

Research Article

Investigating the geographical distribution of skin cancer (BCC type) in Ardabil province via GIS

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ABSTRACT

Background: Skin cancer is the most common type of cancer in most countries and it holds the first or the second place in terms of frequency in different areas of the country. BCC is the most usual type of tumor in the white skinned people, and its incidence rate rises as individuals get older, especially after age 40. This type of skin cancer mostly occurs in the white skinned people and, in 85% of cases; it develops on the head and neck. This study aimed at examining the geographical distribution of skin cancer (BCC type) in Ardabil province through GIS.

Methods: This cross-sectional study has been done on 131 cases of skin cancer with type BCC in 2007-2014. The required information such as age, sex, occupation, and the locus of BCC, was extracted from the patients' records based on their place of residence. Data analysis was performed using SPSS (version 20). ARC GIS (version 10) was used for drawing geographic maps.

Results: 50.4% of the subjects were men and the mean age of them was 62.8 ± 14.5 years. Of the subjects, 66.4% were from Ardabil city, 80.2% from urban population and 15.3% of the subjects were smokers. Of the patients, 78.5% had developed cancer in their face.

Conclusions: Results showed that for control of cancer, educational interventions should be given priority, and people should be instructed about the use of personal protection equipment, like proper sunscreen cream, hat and sunshade in the workplace, as far as it is possible.

Keywords: Cancer, Geographical distribution, BCC, GIS, Ardabil

INTRODUCTION

Human skin is one of the largest organs in the body. This organ is so extended that in an adult is about 2 square meters. This vast surface area protects internal environment of the body as a shield against damaging chemical, physical agents, or microbes. One of the most important diseases that affect human skin is skin cancer.^{1,2}

Skin cancer is the most common cancer in the majority of countries. Its prevalence has been increasing in the recent

decades and its frequency has the first or second rank indifferent areas of Iran. In the United States, 2 million people are diagnosed with skin cancer and more than 50 thousands of people lose their lives due to this disease. In 2004, the incidence rate of skin cancer was reported 10.13 per hundred thousand people in Iran.³⁻⁵

Non-melanoma skin cancers are squamous cell carcinoma (SCC), and basal cell carcinoma (BCC). The prevalence of melanoma incidence in human is directly related to human's complexion, and geographical area of residence. In both sexes, face is the place where cancer mostly

occur.^{6,7} Epidemiology of all types of skin cancer recognizes ultraviolet radiation, either from the solar supplier or other synthetic source (sun bed), as the main risk factor.^{8,9}

Basal cell carcinoma (BCC) comprises 70-80% of non-melanoma skin cancers, and rarely metastasizes. Other factors associated with increased incidence of skin cancer include male gender, older age, and race, fair skin, being prone to become sunburned and working in the open area. The incidence of these tumors increases with decreasing latitude.^{10,11} A study undertaken in 2013 on the prevalence of skin cancer in the south-west of Iran showed a significant association between the locus of cancer and exposure to sunlight. The mean age of 602 skin cancer cases was 61 years, 424 cases (70.4%) out of this number had BCC. Moreover, the frequency of skin cancer in women held second rank while in the men occupied the first rank.¹²

Valve and colleagues, in their study showed that BCC was the cancer type in 70.4% of patients and the number of patients with BCC was far more in the places where people were more exposed to sunlight.¹³

To date, many studies have been done on the prevalence of skin cancer, its various aspects, its evident changes, and its frequency in many parts of the world. It seems that examining the relationship between geographical distribution and the incidence of skin cancer can be helpful. GIS provides the possibility for epidemiologists and cancer researchers to come up with a particular pattern, in examining the disease, thereby detecting the relationship between cancer and other variables related to health, social, economic and environmental problems.¹⁴

Only scanty number of studies has been conducted on the geographical distribution of skin cancer and other cancers in Iran. And most of studies performed are descriptive studies that report cancer statistics. Taking the fact that knowledge of geographical features and geographical distribution of skin cancer can result in a consistent and more accurate planning for the prevention of it, this study made attempt to assess the geographical distribution of BCC in Ardabil, so that the outcomes may be informing in the prevention of the disease via controlling the possible risk factors, and in its early diagnosis with the purpose of finding an effective cure for it.

METHODS

In this cross-sectional study, the information was collected from the dermatology clinic in Ardabil, and 131 cases of histologically confirmed skin cancer from March 2007 to March 2014 were recorded. All the skin biopsy specimens had been confirmed by pathology experts. The required data such as patient's age, gender, place of residence, and occupation as well as the involved area in cancer were obtained from patients' files. The patients whose addresses were outside the province were

excluded from the study. Ardabil province is located in the northern part of Iran, and its northern, western, southern and eastern neighbors are Azerbaijan country, eastern Azerbaijan province, Annan province, and Galan province, respectively. Ardabil province includes 10 city or towns, and according to statistical center of Iran's Census in 2011, the population of Ardabil province stands at 1,248,488, 45% of which were in Ardabil city. The Data were analyzed using SPSS version 16 and Excel Microsoft software. The ArcGIS version 10 was used to investigate the geographical distribution of the disease.

RESULTS

Of all subjects, 50.4% were male and the rest were female (Figure 1).

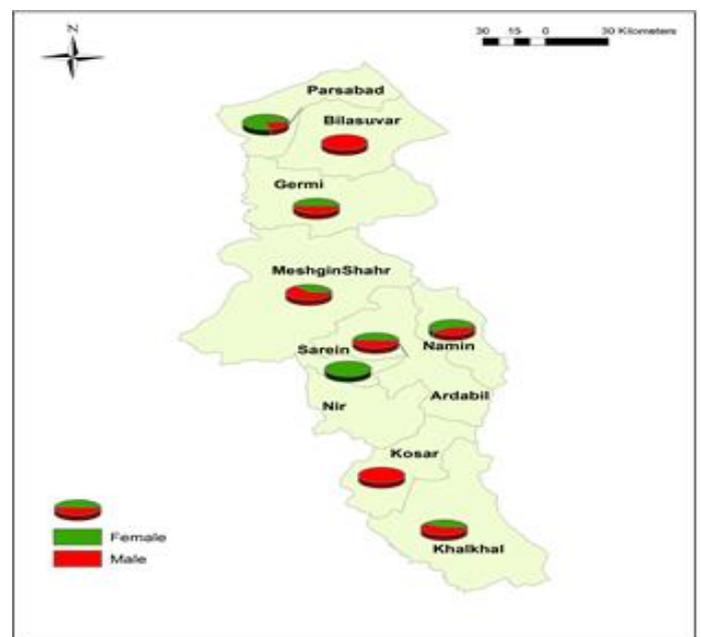


Figure 1: Sex distribution of the sample based on segregation by city.

The minimum age of the patients was 27, and the maximum age was 90. The mean age of the subjects was 62.8 years with the standard deviation of 14.5. Of the subjects, 10.7% were under 40 years, and the rest were above 40 years, and the highest incidence rate of cancer was 78.6% which was seen in the age group of (40-80) (Figure 2).

Most cases were self-employed and 3.8% were unemployed. Most of cases with the frequency of 86 patients (66.4%) were related to the city of Ardabil (Figure 3). 105 subjects (80.2%) were from urban areas and the rest were from rural areas (Figure 4). The highest cancer incidence rate i.e., 103 cases (78.6%) had occurred on the face (Figure 5). Of the patients, 20 people (15.3%) were smokers and the rest were non-smokers. Most of cases diagnosed by biopsy relate to 2013 (24 cases)

(Figure 6). The minimum duration of suffering from cancer was 6 month and the maximum duration was 20 years, with the average duration of 3.6 years.

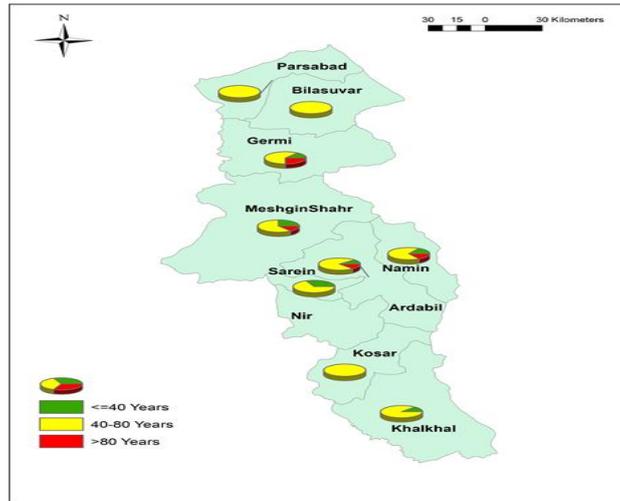


Figure 2: Age distribution of the sample based on segregation by city.

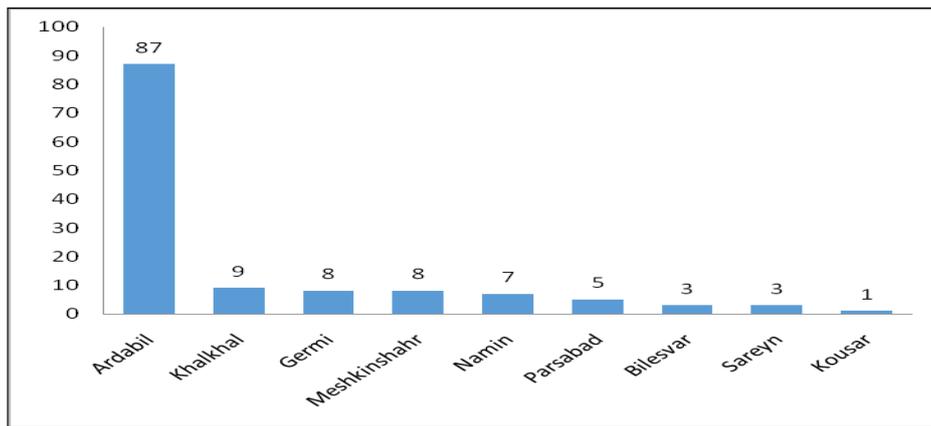


Figure 3: Distribution of frequency of the sample based on segregation by city.

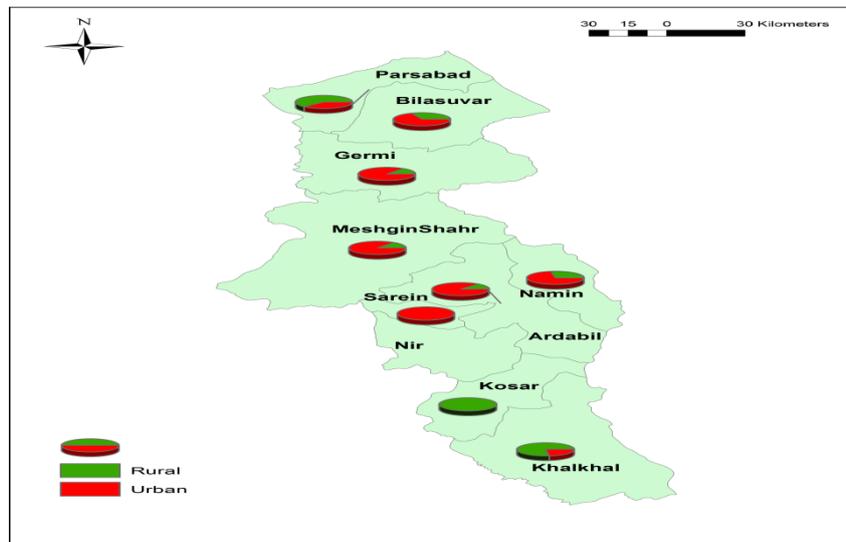


Figure 4: Distribution of frequency of the sample based on segregation by city and place of residence.

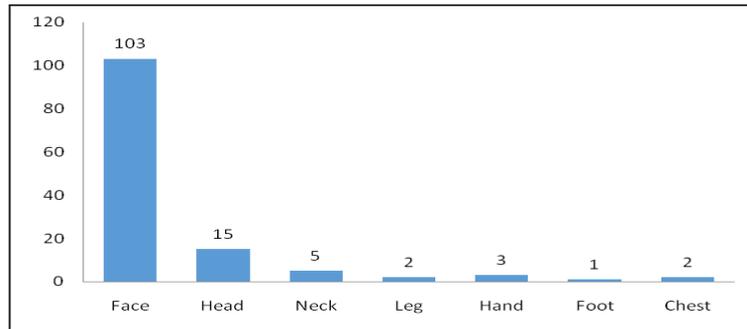


Figure 5: Distribution of frequency of the sample based on segregation by involved area.

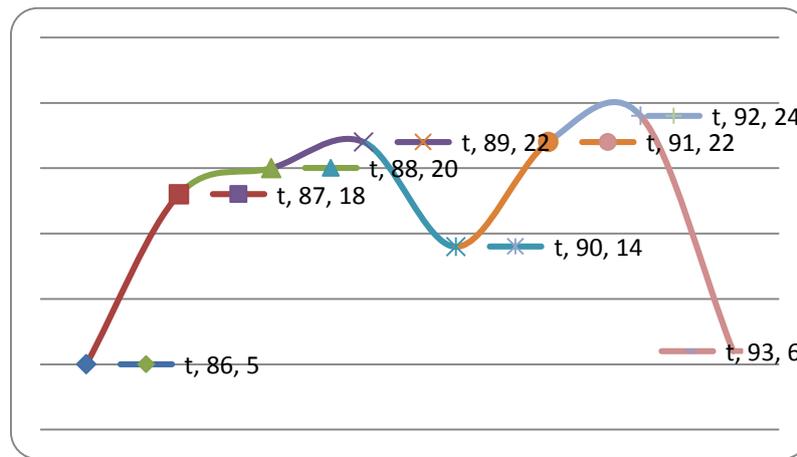


Figure 6: Distribution of frequency of the sample based on segregation by age at the time of being diagnosed via biopsy.

DISCUSSION

In this study, the frequency of skin tumors among 27,000 patients who had visited the dermatology clinic was 0.4%, and the most common pathological type was BCC with 72%. The study undertaken by Noorbalaand colleagues in the city of Yazd in 2007 showed that the most common pathologic type of cancer was BCC with 76.9%, and nose, head and neck were the loci that were highly involved in developing cancer, with total percentage of 92%. They reported that the incidence of skin cancer in Iran is significantly lower than that of western countries which is most probably because of people having different styles in dressing and covering body, being engaged in agriculture, animal husbandry, and not using hat, sunscreen cream, and sunglasses in Ardabil.¹⁵ Other study, undertaken in 2010, showed that among 35 patients admitted to Fatemi hospital in Ardabil, BCC had the highest prevalence (85.7%) and the most common involved locus was nose.¹⁶ In another study conducted in New Mexico in 2003, it was indicated that the incidence of BCC had 50% increase in men, and 20% increase in women.¹⁷

A study in Tehran, run by the Robati et al. in 2014, revealed that 85.2% of the subjects were female and the rest were male. And 1.14% of total sample were diagnosed with skin cancer, of which 66.7% had BCC. They concluded that skin cancer screening is an effective action and suggested that the groups at high risk of skin cancer to be screened for cancer and trained about symptoms of skin cancer.¹⁸ In another study conducted at the University of Essen, Germany, in 1995-99, it was found that the incidence of BCC was 11.2 per 100,000 people in men, with the mean age of 43.7 and 4.4 per 100,000 people in women with the mean age of 31.7.¹⁹ In another study in 2003 in America, non-melanoma tumors had the highest incidence, i.e., of 1.3million cases of skin malignancy, 53,000 people were diagnosed with malignant melanoma which is a dangerous and malignant type of tumor. The findings of this study were consistent with the findings of above mentioned study. The results of the present study showed that the gender of most patients (50.4%) was male, which is compatible to the findings of the study done in Mashhad indicating that skin cancer is more common in men than women.²⁰ In the same vein, the study run in Sweden has supported the higher incidence of BCC in men compared to women.²¹ Therefore the men's higher risk of having cancer can be

attributed to their daily activities in open and sunny environment, or their massive exposure to carcinogens.²²

As well, the Coolins et al. study²³ in the Netherlands, reported 64 years as the average age of patients which were similar to the present study. Regarding the distribution of place of residence, the majority of patients (71%) in this study lived in urban areas of the province which was parallel to Yazdan far's study in Hamadan in which the most of patients (70.8 percent) were living in urban areas.²⁴ During the years under study, the incidence of skin cancer in Ardabil province has been varying, and has been lower than national statistics report which may be ascribed to the environmental factors such as type of occupation, the amount of working hours outside home, dryness and humidity of climate, smoking and using other addictive substances and infectious agents. Incomplete recorded data in some cases, which can be most probably because of some patients visiting other clinics in neighboring provinces, was one of the limitations of the study. The results of this study indicate that skin cancer incidence is higher in women than men and mostly occurs at the older age, there upon screening programs for early diagnosis of the disease in its early stages should be performed, for older men, especially those who due to their jobs receive high exposure to sunlight.

The frequency of BCC, SCC, and malignant melanoma was 0.72%, 22.6%, and 0.54%, respectively. And there was a significant difference between distribution of frequency of different types of skin cancer and the patient's age. It means that the incidence of different types of cancer was greater in the age group of (50-70) compared with other age groups (46.1%), and it had the lowest incidence in the age group under 30 (2.9%). In the present study, from 2007-2015, the highest incidence of BCC was related to the age group of 40-80 and the lowest incidence was seen in the age group under 40. Ardabil city with 66.4% and Kowsar town with 1.6% had the lowest incidence of BCC cases. Other studies' findings on the incidence of skin cancers were consistent with the present study's results. However, in respect of age pattern, in a study conducted in Arak, the age group above 80 was reported with the highest incidence of the cancer and also, in the present study the gender pattern was not consistent with other studies.^{25,26}

CONCLUSION

The incidence of skin tumors is more common in men than women which can be due to men's longer exposure to sunlight. It was found that BCC was the most common non-melanoma cancer. The findings were in concordance with the results of other studies. Considering the impact of risk factors such as age over 40 years, male gender, and excessive exposure to the sun, etc., the use of sunscreen cream, and protective hats, and less exposure to sun light are recommended.

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