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The Relationship Between Changes in UV Levels and the Incidence of Skin Cancer from 2005 to 2014 (Case Study : Different Cities of East Azerbaijan Province)

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Abstract

The incidence of skin cancers has been on the rise in recent decades, with most of these cancers resulting from frequent exposure to sunlight. Changes in UV levels can be a major cause of the increase in skin cancer. This article aims to investigate the effect of UV changes on the incidence of skin cancer in East Azerbaijan Province. Data and information related to skin cancer were collected from the Disease Management Center of the province located in Tabriz, and data regarding ultraviolet (UV) radiation were extracted using satellite images. To analyze the satellite images, ArcGIS software was used to create a geographic distribution map of skin cancer by county. Subsequently, a geographic distribution map of UV radiation levels in East Azerbaijan Province was created from point data, and finally, a model was developed to correlate the two layers of skin cancer incidence with UV radiation levels. The SAS 9.1 statistical software was used to analyze the correlation between latitude and longitude with the incidence rate of skin cancer. The results of the study on the distribution of skin cancer in East Azerbaijan Province indicate that the highest incidence rates are found in the counties of Tabriz and Haris, with rates ranging from 15.2 to 22 per 100,000 population. The lowest incidence rates are found in the southern strip of the province, including the counties of Malekan, Charavimaq, and parts of northeastern areas such as Khoda Afarin and Jolfa, with an incidence rate of 2.7. A concentration of skin cancer is also observed in parts of Tabriz County, Kalibar, and Haris, with the highest rate recorded in Ahar County at 12 per 1,000,000 people. The UV levels in various parts of the province range from high to very high risk. Satellites have recorded UV indexes as high as 11.8 in 2011 at stations such as Malekan and Bonab. In the studied area, the results indicate that the increase in UV levels from 2005 to 2014 is undeniable, with varying trends observed across different parts of the province.

Keywords: UV, Skin Cancer, East Azerbaijan, Ozone Changes.



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Extended Abstract

Introduction

The amount of ozone present in the atmosphere is of significant importance not only from a climatological perspective but also in terms of health and environmental concerns. Any reduction in ozone levels can pose serious risks to the health of humans, animals, and plants. UV-A radiation is partially affected by ozone, allowing most of it to reach the earth's surface, leading to skin darkening, skin aging, and eye diseases. UV-B radiation is significantly influenced by ozone levels. A decrease in stratospheric ozone results in increased UV-B radiation reaching the earth's surface, which can cause sunburn and various skin diseases, including skin cancer. The skin, being the largest organ of the body, serves multiple functions, including mechanical protection against the external environment, temperature regulation, sensory perception, fluid control, immune protection, and defense against ultraviolet radiation from the sun. Deficiencies in the latter function can lead to a range of skin lesions, from benign precursors to overt skin cancer. Prolonged UV exposure causes skin wrinkling, pigmentation changes, and ultimately the onset of skin cancer. Skin that is exposed to UV radiation for extended periods undergoes changes that jeopardize its immune function.

Data and Method

This research is based on the hypothesis that changes in ultraviolet radiation, influenced by environmental variables, lead to the incidence of skin cancer, particularly in high latitudes. The cities of east azerbaijan province are at greater risk due to their geographical location. The aim of this study is to examine changes in solar ultraviolet radiation and its effect on the prevalence of skin cancer in east azerbaijan province over a four-year statistical period. It seeks to answer the following questions: Is there a relationship between changes in solar ultraviolet radiation and the prevalence of skin cancer in east azerbaijan province? What is the geographical distribution of skin cancer and the geographical distribution of ultraviolet radiation in the province? data and information regarding skin cancer were collected from the provincial disease management center located in tabriz over a four-year period. Data on solar ultraviolet radiation were extracted using satellite images. Population data were obtained from the statistical center of iran. Arc GIS software was used for the analysis of satellite images.

Results and Discussion

The significant impact of environmental and geographical factors on the incidence and spread of skin cancer has made the study of this type of cancer a geographical issue, attracting the interest of medical geography researchers to study and understand the crisis centers, prevalence, distribution, and more of affected individuals. The geographical and climatic characteristics of Iran provide a suitable environment for the emergence and spread of skin cancer in many regions, making Iran a potential hotspot for the emergence and expansion of this disease. In Iran, skin cancers alone account for between 2.5% and 32.7% of all cancers. The prevalence of skin cancers has been increasing in recent decades, and since most of these cancers result from repeated exposure to sunlight, climatic changes, including changes in the thickness of the protective ozone layer, along with changes in individual and social habits, can justify this increase. In east azerbaijan province, the incidence of skin cancer varies significantly across



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different counties in different years, with the highest rates observed in tabriz compared to other parts of the province.

Conclusion

The results of this study indicate that the level of ultraviolet radiation in east azerbaijan Province has shown an upward trend over the past decade, with increases noted in 2007 and 2011 compared to other years. It can be concluded that as one moves from the northern part of the province to the south, the level of solar ultraviolet radiation increases, with the highest levels recorded in the cities of Malekan and Bonab at 10.185, and the lowest in the cities of kalibar and khodafarin at 8.82. The average ultraviolet radiation level in tabriz is 9.60, which is comparatively in the mid-range among other cities in the province. The UV analysis in the studied cities of east azerbaijan province indicates that the greatest differences were observed in 2011 (11.4) and 2007 (10.52). Measurements of ultraviolet radiation for Tabriz showed that in 2014, the annual average UV index was 9, which is approximately equal to the long-term average (8.9) for this city, with fluctuations reaching up to 11.4. The UV index (very high radiation) has the highest frequency, necessitating protective measures by the public to avoid associated harm. A comparison of satellite data on solar ultraviolet radiation and ground measurements indicates that satellite figures often show values up to 40% higher.

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