limitation is the lack of consideration of contextual variables, such as access to healthcare services and sun exposure in different regions of Brazil, which may influence sun protection habits. Finally, the analysis did not include qualitative aspects that could provide a deeper understanding of the motivations and barriers associated with sunscreen use and exposure protection.

CONCLUSION

The results of this study indicate that while some sociodemographic variables did not show a significant association with prolonged sun exposure during the day, factors such as sex, education level, and monthly income were relevant for daily sunscreen use. Specifically, the analysis revealed that women, individuals with higher levels of education, and those with higher monthly incomes were more likely to use sunscreen daily.

These findings suggest that education and economic status are essential in adopting preventive behaviors. The results underscore the need for health education strategies that consider these factors to promote more effective and widely adopted sun protection practices.

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