

Incidence of skin cancers in Kerman Province, Iran from March 2005 to March 2010: Trend analysis for the next 10 years

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Background: Skin cancers are the most common human cancers. The most common skin cancers are basal cell carcinoma, squamous cell carcinoma and malignant melanoma. Different factors are involved in development of skin cancers; the most notable one is exposure to ultraviolet radiation. In this study, the incidence of skin cancer was determined in Kerman province where is located in the desert region of Iran with ample sunlight, during a 5-year period.

Method: All registered cases of skin cancers between March 2005 and March 2010 were retrieved from the Kerman Province Cancer Registry. For each patient, data about age, gender, location, pathologic type of cancer and site of skin involvement, were obtained. Incidence rates according to the age, sex and the location of the lesions were calculated. Trend analysis was done for the next 10 years.

Result: During these 5 years, 1250 cases of skin cancer were recorded. The incidence in men was 1.2 times higher than women. The highest incidence was seen in individuals older than 80 years of age. Fifty percent of all skin cancers were located on the face. The highest incidence was observed in the city of Kerman with an annual incidence of 12.6 in 100,000. Trend analysis showed that the incidence of skin cancer in Kerman province would reach 23 in 100 000 people in 2019, which is 2.3 times higher than the incidence rate in 2009.

Conclusion: Skin cancer is a public health concern in Kerman province in Iran. Considering the desert climate and the intensity of sunlight in most seasons, it is necessary to plan scientific practical interventions to prevent skin cancer and reduce its incidence.

Keywords: incidence, skin cancer, basal cell carcinoma, squamous cell carcinoma, malignant melanoma

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INTRODUCTION

Skin cancers are among the most prevalent cancers in most countries worldwide, but with the exception of malignant melanoma (MM), they are associated with low morbidity and mortality rates^{1,2}. In the recent years, the incidence of skin cancer has increased in the world³. This increase

can be due to increased exposure to sunlight by working outdoors, not using proper clothing, increased vacationing on beaches, decrease in the thickness of the ozone layer and longer life spans. Although many genetic and environmental factors are related to development of skin cancers, the most important risk factor for skin cancer is exposure to sunlight. Ninety percent of skin cancers occur

in body areas which are exposed to sunlight ⁴.

Most common types of skin cancers are basal cell carcinoma (BCC), squamous cell carcinoma (SCC) and MM ⁵. The most dangerous form of skin cancer is MM, which contributes to 4% of skin cancers in men and 3% of skin cancers in women ^{6,7}. According to the World Health Organization (WHO) report in 2000, more than 13 million people in the world have developed skin cancers and out of this number, more than 200 000 cases were suffered from MM. Skin cancer in this year led to the loss of 765 000 years of human lives due to death or disability and it is predicted that this disease will play an important role in the next decades in the world burden of disease ⁸.

The incidence rate of these cancers increase with increase in sunlight exposure and life expectancy. A review of the literature shows that the incidence is two times higher in men than women. The incidence rate of MM is also increasing in most parts of the world. Its incidence rates rate increases 3% to 7% annually ⁹. Due to the presence of intense sunlight in most seasons in many parts of Iran and the high exposure of farmers, shepherds, sailors and construction workers to sunlight as well as lack of protective equipment use such as adequate clothing and proper hats, high rates of skin cancer are expected ¹⁰. The incidence rate of skin cancer in Iran, according to the report from Nabizadeh et al, is 10.13 in 100 000 population ¹¹.

According to the national cancer report in 2003 in Iran, 15.7% of all registered cancer cases were skin cancers. In 2004, about 15.5% and in 2005, 15.1% of all reported malignancies in Iran were skin cancers ¹².

Kerman province is located between the east geographical longitude of 54°21' and 59° 34' and northern latitude 26° 29' and 31° 58' and has an area of about 133 000 km². It has a hot and dry weather with hot summers and relatively cold winters and limited rainfall. It has an altitude of 1491 m over sea level. According to the last census performed by the Statistical Centre of Iran in 2006, the total population of Kerman province was 2652413 which constitutes 3.76% of Iran's population with a male to female ratio of 104:100 ¹³.

The mean amount of annual solar ultraviolet (UV) radiation in Kerman Province is 7, which is in the high range. The maximum amount of UV radiation in Kerman Province from May to July is

10, which is classified as very high ¹¹. According to the standard classification of UV radiation, the range of 6 to 7 is high, 8-10 is very high and more than 10 is extremely high ¹⁴. Kerman Province has a mainly desert climate and intense solar radiation in most seasons. However, to the best of our knowledge, no study about skin cancer incidence and its trends has been conducted in Kerman. This study was conducted to evaluate the status of the skin cancers from March 2005 to March 2010 in Kerman province, Iran. This evidence may help policymakers to implement initiatives to reduce the incidence of skin cancers.

PATIENTS AND METHODS

This study was conducted from March 2005 to March 2010. The relevant data about skin cancers incidences in Kerman province were inquired from the Kerman Province Cancer Registry from both the vice-chancellery of Health, Kerman University of Medical Sciences and vice-chancellery of Health, Rafsanjan University of Medical Sciences. This study received its ethical clearance from the Ethics in Research Committee, Kerman University of Medical Sciences.

In Kerman Province Cancer Registry, data of cancers are routinely collected from the province's pathology laboratories, imaging centers, hospitals and physician offices. For more conformability, we visited all the pathology laboratories in Kerman and checked their reporting procedures. All of those laboratories had reported their cases to the Province Cancer Registry.

The data were described and analyzed using version 16.2.1 of Minitab software (2010, Minitab Inc. USA). In order to determine the relation between gender, age group and skin cancer, the chi-square test was used. The relation between age and incidence of skin cancer was also evaluated by Spearman's correlation test. The difference of incidence between the body parts was also examined using the chi-square test, Time trend analysis was used for projection of skin cancer until 2019. *P* values less than 0.05 were considered significant.

RESULTS

One thousand two hundred and fifty cases of skin cancers were registered in Kerman Province

from March 2005 to March 2010. Sixty-two percent were BCCs, 25% were SCCs, 6% were MM and 7% were other skin cancers.

The general trend of different types of skin cancer in Kerman province from March 2005 until March 2010 is shown in Figure 1. The annual trend was mainly upwards.

The incidence of skin cancer in Kerman province was 9.3 in 100000 population annually. The incidence was 10 and 8.6 in men and women in 100000 population, respectively. The incidence rates of skin cancers in Kerman province according to the sex of the patients sex are shown in Figure 2. The annual incidence rates in men was always higher than women. The difference was significant in 2005 ($P=0.02$) and 2006 ($P=0.03$).

The most prevalent skin cancer in both men and women was BCC, followed by SCC and MM. Based on age at diagnosis, the maximum number of cancer cases in both genders were in the age range above 80 years which was 150 in 100000

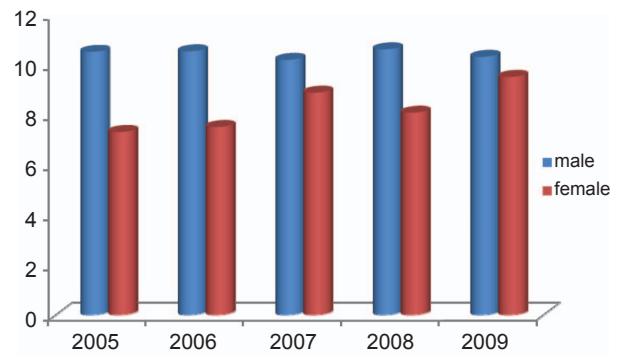


Figure 2. Sex-specific incidence rates of skin cancers in Kerman province (count per 100000 population from March 2005 until March 2010).

population and the minimum incidence rate was in the age group 10-19 which was 0.51 in 100000 population annually (Table 1).

The most prevalent involved body part was the face with an annual incidence of 4.6 in 100000. The highest incidence rate in Kerman province was 12.6 in 100000 population, which was observed

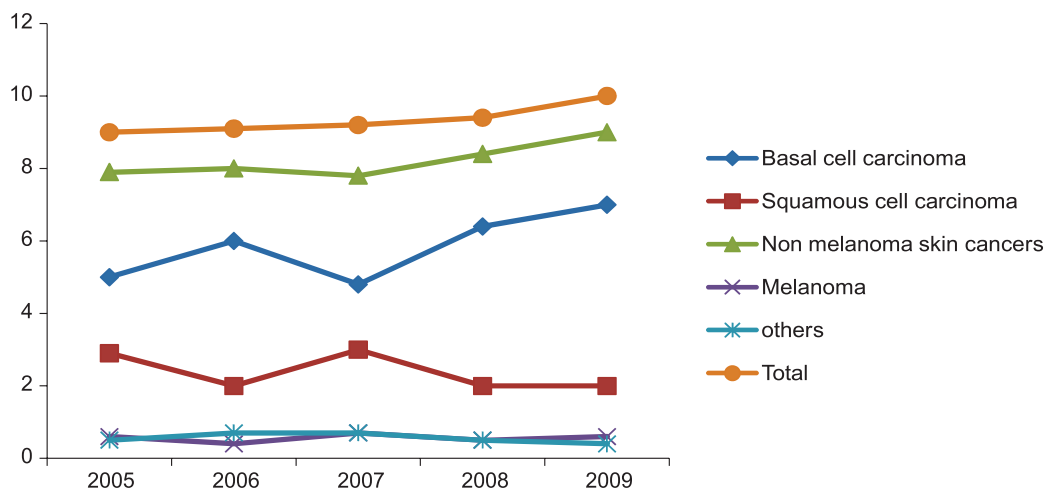


Figure 1. The trend of different skin cancers in Kerman. (count per 100000 population from March 2005 until March 2010)

Table 1. Age-specific incidence rates of different skin cancers in Kerman province. (count per 100,000 population from March 2005 until March 2010)

| Age (years) | Cancer type | | | | | |
|-------------|----------------------|-------------------------|---------------------------|----------|--------|-------|
| | Basal Cell Carcinoma | Squamous Cell Carcinoma | Non melanoma skin cancers | Melanoma | Others | Total |
| <10 | 0.19 | 0.3 | 0.49 | 0.14 | 0.09 | 0.72 |
| 19-10 | 0.24 | 0.14 | 0.38 | 0.035 | 0.1 | 0.51 |
| 29-20 | 0.3 | 0.4 | 0.7 | 0 | 0.3 | 1 |
| 39-30 | 1.6 | 0.8 | 2.4 | 0.5 | 0.4 | 3.3 |
| 49-40 | 6 | 2.3 | 3.2 | 0.3 | 0.7 | 9.3 |
| 59-50 | 18.4 | 5.8 | 24.2 | 1.6 | 1.2 | 27 |
| 69-60 | 35 | 14.6 | 49.6 | 3.5 | 3.4 | 56.5 |
| 79-70 | 52 | 22.5 | 74.5 | 4 | 3.5 | 82 |
| >80 | 100 | 27.6 | 127.6 | 11 | 11.4 | 150 |

in the city of Kerman. The lowest incidence was observed in Manoojan with an annual rate of 0.35 in 100000 population. There was a significant statistical association between male sex and a higher incidence of development of skin cancer ($P=0.01$). The relation between age and incidence of skin cancers showed a significant correlation between increasing age and the incidence of skin cancer. ($r=0.964$, $P<0.001$)

The difference of incidences on different body parts was also significant ($P<0.001$). The incidence was higher in exposed body parts in comparison to the non-exposed body parts.

Based on the skin cancer incidence data from March 2005 to March 2009 and by using time trend analysis, different statistical models including the linear trend model, the quadratic trend model, the S-Curve trend model and the Growth Curve Model were examined. The best model was determined according to the least sum of residual squares. The best model was the quadratic trend model (Figure 3). According to this model, the incidence of skin cancer in Kerman Province would increase and probably reach 23 in 100 000 population in 2019, which would be 2.3 times higher than its incidence rate in 2009.

DISCUSSION

Several studies have investigated the rate of skin cancer in different parts of the world. Most of these studies have shown that skin cancer accounts for 25% to 35% of all cancers^{1,10,15}. In the United States, 400 000 cases of skin cancer are registered annually, which are about 30% of all registered cancers. The incidence of skin cancers in the US is 300 cases per 100 000 persons^{16,17}. The incidence rate of skin cancer in the UK is about 100 cases in 100 000 persons and the highest rate is seen in Australia with about 800 cases in every 100 000 persons^{10,15,18}. In Iran, according to the published studies, the rate of skin cancer is 10.13 cases in 100 000 persons per year¹¹, which is much less.

In the current study, the average annual incidence rate of skin cancer in Kerman province was 9.3 per 100 000 population which is lower than the national average. The higher incidence rates of skin cancers, which have been reported from the US, Australia and European countries can be due to factors such as genetics, lighter skin phototypes, clothing and longer life expectancy^{19,20}. In Iran, religious clothing can be a protective factor; however, by increase in life expectancy in Iran, we

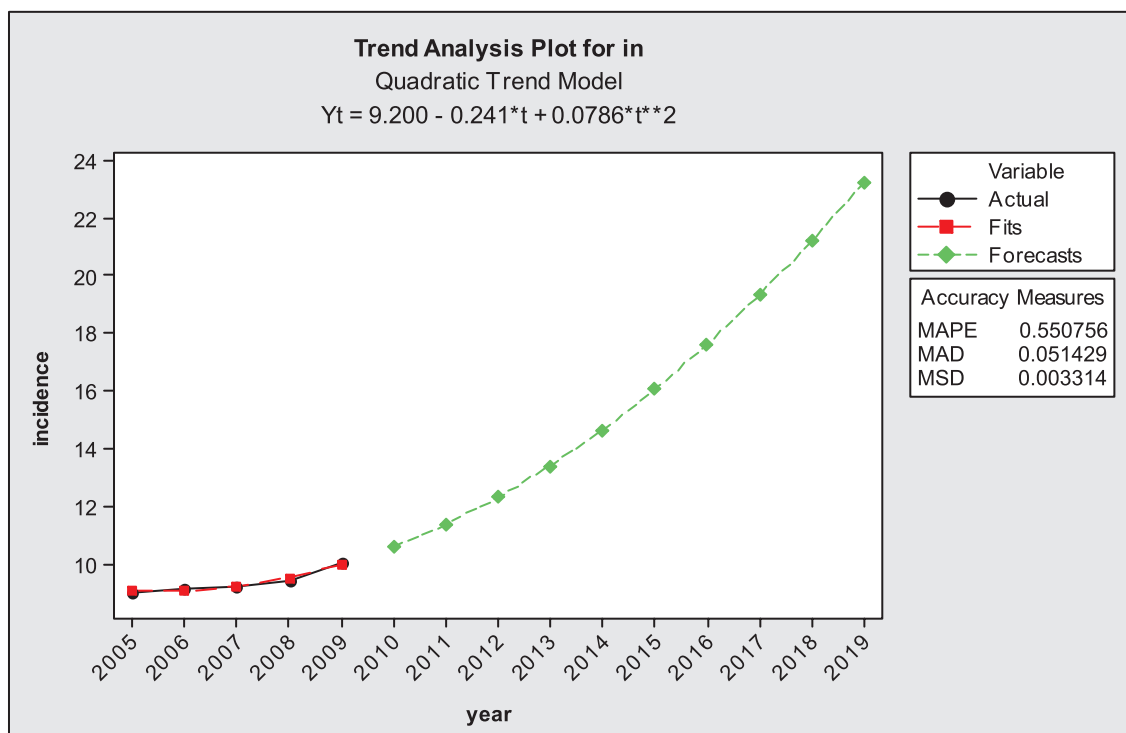


Figure 3. Overall predictions of incidence rates of skin cancer in Kerman Province (count per 100,000) until 2019.

expect that the incidence of this cancer increase as well. Therefore, education about preventive measures seems necessary.

In a study by Asilian et al, the proportions of skin cancers to all other cancers were 27.5% in Isfahan province, 39% in Chaharmahal and Bakhtiari province and 32% in Yazd province. The higher rate of skin cancer in Chaharmahal and Bakhtiari province was probably due to its mountainous region, heavy snow falls, lighter skin color of the residents and their farming activities which exposes them to more sunlight ²⁰.

In the present study, BCC had the highest incidence among skin cancers. Studies done in Australia and the US are also compatible with these findings. In the US, 75% of all skin cancers and in Australia 79% of all skin cancers have been BCC ^{1,13,15}. In a study performed in Yazd, 77% of all skin cancers were BCC ¹⁰.

After BCC, SCC and MM are the most prevalent skin cancers ^{21,22}. Similar to other studies, the incidence rate of non-melanoma skin cancer (NMSC) was 1.5 times higher in men than in women. It is caused by men's more sun exposure because of working outdoors ^{1,10,17,23}. Although, the incidence of MM is higher in women than men in most countries ¹⁰. In the present study, MM incidence rate was 1.2 times higher in men in comparison to women. The higher rate of MM in the current study may be due to less clothing of men compared to women in Islamic societies and more exposure to solar UV in men due to spending more hours outdoors. In the study which was conducted in Yazd Province in 2007, the incidence rate of MM was 1.5 times higher in men than women ¹⁰.

Skin cancers usually occur in the sixth and seventh decade of life or later ^{1,17,21}. In this study, most of the reported cancer cases were in their sixth decade of life or older as well. MM is often seen at lower ages but in this study, the majority of MM cases were observed after their seventh decade. Skin cancer is usually seen on body parts, which are not covered and are exposed to sunlight especially the face, head and neck ^{1,17,19,21}. In this study, most of the cases of reported skin cancers are located on the face, head, neck as well which shows the essential role of sunlight in the development of skin cancer. Similarly, in the study in Yazd province, more than 90% of the skin cancers were located on in the face, head and neck ¹⁰.

This study used the data from two cancer registries of the province. There is a possibility that some cases were not registered and therefore the calculations reflected an underestimation. However, this is the problem that cancer registries encounter all over the world. One reason for this is patients visiting physicians in other provinces.

In Iran, all pathology laboratories are required by law to report their cancer cases to the provincial cancer registries. The Kerman cancer registry also receives data from hospitals, imaging centers and physician offices. The Kerman Province Cancer Registry was one of the first 3 population based cancer registries in Iran.

In the present study, Manoojan had the lowest incidence in the province. However this finding may be due to the fact that Manoojan is an impoverished town in the south of Kerman. There is a possibility that people ignore their skin lesions and/or do not visit dermatologists in small towns. Also, most of the medical work in small towns is conducted by general physicians and suspicious cases are referred to bigger cities including the capital city of the province (Kerman) for diagnosis.

Also, slight ups and downs in cancer incidence (Figure 1) are quite common in disease registration data, and are probably due to variations in cancer registration and diagnosis, not a specific disease causing reason.

Most regions in Iran, especially provinces such as Kerman, are located in the hot desert region where ample sunlight is present most of the year. Therefore, it is necessary to educate people, especially men and those such as farmers and workers who work outdoors in the sunlight, about the hazards of sunlight.

People should be educated to expose themselves less to sunlight especially between 10 am to 4 pm, when UV radiation is the highest. In case they have to stay outdoors during this time, they can protect their skin from sunlight by wearing light colored, long sleeved, and collared clothing, hats, sunglasses and gloves. Another way for protecting skin from solar UV is using sunscreen products. It is recommended to use these products every day before leaving home, on all exposed skin surfaces. The scale for measuring these products protection is sun protection factor (SPF). The least necessary SPF needed is 15. However, many dermatologist advise that sunscreens with a SPF less than 30

should not be used and the product should be reapplied every 20 to 30 minutes if there are long hours of exposures ²⁴.

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