Original Article

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

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Received: 12/10/2013 Accepted: 2/25/2014

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 investigate the probable role of clothing for the prevention.

Materials and Methods: In this cross-sectional study, data were obtained from the Kerman and Rafsanjan Cancer Registries from 2005 to 2009 on age, pathology, sex, location, and site of skin involvement of diagnosed melanoma patients in Kerman Province, Iran. Similar data related to melanoma incidence in Victoria, Australia were obtained from the Victorian Cancer Council, Melbourne. Incidence was calculated by age, sex and site of skin 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 million per year. Incidence in men was higher than women. The highest incidence was observed at 70-79 years of age. Most cases of melanoma (30%) were localized in the face.

Incidence in Victoria State was 431.9 in million per year. The incidence in men was more than women. The highest incidence was observed at above 80 years of age.

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

Keywords: Melanoma, Incidence, Kerman, Victoria, Clothing

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Introduction

Skin cancer is an important growing public health problem, causing a heavy burden on the worldwide health [1]. This cancer includes basal cell carcinoma, squamous cell carcinoma and melanoma [2, 3]. Throughout most of the world, the incidence of melanoma has increased steadily over the past few decades [1]. Malignant melanoma is one of the fatal coetaneous neoplasm [4] and one of the fastest growing skin cancers worldwide [5]. 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 [6]. The estimates suggest a doubling of melanoma incidence every 10-20 years [7]. 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 [8].

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 [9].

Epidemiological studies have shown that the major environmental etiological factor in malignant melanoma is sunlight exposure [10]. Ultraviolet (UV) radiation affects the human organs such as skin, eyes and the immune system. UV radiation can damage DNA and thus mutagenize several genes involved in the development of skin cancer. This role of sunlight in the development of skin cancer has been recognized as early as in 1894. The main natural source of UV radiation is the sun [11, 2 , 3].

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 [12]. Rates of skin cancer have increased parallel with the increasing exposure to sun light in recent years [13].

Melanoma is preventable by limiting ultraviolet radiation exposure and enhancing UV protection behaviors [14, 15]. 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 [16].

In this study in order to evaluate the role that culture may have on skin cancer through imposing different types of clothing, 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).

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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^2.

It has hot and dry climate 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 center of Iran in 2006, the total population of Kerman province was 2,652,413 which constitute 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 it is 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 residents 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 from the beginning of 2005 until the end of 2009 on age, topography, sex, location, and site of skin involvement, were obtained from the Kerman and Rafsanjan Cancer Registry. The only exclusion criterion was imported cases not residing in Kerman province.

The Kerman Cancer Registry is based in the Deputy of Health at Kerman University of Medical Sciences and The Rafsanjan Cancer Registry is based on 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 a law passed 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.

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 their rates in Kerman.

Then incidence of melanoma was calculated by age, sex and site of skin 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 version 16.2.1 of Minitab Software (2010, Minitab Inc. USA**).**

Then the incidence rate differences in exposed and unexposed limbs were also calculated and compared.

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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 men and 5.4 in 1,000,000 women. The highest incidence was observed 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 observed at above 80 years of age (1780.54 in 1,000,000). Most of the 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, the incidence rates in both Kerman province and Victoria state were higher in males and have varied throughout the study period from 2005 to 2009 (Figure 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-value=0.001) and Victoria ($r=0.96$, p-value<0.001).

We analyzed melanoma incidence for different body parts separately in Kerman Province and Victoria, and with the exception of the hand, there were significant differences between all other body parts and 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 performed this comparison separately for men and women, again for all body parts there was a significant difference with the exception of the hand and male's feet (Table 2).

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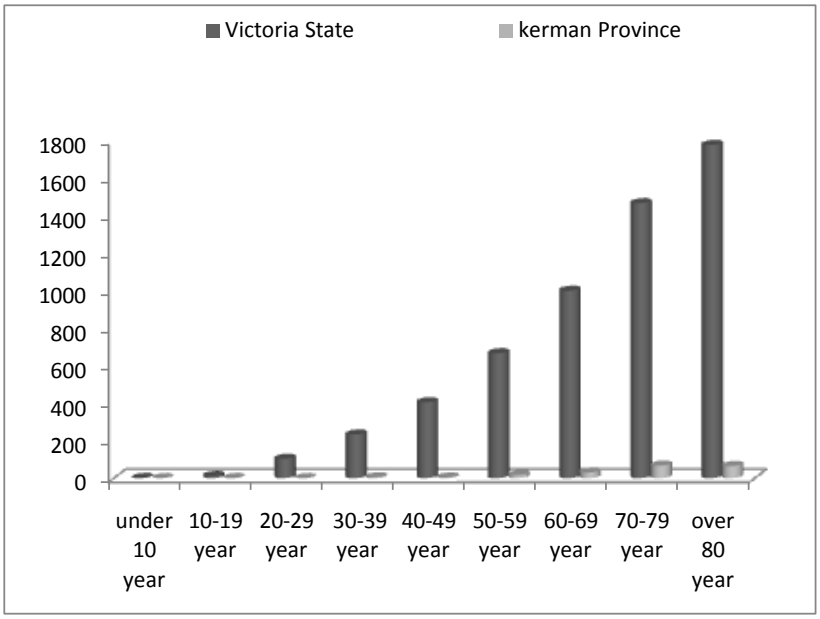

Figure1: Comparison incidence rate of melanoma by age group between Kerman Province and Victoria State during 2005 to 2009 (count per 1000000 population from March 2005 until March 2010).

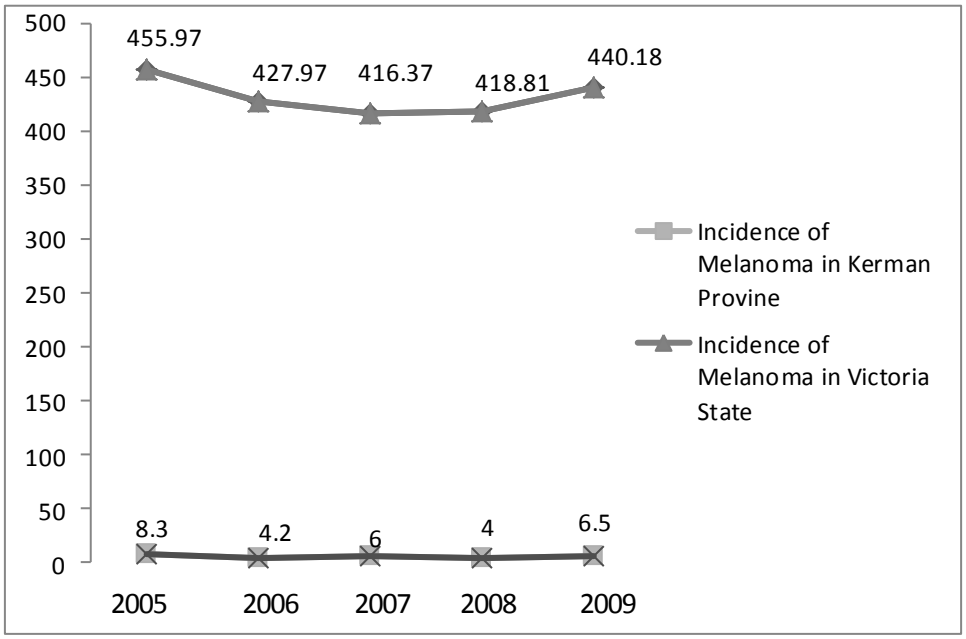

Figure 2: Incidence trend of Melanoma in Kerman Province and Victoria State (cases per million) during 2005 to 2009.

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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)

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

Location	Victoria State		Kerman Province		Incidence difference		*p-value* of comparison	
	Male	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**
Head & Neck	47.16	15.51	0.8	0.04	46.36	15.11	<0.001	<0.001
Face	71.78	46.24	2	1.6	69.78	44.64	<0.001	<0.001
Trunk	184.79	75.76	0.2	0	184.59	75.76	<0.001	<0.001
Hand	2.47	4.46	1.4	0.8	1.07	3.66	0.5	0.1
Arm	88.46	102.25	1.2	1	87.26	101.25	<0.001	<0.001
Foot	5.94	10.59	1.80	1.20	4.14	9.39	0.16	0.004
Leg	52.79	113.91	0.8	0.2	51.99	113.71	<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 location. In the present study, the incidence of malignant melanoma in both countries was higher in men than women. This result was also seen in other studies [19-21].

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

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In our study, body parts such as the hands that are exposed in both cultures had a relatively similar, non-significant difference in the incidence rate. The fact that body parts that are more exposed to sunlight acquire more melanoma has also been confirmed in others studies [22-26]. In Lesage et al, researchers 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 photo protection by hair and sun exposure in cars [19].

The dressing code in Iran as an Islamic nation requires all women over 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 considered unusual for Iranian men. Also men expose their hand and feet much more than women which can probably explain the insignificant difference in 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 the more outdoor work in men. In a study which was conducted in Yazd Province in 2007, the incidence rate of MM was 1.5 times higher in men than women [27]. These results are also consistent with other studies [22, 23, and 27]. Men, who are more exposed to solar UV [26], are 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 the different skin colours. Iran has a much more homogenous population in this regard, although Australia enjoys a diverse range of ethical 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 [28]. However, the strength is that the intensity of these factors can show itself in the incidence difference in exposed body parts such as the face, hands and feet which is uncovered in both populations and as our results show, the difference between these parts was insignificant.

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Based on these results in Table 2 and by subtracting the incidence difference of the face (which is the highest among exposed parts) from other body 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, Iranian are acquiring much less melanoma in the unexposed body parts. These results are in line with studies that believe clothing is an important preventive factor for skin cancers including melanoma [27, 29 , 30].

Acknowledgement

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 that provided the data for this study.

References

1-Edevries LV, Vandepoll-Franse WJ, Louwman FR, et al. Predictions of skin cancer incidence in the Netherlands up to 2015. British J Dermatol. 2005;152(3):481–88.

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 AH, 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 MB, 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 absurbed 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

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17. Statistical Center of Iran (2007). Iran Statistic Yearbook, 2007. Tehran: Statistics Center of Iran.2007

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 RM, Quinin AG. 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 AC, Zhang Z, Sober AJ, 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. 2008.

27. Marks R. Epidemiology of melanoma. Clin Exp Dermatol. 2000; 25(6); 459-63.

28. Konstantinos L, Sabine K, Despina I, et al. Epidemiological di erences for cutaneous melanoma in a relatively dark-skinned Caucasian population with chronic sun exposure. European J Cancer . 2004; 40(16):2502–7.

29.Amoozgar MH, 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 MT. evaluation of the skin cancers in Yazd. Iranian J Dermatol. 2007; 10(1):9-13. [Persian]

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