

## Original Article

# The Incidence of Malignant Melanoma in Two Different Cultural Settings and the Probable Role of Clothing in Melanoma Prevention

Leila Dehghani<sup>1</sup>, Narges Khanjani\*<sup>1</sup>, Abbas Bahrampoor<sup>2</sup>.

<sup>1</sup> Department of Epidemiology and Biostatistics, School of Public Health, Kerman Medical University, Kerman, Iran

<sup>2</sup> Departments of Epidemiology and Biostatistics, School of Public Health, Kerman Medical University, Kerman, Iran.

---

**Received:** 12/10/2013

**Accepted:** 3/2/2014

---

### Abstract

**Introduction:** Malignant melanoma is a fatal cutaneous neoplasm and one of the fastest growing cancers worldwide. The objective of this study is to evaluate the prevalence of melanoma in different cultural settings and the probable role of clothing in prevention.

**Materials and Methods:** In this cross-sectional study, data about diagnosed melanoma patients (i.e. age, pathology, sex, location, and site of skin involvement) were collected from the Kerman and Rafsanjan Cancer Registries from 2005 to 2009. Similar data related to melanoma incidence in Victoria, Australia were obtained from the Victorian Cancer Council, Melbourne. Incidence by age, sex and site of skin was calculated in both Kerman Province and Victoria State. Then the incidence differences for exposed and unexposed limbs were calculated and compared.

**Results:** Melanoma incidence in Kerman was 5.7 in one million annually. Incidence in men was higher than women. The highest incidence was seen in 70-79 years of age. Most cases of melanoma (30%) were localized in the face. Incidence in Victoria State was 431.9 in one million annually. The incidence in men was higher than women. The highest incidence was seen in people of above 80 years of age. Most of the cases (30.1%) of melanoma were seen in the trunk and then arm with 22.1%. The incidence difference between the two nations was significant except for the hands and male's feet.

**Conclusion:** The present study suggests that clothing is possibly preventing about 25.7, 37.4 and 72.6 cases of melanoma respectively in the trunk, arm and leg in 1,000,000 people annually in Iran.

**Keywords:** Melanoma, Incidence, Kerman, Victoria, Clothing.

---

\* **Corresponding Author;** Tel/Fax: +98-341-3205102 , Email: n\_khanjani@kmu.ac.ir

## Introduction

Skin cancer is an important growing public health problem, causing a heavy burden on worldwide health<sup>[1]</sup>. This cancer includes basal cell carcinoma, squamous cell carcinoma and melanoma<sup>[2, 3]</sup>. Throughout the world, the incidence of melanoma has been increasing steadily over the past few decades<sup>[1]</sup>. Malignant melanoma is one of the fatal cutaneous neoplasms<sup>[4]</sup> and one of the fastest growing skin cancers worldwide<sup>[5]</sup>. During the past several decades, there has been a significant increase in the incidence of melanoma among all populations. The annual increase in the incidence rate varies between populations, but in general has been about 3 to 7% per year<sup>[6]</sup>. The estimates suggest a doubling of melanoma incidence every 10-20 years<sup>[7]</sup>. In Australia, melanoma is the fourth most common cancer among males after prostate cancer, bowel cancer and lung cancer and the third most common cancer among females after breast cancer and bowel cancer<sup>[8]</sup>.

The number of deaths due to malignant melanoma has also increased in most fair-skinned populations throughout the world in the past few decades. The role of different environmental, hereditary and host factors in the etiology of melanoma is controversial<sup>[9]</sup>.

Epidemiological studies have shown that the major environmental etiological factor in malignant melanoma is sunlight exposure<sup>[10]</sup>. Ultraviolet (UV) radiation affects human organs such as the skin, eyes and immune

system. UV radiation can damage DNA and thus mutagenize several genes involved in the development of the skin cancer. This role of sunlight in the development of skin cancer has been recognized as early as 1894. The main natural source of UV radiation is the sun<sup>[11, 2, 3]</sup>.

Although different patterns of sun exposure are associated with different levels of risk for melanoma among individuals, it seems that intermittent intense sun exposure is more important than total lifetime exposure<sup>[12]</sup>. Rates of skin cancer have increased parallel with increasing exposure to sunlight in recent years<sup>[13]</sup>.

Melanoma is preventable by limiting ultraviolet radiation exposure and enhancing UV protection behaviors<sup>[14, 15]</sup>. The currently recommended sun protection regimen includes wearing protective long-sleeved clothing, avoiding midday sun, and regular use of broad spectrum, high sun protection factor (15 or higher) sunscreens<sup>[16]</sup>.

In this study, in order to evaluate the role of culture on skin cancer, through imposing different types of clothing, and the incidence of melanoma by body site was compared between the State of Victoria, Australia (a representative of western culture) and the Kerman Province in central Iran with a warm and sunny desert climate (a representative of Islamic culture).

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 km<sup>2</sup>. It has a hot and dry weather with hot summers and relatively cold winter seasons 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 2,652,413, which covers 3.76% of Iran's population with a male to female ratio of 104:100 [17]. Victoria is a state in the south-east of Australia and geographically the smallest mainland state. Victoria is Australia's most densely populated state, and has a highly centralized population. The 2006 Australian census reported that Victoria had 4,932,422 people resident at the time of the census [18]

### Materials and Methods

This study is an ecological study based on population data from two different countries. All registered data was used.

For each patient in Kerman province, data related to age, topography, sex, location, and site of skin involvement, were obtained from the Kerman and Rafsanjan Cancer Registries from the beginning of 2005 to the end of 2009. The Kerman Cancer Registry is based at the Deputy of Health at Kerman University of Medical Sciences and The Rafsanjan Cancer Registry is based at the Deputy of Health at

Rafsanjan University of Medical Sciences. These two registries have recorded all incident cancer cases in Kerman Province during this time. Based on the law approved on Oct 9, 1984 by the Islamic Consultative Assembly (Parliament) of Iran, all physicians and medical institutes, governmental or nongovernmental, are obliged to test every tissue and sample taken from a living body under any goal and report cases of cancer to the local provincial cancer registry. The only exclusion criterion was imported cases not residing in Kerman province.

Data related to melanoma in Victoria, Australia were obtained from Victorian Cancer Council after official communication. In Victoria, only melanoma cases were recorded and we were not able to compare the rates of other non-melanoma cancers with similar rates in Kerman.

Then incidence of melanoma by age, sex and site of skin was calculated in both Kerman province and Victoria State. Afterwards, site-specific incidence rate differences were calculated for different limbs. Then, the incidence rate differences in exposed and unexposed limbs was also calculated and compared by chi-square test. The Spearman's correlation test was used to determine the effect of age on melanoma incidence in Kerman province and the State of Victoria. The data were analyzed using Minitab Software 16.2.1 (2010, Minitab Inc. USA).

## Results

Seventy six cases of malignant melanoma were recorded over 5 years in Kerman province, among which 42 cases (55%) were male and 34 cases (45%) were female.

The incidence was 5.9 in 1,000,000 in men and 5.4 in 1,000,000 in women. The highest incidence was seen in 70-79 years of age (67 in 1,000,000). Most cases of melanoma (30%) were localized in the face. The total incidence in Kerman was an annual incidence of 5.7 in 1,000,000.

In Victoria State, 11,297 cases of malignant melanoma were recorded over these 5 years, among which 6227 cases (55.1%) were male and 5070 cases (44.9%) were female. Incidence in men was 480.76 in 1,000,000 and women 383.66 in 1,000,000.

The highest incidence was seen in people of above 80 years of age (1599.27 in 1,000,000). Most cases of melanoma were seen in the trunk (30.1%) and then arm (22.1%). The total annual incidence in Victoria State was 431.86 in 1,000,000.

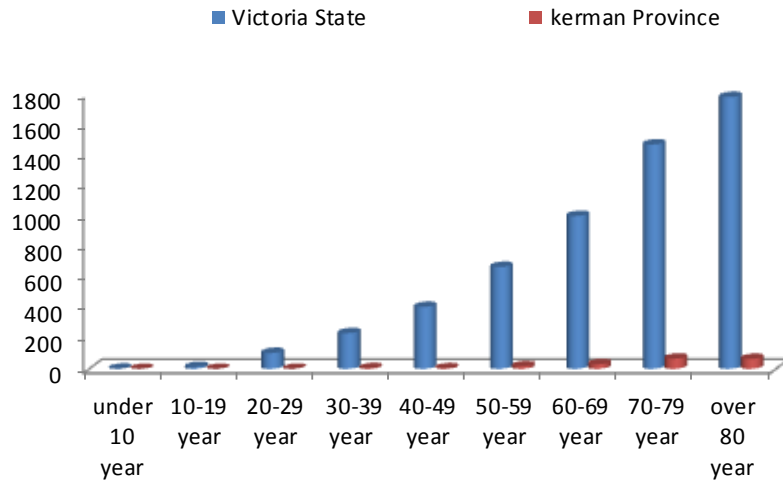
Data on the incident of melanoma by age group in Kerman province, and Victoria Australia are separately shown and compared

in Fig 1. Although, the melanoma incidence in Victoria is higher than Kerman province, incidence rates in both Kerman province and Victoria state were higher in males and varied throughout the study period from 2005 to 2009 (Fig 2).

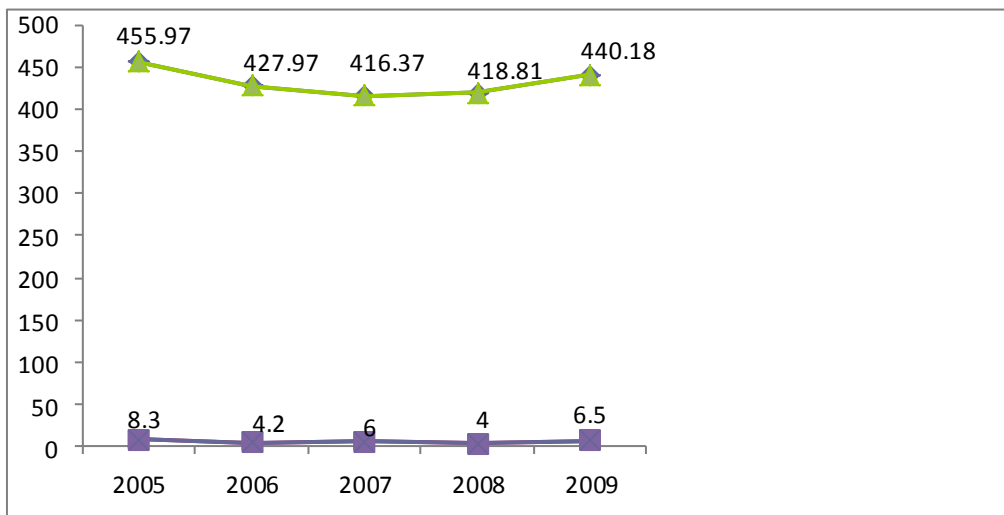
By use of Spearman Correlation, we evaluated the effect of age on melanoma incidence in Kerman province and the State of Victoria. The results show that there is a significant positive correlation between age and melanoma incidence both in Kerman ( $r=0.85$ ,  $p\text{-value}=0.001$ ) and Victoria ( $r=0.96$ ,  $p\text{-value}<0.001$ ).

We analyzed melanoma incidence for different body parts separately in Kerman Province and Victoria, and except for the hand, there was significant difference for all other body parts, considering that Victorians were acquiring more melanoma (Table 1). The incidence difference varied from 2.77 to 129.66 cases per one million annually in different body parts.

We also made the same comparison separately for men and women, and for all body parts there was a significant difference except for males' hand and feet (Table 2).



**Figure. 1:** Comparison incidence of melanoma by age group between Kerman Province and Victoria State during 2005 to 2009.



**Figure 2:** Incidence trend of Melanoma in Kerman Province and Victoria State (cases per million) during 2005 to 2009.

**Table 1:** Comparison of melanoma incidence rate by limb between Kerman Province and the State of Victoria during 2005 to 2009 (cases per 1,000,000 annually).

Tumor Site	Head & Neck	Face	Trunk	Hand	Arm	Foot	Leg
<b>Victoria State</b>	31.18	58.89	129.74	3.47	95.42	8.25	83.61
<b>Kerman Province</b>	0.36	1.80	0.08	0.70	0.90	1.10	0.80
<b>Incidence difference</b>	30.82	57.09	129.66	2.77	94.52	7.15	82.81
<b>p-value of comparison</b>	<0.001	<0.001	<0.001	0.18	<0.001	0.02	<0.001

**Table 2:** Comparison of melanoma incidence rate by limb and sex between Kerman Province and the State of Victoria during 2005 to 2009 (cases per 1,000,000 annually).

	Leg		Foot		Arm		Hand		Trunk		Face		Head & Neck	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F
<b>Victoria State</b>	52.7	113.9	5.9	10.4	88.4	102.6	2.4	4.4	184.7	75.7	71.7	46.2	47.1	15.5
<b>Kerman Province</b>	0.8	0.2	1.8	1.2	1.2	1	1.4	0.8	0.2	0	2	1.6	0.8	0.04
<b>Incidence difference</b>	51.9	113.71	4.1	9.3	87.2	101.6	1.0	3.6	184.59	75.7	69.7	44.6	46.3	15.1
<b>P value</b>	<0.001	<0.001	0.16	0.04	<0.001	<0.001	0.5	0.1	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

## Discussion

In this study, we compared the incidence of cutaneous melanoma in Kerman province and the State of Victoria during the years 2005 to 2009 by age, sex, and body parts.

In the present study, in both countries, the incidence of malignant melanoma was higher in men than women. This result has also been confirmed by other studies<sup>[19,20,21]</sup>.

In the present study, it was shown that with increasing age, the incidence rate increases in both Kerman province and Victoria, which is rational in regard to increased lifetime UV exposure. These results are similar to other studies, which confirm that as age increases, skin cancer incidence increases as well<sup>[21, 22, 25]</sup>.

In our study, similarly sun-exposed body parts in both cultures such as hands had a relatively similar, non-significant difference in incidence rate. The fact that body parts' more exposure to sunlight acquires more melanoma has also been confirmed in other studies<sup>[22, 23,</sup>

<sup>24, 25, 26]</sup>. Lesage et al found that men's head and neck melanoma (HNM) mainly occurred in the peripheral area (i.e. scalp, forehead, temples, ears, and neck) and women's mainly occurred in the central area and this difference was significant. Moreover, HNMs located in the peripheral area occurred significantly more on the left side in men and on the right side in women. The authors hypothesized that this different distribution of melanoma between men and women could be explained by the role of long-term photoprotection by hair and sun exposure in cars<sup>[19]</sup>.

The dressing code in Iran as an Islamic nation requires all women from the age of 9, to cover their head (hair), neck, trunk, arms, forearms, thighs and legs. This leaves only their face, hands and feet exposed. Exposing the feet and hands is not forbidden, but many women are also accustomed to wearing socks and long dresses or pants, which cover their feet as well.

The usual dressing for Iranian men is also relatively different from Westerners. Wearing sleeveless shirts and short pants in public is not prohibited but is unusual for Iranian men. Also, men expose their hand and feet much more than women, and this could probably explain the insignificant difference between men's melanoma incidence in the hands and feet between the two nations.

According to the results of this study, the incidence in men was higher than women in both nations. The reason can be more outdoor work for men. Men are more exposed to solar UV <sup>[26]</sup>, and probably less accustomed to using sunscreens and therefore, are at increased risk of the adverse consequences associated with UV exposure and skin cancer. This study, like any other ecological study, had the limitation of not using individual data and not being able to adjust for individual variables. Some variables are different between the two populations such as the intensity of UV exposure between the two nations and different skin colors. Iran has a much more homogenous population in this regard, although Australia enjoys a diverse range of ethnic groups from all over the world. Epidemiological studies have shown that exposure to sunlight is the

major environmental risk factor for the development of melanoma especially in individuals with fair-skin <sup>[27]</sup>. However, the strength is that the intensity of these factors can show itself in the incidence difference in exposed body parts such as face, hands and feet, which are uncovered in both populations, and as our results show, the difference between these parts was insignificant. Based on these results in Table 2 and by subtracting the incidence difference of the face (which has the highest exposure among exposed parts), we guess that clothing is possibly causing a risk difference of about 25.72, 37.43 and 72.57 cases of melanoma (respectively in the trunk, arm and leg) in 1,000,000 people annually between the two nations and due to more clothing in Iranian culture are acquiring much less melanoma in unexposed body parts. These results are in line with studies that believe clothing is an important preventive factor for skin cancers including melanoma <sup>[28, 29, 30]</sup>.

### Acknowledgements

The authors wish to thank the Cancer Council Victoria, Dr. Varzandeh from The Kerman Province Cancer Registry and Dr. Reiahi from the Rafsanjan Cancer Registry, who provided the data for this study.

### References

1. Edevries L.V, Vandepoll-Franse W.J, Louwman F.R, et al. Predictions of skin cancer incidence in the Netherlands up to 2015. *British J Dermatol*. 2005;152(3):481–8.
2. Mahmoud R. Ultraviolet radiation and skin cancer molecular mechanisms. *J Cutan Pathol* .2005; 32(3):191–205.
3. Luther U, Dichmann S, Schlobe A, et al. UV light and skin cancer. *Med Monatsschr Pharm*.2000;23(8):261-6.

4. Safaii Naraghi Z, Bahadori M, Ehsani A.H, et al. Evaluation of primary cutaneous malignant melanoma according to Breslow and Clarke pathological indices. *Tehran Univ Med J* .2006; 64(5):79-86.
5. Eleni Linos, Susan M, Myles G, et al. Increasing Burden of Melanoma in the United States. *J Invest.* 2009;129(7): 1666–74.
6. Mahler V, Diepgen TL. The epidemiology of skin cancer. *Br J Dermatol.* 2002; 146 (61):1–6.
7. Garbe C, McLeod GR, Buettner PG. Time trends of cutaneous melanoma in Australia and Central Europe. *Cancer* .2000; 89(6):1269-78.
8. AIHW. Australian Health Trends 2001. Canberra: Australian Institute of Health and Welfare, 2001.
9. Lens MB, Dawes M. Global perspectives of contemporary epidemiological trends of cutaneous malignant melanoma. *British J Dermatol.* 2004; 150(2):179–85.
10. Marks R. Epidemiology of melanoma. *Clin Exp Dermatol* . 2000; 25(6):459-63.
11. Tavakoli M.B , Shahi Z. Solar ultraviolet radiation on the ground level of Isfahan. *Iran. J. Radiat. Res* .2007; 5 (2):101-4.
12. Berwick M. Patterns of sun exposure which are causal for melanoma.In: *Melanoma. Critical Debates* (Newton Bishop JA, GoreM, eds). Oxford: Blackwell Science, 2002; 3–15.
13. Diffey BL. A quantitative estimate of melanoma mortality from ultraviolet absorbed use in the UK. *Br J Dermatol.* 2003;149(3):578-81.
14. Glanz K, Mayer JA. Reducing ultraviolet radiation exposure to prevent skin cancer methodology and measurement. *Am J Prev Med.* 2005; 29(2):131–42.
15. Rigel DS. The effect of sunscreen on melanoma risk. *Dermatology Clin.* 2002; 20(4): 601–6.
16. UV Awareness. 2012, Available at :<http://www.uvawareness.com/uv-index/uv-forecasts.php>. Accessed May 16, 2012
17. Statistical Center of Iran (2007). *Iran Statistic Yearbook, 2007*. Tehran: Statistics Center of Iran.
18. Victoria (Australia). Available at <http://en.wikipedia.org/wiki/Victoria> Accessed Nov 18, 2012.
19. Lesage C, Barbe C, Clainche A L, et al. Sex-Related Location of Head and Neck Melanoma Strongly Argues for a Major Role of Sun Exposure in Cars and Photo protection by Hair. *J Investigative Dermatol.* 2013; 133(5):1205–11.
20. Clark LN, Shin DB, Troxel AB. Association between the anatomic distribution of melanoma and sex. *J Am Acad Demerol.* 2007; 56(5):768–73.
21. Elwood JM , Gallagher RP. body site distribution of coetaneous malignant melanoma in relationship to patterns of sun exposure exposure. *Int. J. Cancer.*1988; 78(3), 276-80.
22. Mackie R.M, Quinin A.G. Non-melanoma skin cancer and other epidermal skin tumors. In: Burns T BS, Cox N, Griffiths C, (editors). *Rook' s textbook of dermatology.* 7 ed. Oxford. Blackwell Science Publication,2004.p.50.
23. Geller A.C, Zhang Z, Sober A.J, et al. The first 15 years of the American Academy of Dermatology skin cancer screening programs:1985-1999.*J Am Acad Dermatol.* 2003;48(1):34-41.
24. Corona P, Dayliotti E, D'Errico M, et al. Risk factors for basal cell carcinoma in a Mediterranean population: role of recreational sun exposure early in life. *Arch Dermatol.* 2001;137(2):1162-68.
25. Guibert P, Mollat F, Ligen M, et al. Melanoma screening: report of a survey in occupational medicine. *Arch Dermatol.* 2000; 136(2): 199-202.



26. Protecting Workers from Ultraviolet Radiation. Editors: Paolo V, Maila H, Bruce E, Stuck ED, Shengli N. International Commission on Non-Ionizing Radiation Protection; In Collaboration with International Labour Organization, World Health Organization.
27. Marks R. Epidemiology of melanoma. *Clin Exp Dermatol*. 2000; 25(6); 459-63.
28. Konstantinos L, Sabine K, Despina I, et al. Epidemiological differences for cutaneous melanoma in a relatively dark-skinned Caucasian population with chronic sun exposure. *European J Cancer* . 2004; 40(16):2502-7.
29. Amoozgar M.H, Yazdanpanah MJ, Ebrahimirad M. Frequency of the skin cancers in Ghaem hospital in Mashhad during 1975-1995. *Iranian J Dermatol*. 2006;9(1):28-34. [Persian].
30. Noorbala M.T. evaluation of the skin cancers in Yazd. *Iranian J Dermatol*. 2007; 10(1):9-13. [Persian].