

A Study on the Effect of Sun Radiation on Human Health (The Skin)

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Abstract

A considerable high number of outdoor workers worldwide are constantly exposed for majority of their working life to sun radiation (SR); this exposure is known to induce various adverse health effects, mainly related to its ultraviolet (UV) component. The skin is one of the principal target organs for both acute and long-term exposure as well as other organs of the body. Ultraviolet B (UVB) rays vary with time and season and are the major cause of sunburns. Sunburned skin is a leading risk factor for melanoma and non-melanoma skin cancers, protection against exposure to UVB rays may be achieved by a combination of various approaches such as use of broad-spectrum sunscreen formulations. There was no significant association between age and color of skin ($X^2=36.929$, $P=0.005$). Researchers recommend using sunscreen to protect the skin from harmful UVR. SR exposure is influenced by various environmental and individual factors, and occupation is one of the most relevant.

Keywords: *sun radiation, human health, skin*

Introduction

Monitoring and prediction of the climatic phenomenon have developed over the years; wide knowledge and information have been gathered that have helped to understand and to predict it. More importantly, climatic change has a great influence on the lives of people and their environments.¹ This is influenced by the location latitude, elevation and proximity of water bodies. Solar radiation is one of the important parameters to study climate change, environmental pollution, crop production, food industry and hydrology.² The interaction of solar radiation with biological tissue is related to two main mechanisms; Photochemical, typical of the ultraviolet wavelength, and the thermal, the main mechanism in the case of infrared radiation. In the visible region of the radiation SP spectrum, both mechanisms can be observed: the photochemical effect prevails in the violet-blue light region of the visible spectrum (400-550 nm wavelength), whereas the thermal effect prevails in the yellow and light part (600-700nm). Photochemical effects, typically of UVR and of shorter wavelength of visible radiation as violet-blue, are essentially related to the absorption of photons by specific molecules in target tissues, including DNA, called chromospheres. The effects related to the photochemical mechanism depend on the total dose, such as a result of the product between the duration of the exposure and the intensity of the

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radiation. Accordingly, high short-term exposure and less intense but more prolonged exposure can reduce similar effects.³

The main skin reaction of solar ultraviolet radiation exposure are on-melanogenesis and skin darkening, which are responsible for skin darkening, which can be interpreted as an adaptive defense mechanism. Long-term exposure induces the complex phenomenon of photo ageing, related to different UV components, but mainly chronic UV-A damage. Also, in the human eyes, different solar radiation band are absorbed by different ocular structure, and consequently, different thermic and photochemical effects are possible. UV-C is absorbed by the cornea, whereas UV-B and UV-A rays are absorbed by the cornea and lens respectively. Furthermore, approximately 1-2% of UV-A (380-400nm) can reach the retina; age related differences have been described with proportions up to 10% in childhood. The whole visible spectrum and near infrared (IR-A) are absorbed by the retina, whereas the IR-B from the cornea and the lens and the IR-C from the cornea.³ The aim of this study is to understand the effect of solar radiation on human health (especially the skin).

Materials and Methods

Study Design

This study used semi-structured questionnaire approach, which was distributed to participants across some selected regions of Sabon Gari LGA in Zaria, Kaduna State, Nigeria.

Sampling

The respondents in this study comprise of all persons that are involved in activities under the sun with some participants that are not involved under the sun as control.

Study Procedures

The questionnaire was subdivided into various sections. Section A of this questionnaire requested information on demographic variables such as gender, age, occupation, where you live in Zaria. Section B requested information on variables relating to effects of sun on the skin in terms of how long do you stay under the sun, do you have any skin burn, what is your skin color and do you have skin problem. Section C requested information of knowledge on the effects of constant exposure to the sun in term of do you think that working under the sun can affect your skin, if yes specify, constant exposure to the sun cause cancer and constant exposure to the sun can make your skin dark.

Selection Criteria

The participants in this study comprised of all people working under the sun.

Statistical Analysis

Completed questionnaires were received coded, entered and analyzed using the Statistical Package for the social science (SPSS), version 25.0 for windows (SPSS Inc., Chicago, Illinois, USA), The analytical approaches used were descriptive statistics such as percentages and frequencies. Data were analyzed using chi square and $P < 0.05$ was considered statistically significant.

Results

The percentage distribution of respondents is presented in Figure 1. Of the 3000 questionnaire distributed and collected, more male ($n=187$, 62.3%) than female ($n=113$, 37.7%) participated in the study.

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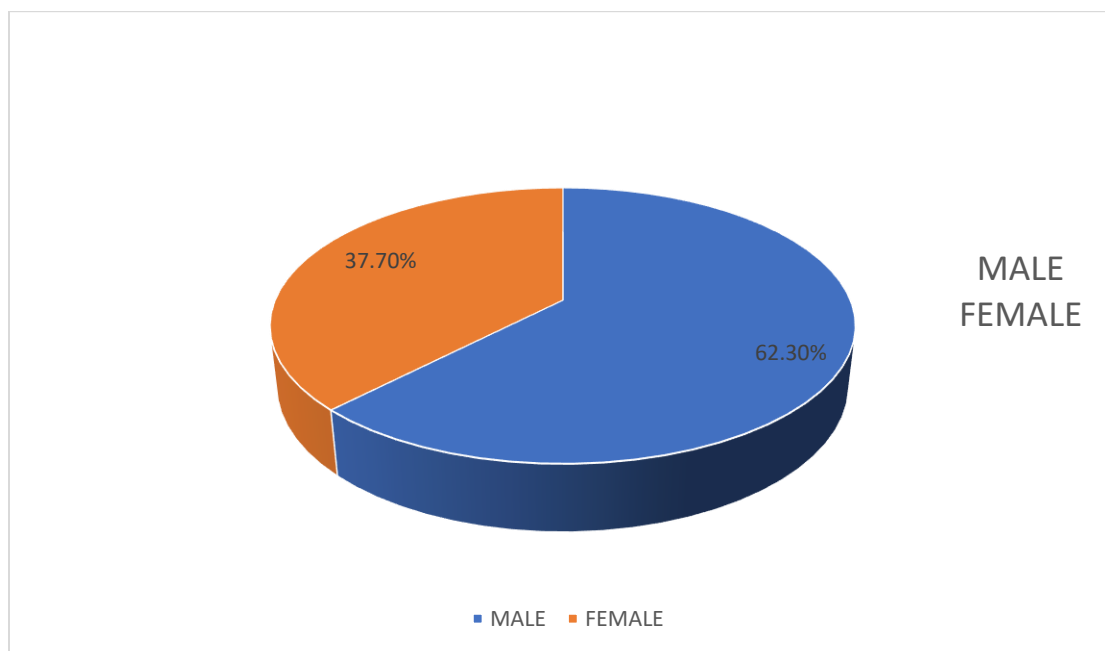


Figure1: Proportion of respondents with respect to gender

With respect to the effects of the sun on the skin among the 200 experimental participants, 20 participants reported that they have skin rashes, 12 reveal that they have pimples, 9 said they have rough skin, 12 said the sun make the skin dark, 8 said they have skin redness while 8 said skin irritation.

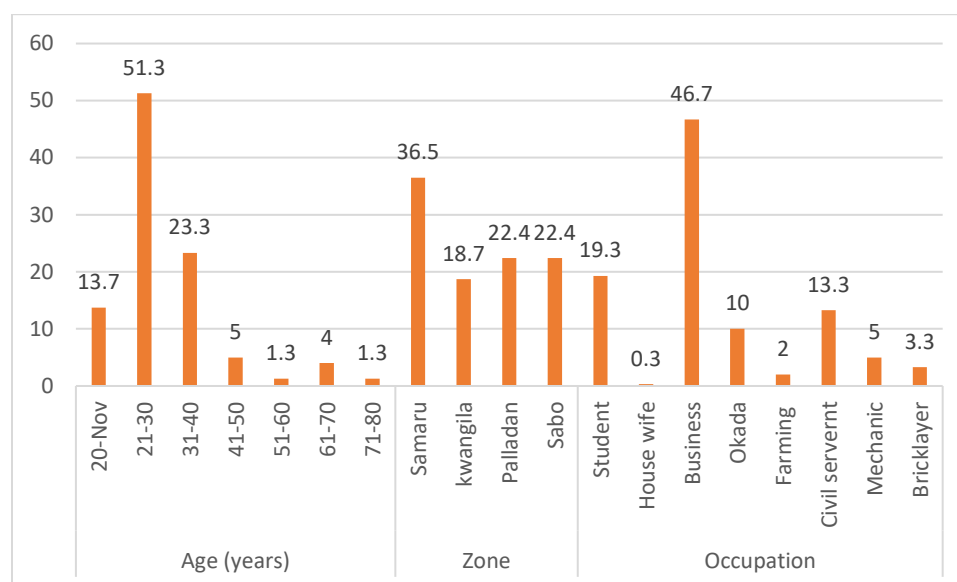


Figure 2: Demographic characteristics of participants in percentages

However, among the 100 control participants, 3 said they have skin redness while 1 participant said pimple. Also of the 200 experimental participants, 14 said working under the sun causes skin burn, 4 said it causes skin cancer, 75 said it makes skin darker, 13 said it causes sweat, among the 100 control, 12 participants reported that working under the sun causes skin burn, 11 said it causes skin cancer, 16 said it makes skin darker, 2 said it causes sweat Table 2.

Table 1: Participants' knowledge on the effects of constant exposure to the sun

Variable	Strongly agree (%)	Agree (%)	Disagree (%)	Strongly disagree (%)	Neutral (%)
Constant exposure to the sun can cause premature aging	99(33.0)	144(48)	31(10.3)	6(2.0)	20(6.7)
Constant exposure to the sun can cause cancer	54(18.0)	124(41)	50(16.7)	43(14.3)	29(9.7)
Constant exposure to the sun can make one skin dark	149(50)	130(43)	12(4.0)	4(1.3)	5(1.7)

Table 2: Knowledge and effects of sun on participants

Variable	Frequency	Percentage (%)	Frequency	Percentage (%)
Experimental		Control		
Duration of time under the sun				
8 hours	54	18	22	7.3
7 hours	45	15	14	4.7
6 hours	24	8	10	3.3
5 hours	36	12	9	3
4 hours	41	13.7	28	9.3
1 hour	11	3.7	6	2
Knowledge of the effects of sunburn				
Do you have sun burn on your skin				
Yes	39	13	4	0.4
No	161	53.7	96	32
Color of your skin				
Dark	149	49.7	26	8.7
Fair	48	16	73	24.3
Do you have skin problem				
Yes	28	9.3	8	2.7
No	172	57.3	92	30.7
If yes specify				
Pimples	12	4	1	0.3
Skin rashes	20	6.7		
Rough skin	9	3		
Make skin dark	12	4		
Skin redness	8	2.7	3	1
Skin irritation	8	2.7		
Do you think working under the sun can affect your skin				

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Yes	148	49.3	52	17.3
No	76	25.3	23	7.7
If yes specify				
Causes skin burn	14	4.7	12	4
Causes skin cancer	4	1.3	11	3.7
Make skin dark	75	25	16	5.3
Causes sweat	13	4.3	2	0.7

Discussion

The majorities of participants were knowledgeable about the effect of the sun on the skin and 148(49.3%) experimental and 52(17.3%) of the control scores indicated that over exposure to the sun can cause skin problems. Though response to knowledge questions demonstrated that participants are well informed about the risk factors for developing skin cancer, only 3.7% and 1.3% of the control and experimental respectively knew that working most of the time under the sun is a significant risk factor. There was no significant association between gender and color of skin ($X^2=34.913$, $P=0.000$)

There was no significant association between age and color of skin ($X^2=36.929$, $P=0.005$). This is of concern, considering participants must know that sun exposure is a primary external cause of melanoma and individuals spending more time in the direct sunlight could increase their risk of developing skin cancer.⁴⁻⁸

Scores for the duration of time under the sun of the questionnaire were low across all control groups than the experimental group. There was a significant association between age and skin problem ($X^2=2.089$, $P=0.910$). Also, there was a significant association between gender and skin problem ($X^2=0.881$, $P=0.368$).

Conclusion

From the article, we can conclude that too much exposure to the sun have immense effect on the existence of human as well as other low creatures. This paper has so far discovered that there is a continuous depletion of the ozone layer as a result of human activity such as pollution, desertification, production of greenhouse gasses etc. This paper is with the opinion that our education system can play immense role in creating the needed awareness about the effect of too much sunlight not just on the skin but on the human health generally and to promote sun protection habit to avoid both sun burns and chronic sun damages. It therefore suggests that policy statements in favor of environmental education be included in national policy on education. Which presently lack such. Such policy statements should specifically state the teaching of subjects and course on the effect of too much exposure to sunlight.

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