Epidemiological study of malignant melanoma in Kermanshah province of Iran in 2010-2016 based on the geographic information system

Hossain Kawosi, MD [1]
Nader Salari, PhD [2]
Arash Golpazir Sorkhe, MD [3]
Ibrahim Shakiba, PhD [4]
Roya Safarpour, MD [1]
Masoud Mohammadi, MSc [5*]

1. Department of Dermatology, School of Medicine, Kermanshah University of Medical Sciences, Kermanshah, Iran
2. Department of Biostatistics, School of Health, Kermanshah University of Medical Sciences, Kermanshah, Iran
3. Kermanshah Cancer Registry, Kermanshah University of Medical Sciences, Kermanshah, Iran
4. Department of Biochemistry, Faculty of Medicine, Kermanshah University of Medical Sciences, Kermanshah, Iran
5. Cellular and Molecular Research Center, Gerash University of Medical Sciences, Gerash, Iran

*Corresponding author:
Masoud Mohammadi, MSc
Cellular and Molecular Research Center, Gerash University of Medical Sciences, Gerash, Iran
E-mail: masoud.mohammadi1989@yahoo.com

Received: 15 June 2021
Accepted: 22 March 2022

Background: Malignant melanoma is a prevalent, offensive, and fatal cancer in developed countries. Most of our information is related to studies conducted in western countries. This study aims to evaluate demographic and clinical data of melanoma in the Kermanshah province of Iran.

Method: This was a descriptive study on data available in the Cancer Registry Center of Kermanshah, which includes 70 patients during eight years from 2010–2017. Clinical recognition of melanoma was based on American Joint Committee on Cancer criteria. Data were analyzed by SPSS 20 software and shown in ArcGIS (Version 10.7).

Results: Patients included 46 men (65.7%) and 24 women (34.3%) with a mean age of 60.49 ± 16.08. The general prevalence of melanoma was 4.4 in every 1,000,000 persons annually. Most patients had skin type III (65.7%), indoor jobs (61.4%), and lived in the city (67.1%). Also, 35.7% had a trauma history, 2.8% had familial melanoma history, and 17.1% had other types of skin cancer. Extremities (51.4%), acral lentiginous melanoma (50.1%), Clark IV (61.4%), and inguinal lymph nodes (14.3%) were the most prevalent location, clinical type, pathological level, and involved lymph nodes, respectively.

Conclusion: Acral lentiginous melanoma and extremities involvement are prevalent in our region. Most patients go to doctors at an advanced level due to delays in referral, lack of follow-up by patients, lack of recognition at the initial care level, and lack of access to specialty centers. We recommend general instructions through media and holding special workshops for physicians for better familiarity with melanoma.

Keywords: cancer, melanoma, epidemiology, Kermanshah

Iran J Dermatol 2022; 25: 336-344

DOI: 10.22034/IJD.2022.290817.1384

INTRODUCTION

Skin cancers are among the most prevalent cancers in humans, and one million cases of non-melanoma cancers are recognized in USA annually. In the Islamic Republic of Iran, skin cancer is the most prevalent cancer, with a male-to-female ratio of 1.6, observed in the seventh and eighth decades of life [1]. The prevalence of different types of skin cancer has increased in recent decades, and since most of these cancers originate from prolonged exposure to sunlight, atmosphere changes and

especially change in ozone thickness along with changes in personal and social habits can justify this increase [1,2].

Skin cancer is a major health problem. In most countries, different types of skin cancer are prevalent and are increasing rapidly. Despite decreased cancer in recent years, 3 to 5% is added to the amount of cancroid annually with the possibility of prevention and treatment [3]. In Iran, limited studies have been done, and the reported prevalence of different types of skin cancer is between 10 to 15 cases in every 10,000 persons annually [4]. Disability, cosmetic problems, and high costs of this disease, especially its long-term form, cause this cancer to be a general health problem in most communities [5].

Basal cell carcinoma is the most prevalent malignant tumor in whites, and squamous cell carcinoma is the second most prevalent tumor of the skin, accounting for about 20% of cancers [6] and representing one of the deadliest cancers that originate from epidermis melanocytes [6,7].

Squamous and basal cell carcinomas are the most prevalent types of cancer throughout the world and in Iran [8,9]. Malignant melanoma includes 4% of all cancer cases, but it is the cause of death in about 79% of types of cancer [10].

Malignant melanoma prevalence increased in the last decades in many parts of the world. The prevalence of this malignancy has tripled in the last 40 years, which has been more than any other malignancy [11,12]. Melanoma prevalence is lower in Middle-Eastern countries like Iran in comparison to Europe and USA [7,13].

When melanoma turns malignant, it becomes resistant to treatment and apoptosis and causes metastasis in deep parts of the skin and internal organs such as the spleen, liver, and lymph nodes [14]. In clinical terms, malignant melanoma is usually without symptoms. Although itching may be one of the initial signs of the disease, a change in the size or color of a pigmented lesion is the most important clinical manifestation [15]. The most critical histologic finding is radial and vertical growth. Radial growth is the initial trend to grow in a horizontal direction within the epidermis and surface dermal layers, which lack metastasis ability. In vertical growth, melanoma grows into deep dermal layers and causes metastasis [16]. Growth of an old mole, itching or pain in an old mole, formation of a new pigmented lesion, irregularity in the edges of a pigmented lesion, and color change are among the most important signs of melanoma in clinical examinations [15-17].

Risk factors involved in the formation of cancroid and especially malignant melanoma are sunlight, light skin, big congenital moles, immunosuppression, genetic polymorphisms, alcohol use, numerous freckles, genetic factors, and familial melanoma history [18,19].

Although limited studies have been conducted on some epidemiologic characteristics and indices of malignant melanoma in Iran [7,13,20,21], they are quite dated, and new information is needed for policy-making. Therefore, the current study was done to examine the epidemiology of malignant melanoma in the Kermanshah province of Iran during 2010–2017 to guide health policy-makers.

MATERIALS AND METHODS

Data resources

The study population of this descriptive study included melanoma patients from 14 cities of Kermanshah province: Eslamabad-e Gharb, Ravansar, Paveh, Javanrood, Sarpol-e-Zahab, Sahneh, Hersin, Dalahoo, Salas-e-Babajani, Gilan-e Gharb, Qasr-e Shirin, Kangavar, Sonqor, and Kermanshah City. The patients were visited at the Imam Reza Hospital and Haj Daei Dermal Specialty Center from April 2010 to February 2017. These patients were diagnosed with melanoma based on American Joint Committee on Cancer, and their information was registered in the Kermanshah University of Medical Sciences registry system. This study was approved by the Ethics Committee of the Kermanshah University of Medicine Sciences.

Population and scope of Kermanshah

Kermanshah, with an area of 25,009 km^2, is one of the biggest provinces in Iran. Kermanshah makes up 5.1% of Iran and is among the western provinces, sharing the border with Iraq. This province is limited in the north by Kurdistan, south by Lorestan and Ilam, east by Hamadan, and west by Iraq. Kermanshah City is the capital of Kermanshah province. The population of this province was 1,977,000 in 2015, with 71.1% of people living in urban areas (Figure 1).

Figure 1. Map of Iran showing Kermanshah (cities are shown in the inset)

Statistical analysis

Data were analyzed by using SPSS 20. The results were shown based on Kermanshah's geography in ArcGIS (Arc MAP, Version 10.7) software in order to provide more comprehensive results. All of the maps used in the paper were extracted from the software and were not obtained from other sources and articles.

RESULTS

This study included 70 patients, 46 men (65.7%) and 24 women (34.3%), aged 60.49 ± 16.08. Melanoma prevalence in Kermanshah province was about 4.4 in every 1,000,000 persons annually.

Based on the results in Table 1 and the demographic and epidemiologic status of malignant melanoma patients, most cancer cases were in 2015 (18 cases, 25.7%), while the fewest were in 2016 (4 cases, 5.7%). Notably, 46 patients (65.7%) had skin type III, 18 patients (25.7%) had skin type II, and 6 patients (8.6%) had skin type IV. Moreover, 43 (61.4%) had indoor jobs and 47 (67.1%) lived in the city.

Twenty-five patients (35.7%) had trauma history, eighteen patients (25.7%) smoked, eight patients (11.4%) had familial melanoma history, three patients (4.3%) had atypical moles, and two patients (2.8%) had freckles. Sixty-eight patients (97.1%) did not have an immune system dysfunction history or immunosuppressing drug use history, and the most prevalent anatomic site of lesions in patients was the extremities (36 cases, 51.4%), where 23 cases (32.8%) were observed in the lower extremities, and 13 cases (18.5%) were observed in the upper extremities (Table 1).

Two patients (2.85%) had familial melanoma history. Twelve patients (17.1%) had a history of other types of skin cancer, including basal cell carcinoma in 3 (4.3%), squamous cell carcinoma in 8 (11.4%), and both in 1 patient (1.4%). In addition, examining the pathologic files of the patients revealed that the physician recognized melanoma at the first, second, and third visit for 46 (65.7%) patients, 19 (27.1%) patients and 3 (4.3%) patients, respectively. Melanoma recognition was not stated only for 2 (2.8%) patients (Table 1).

The clinical examination of patients showed that among the clinical forms of acral lentiginous melanoma, superficial spreading, malignant lentigo, nodular, malignant melanoma without initial origin, and malignant melanoma on an atypical mole were observed in 35 (50.1%), 16

Table 1. Examining the demographic and epidemiologic status of malignant melanoma patients

Variable	Frequency (%)
Age	60.49 ± 16.08
Sex	
Male	46 (65.7%)
Female	24 (34.3%)
Skin type	
Type II	18 (25.7%)
Type III	46 (65.7%)
Type IV	6 (8.6%)
Occupational Status	
Indoor	43 (61.4%)
Outdoor	27 (38.6%)
Location	
Urban	47 (67.1%)
Rural	23 (32.9%)
Risk factor	
Trauma	25 (35.7%)
Smoking	18 (25.7%)
History of melanoma	8 (11.4%)
Atypical mole	3 (4.3%)
Weak immune system	2 (2.8%)
Freckles	2 (2.8%)
Anatomical location of the infection	
Extremities	36 (51.4%)
Head and neck	28 (40%)
Trunk	6 (8.6%)
Family history of melanoma	2 (2.8%)
Types of skin cancers	
Basal cell carcinoma	8 (11.4%)
Squamous cell carcinoma	3 (4.3%)
Basal cell and squamous cell carcinoma	1 (1.4%)
Diagnostic accuracy	
As the first diagnosis	46 (65.7%)
As a second diagnosis	19 (27.1%)
As a third diagnosis	3 (4.3%)
Lack of diagnosis	2 (2.8%)

(22.8%), 10 (14.3%), 7 (10%), 2 (2.8%), respectively (Table 2). Involvement of inguinal lymph nodes was observed in 10 patients (14.3%), neck nodes in 3 patients (4.3%), and axillary nodes in 2 patients (2.8%). Pathologic examination of lesions revealed that Clark level II, III, IV, and V were observed in 2 (2.9%), 16 (22.8%), 43 (61.4%), and 9 (12.8%) patients, respectively (Table 2).

Based on results obtained from ArcGIS software and survey conducted from 2010 to 2016, Figures 2 to 8 show that Kermanshah City had the highest frequency and percent in all mentioned years: 2010 (60%), 2011 (78.5%), 2012 (77.5%), 2013 (85.7%), 2014 (90.95), 2015 (82.3%), and 2016 (50%). Moreover, most cases after Kermanshah City were in Paveh

Table 2. Other types of skin cancers

Variable	Frequency (%)
Clinical type of acral lentiginous melanoma	
Surface extension	35 (50.1%)
Malignant lentigo	16 (22.8%)
Nodular	10 (14.3%)
Malignant melanoma without primary origin	7 (10%)
Malignant melanoma on an atypical mole	2 (2.8%)
Pathologic status according to Clark criteria	
Level II	2 (2.9%)
Level III	16 (22.8%)
Level IV	43 (61.4%)
Level V	9 (12.8%)
Involvement of lymph nodes	
Inguinal	10 (14.3%)
Cervical	3 (4.3%)
Axillary	2 (2.8%)
Death rate over a year	18 (25.7%)

(92.5%) and Eslamabad-e Gharb (12.5%) in 2016, and Kangavar (13.3%) in 2010 (Figures 2–8).

DISCUSSION

Results showed that most of our patients were males (1:9 ratio). In Hanjani *et al.* [7], Ferdowsi [13], and Naraqi [20] studies, the male-to-female ratio was 2, 1, and 1/2, respectively. The high prevalence of melanoma in men is related to more contact with environmental risk factors like sunlight and other potential factors like trauma.

In most studies [6,7,12,13,19-21], older adults develop melanoma, which is consistent with our study. It seems that the cumulative effects of environmental risk factors [12] and decreased function of immunity (immune senescence) have an important role in the formation of melanoma in older adults [22].

Although melanoma is usually observed in white people [23], most of our patients were of skin type III. This can be because melanoma is a malignancy related to environmental and genetic factors [24]. Moreover, most people in our region are of skin type III [9].

Most of our patients lived in urban areas and had indoor jobs. In addition, acral melanoma was the prevalent form of clinical melanoma in our patients. These results reveal the possibility of risk factors other than sunlight in the pathogenesis of melanoma [25].

Trauma was the most prevalent risk factor registered in our patients. Moreover, the extremities

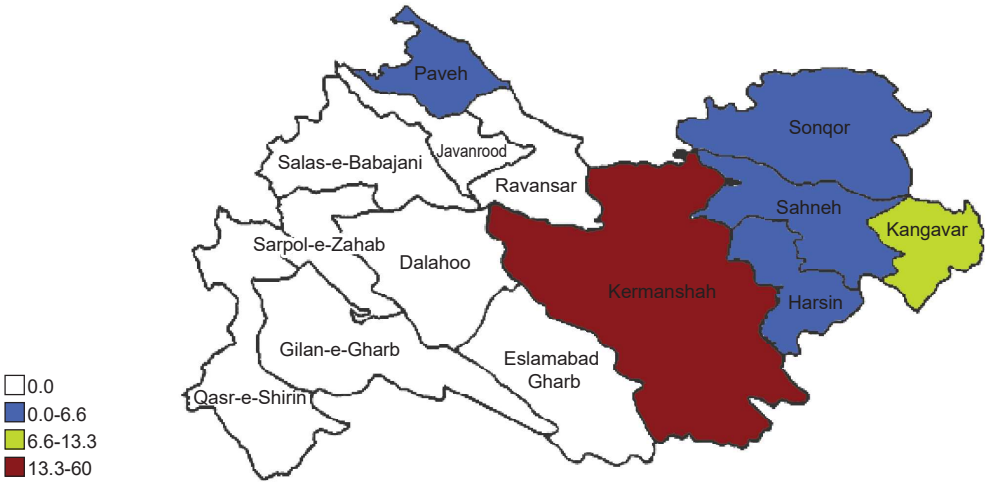

Figure 2. Percent of malignant melanoma cases in cities of Kermanshah province in 2010 based on ArcGIS map

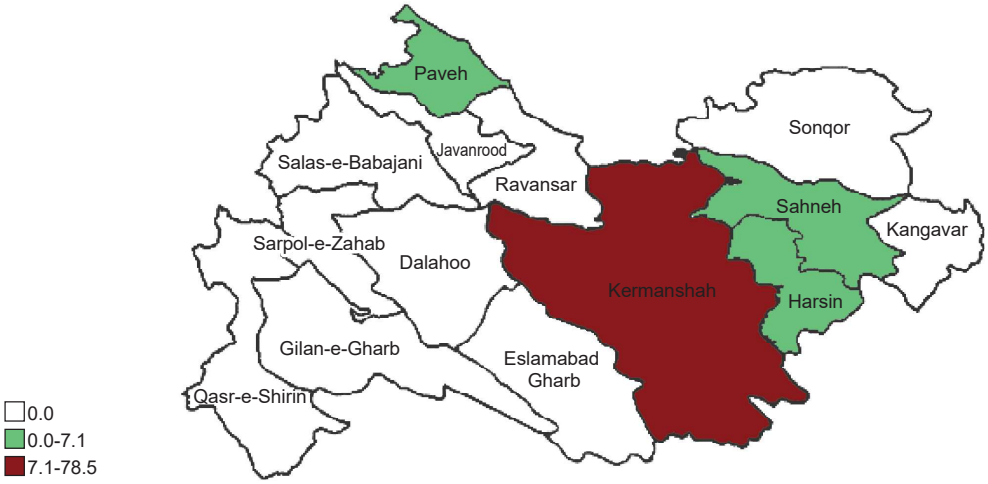

Figure 3. Percent of malignant melanoma cases in cities of Kermanshah province in 2011 based on ArcGIS map

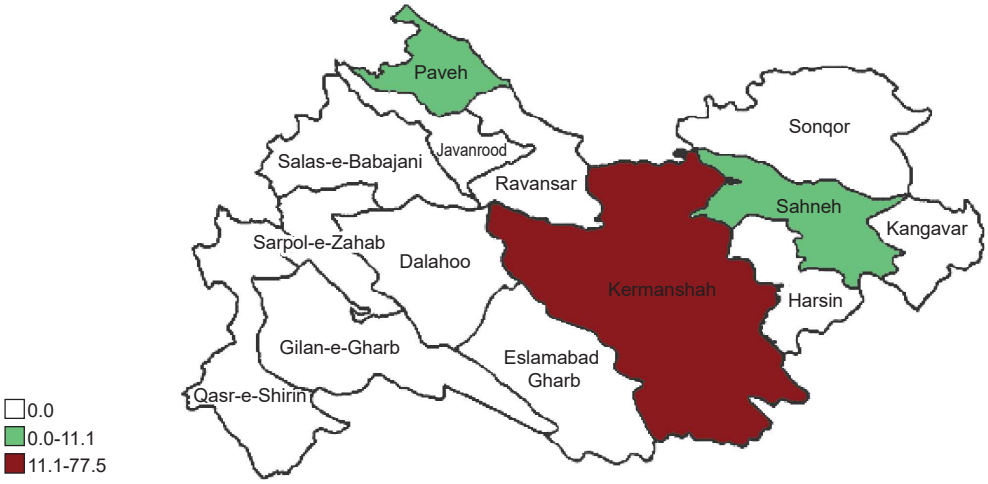

Figure 4. Percent of malignant melanoma cases in cities of Kermanshah province in 2012 based on ArcGIS map

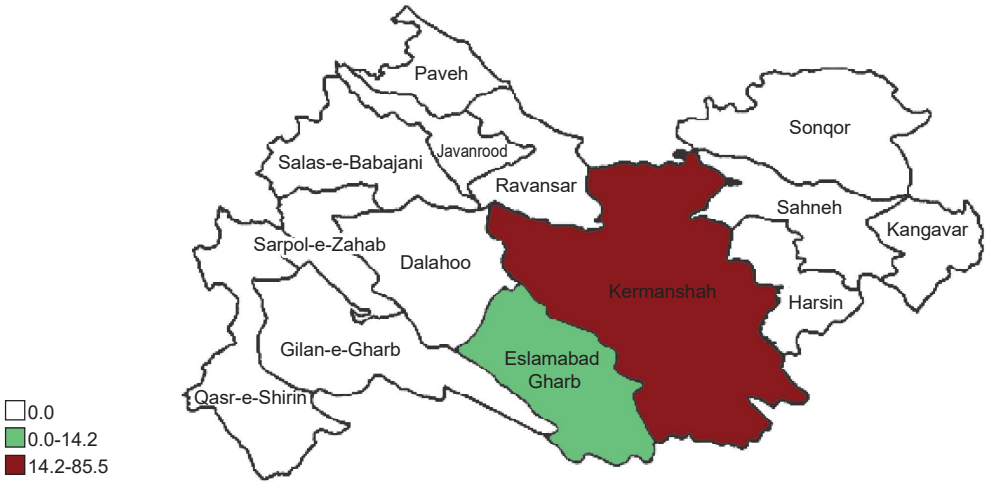

Figure 5. Percent of malignant melanoma cases in cities of Kermanshah province in 2013 based on ArcGIS map

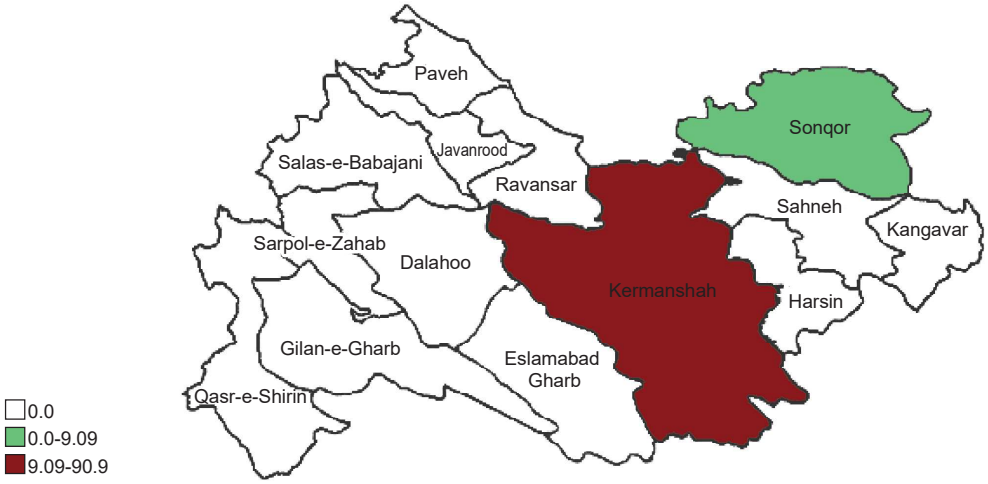

Figure 6. Percent of malignant melanoma cases in cities of Kermanshah province in 2014 based on ArcGIS map

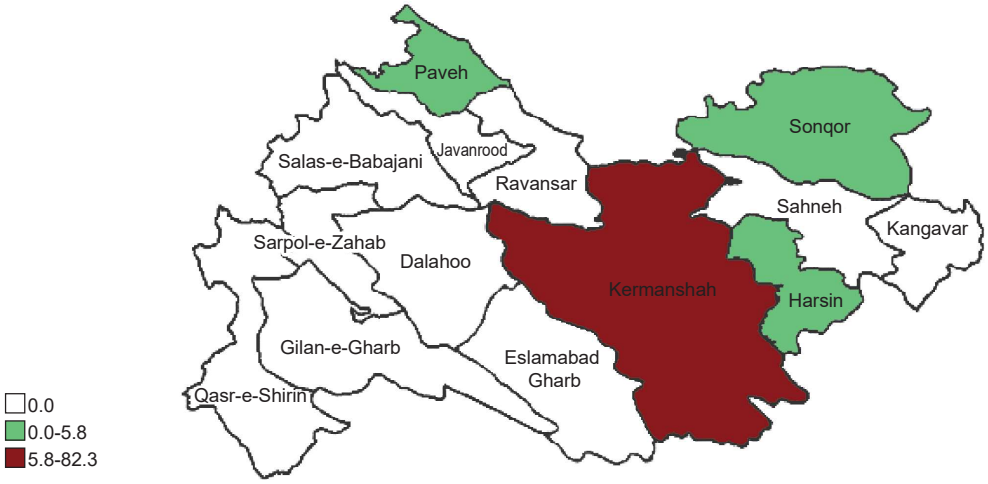

Figure 7. Percent of malignant melanoma cases in cities of Kermanshah province in 2015 based on ArcGIS map

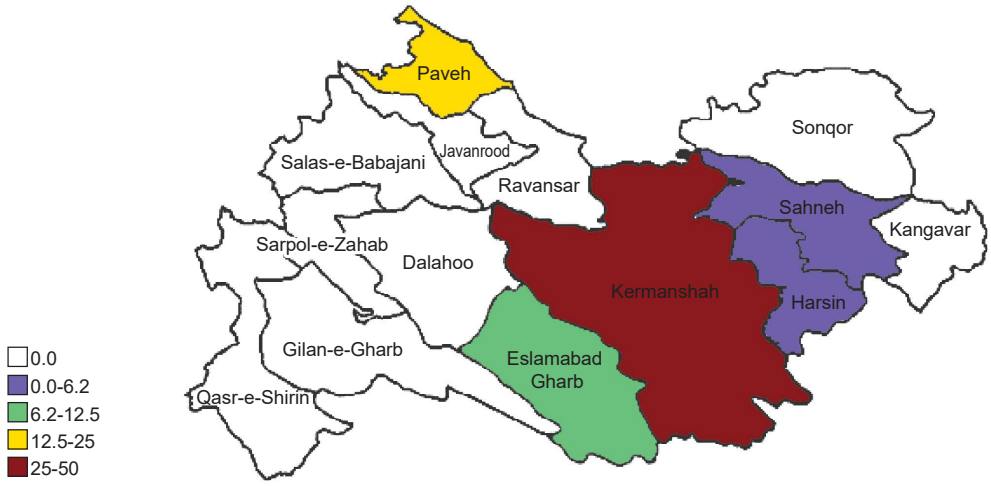

Figure 8. Percent of malignant melanoma cases in cities of Kermanshah province in 2016 based on ArcGIS map

(especially the lower extremities) were the prevalent places of lesions. Strong evidence from East Asia reveals trauma is accompanied by acral lentiginous melanoma, especially in the lower extremities [26-28].

Although environmental factors such as sunlight, genetics, internal factors, and other unknown factors play a role in the co-occurrence of melanoma and other skin cancers like squamous and basal cell carcinoma [29,30], co-occurrence of basal cell carcinoma was more prevalent in the current study (two times), which can be due to similar pattern of contact with sunlight in basal cell carcinoma and melanoma patients [31].

Familial melanoma history was observed in a few patients (2.8%). Familial melanoma prevalence is about 3–15%; therefore, melanoma is a heterogeneous disease, and this disease is inherited in a multifactorial polygenic form despite its presence in second and third-generation relatives [32].

Although dermatologists use the manual dermatoscope as a standard for selecting atypical dermal lesions for biopsy and although computer software cannot be a reliable alternative to the experience of a physician [33], the recognition accuracy of dermatologists who done biopsy was 97.1%, with most cases being recognized on the first visit (65.7%). Thus, dermatologists in our region have good recognition accuracy despite the low prevalence of melanoma.

The prevalence of acral lentiginous melanoma is estimated at 2–3% of all melanoma cases in American whites [34]. However, this clinical form is the most prevalent melanoma form in Africa, East Asia, and Hispanics [26-28,35]. Hanjani *et al.* [7], in a study in south Iran, cited acral lentiginous melanoma as the prevalent clinical form [7,13,20,21]. In line with our results, it appears that melanoma patients in Africa, East Asia, Latin America, and our region have similar clinical patterns. Therefore, older adults with pigmented lesions in the acral area should be assessed for melanoma, especially through a histopathology study.

Tumor thickness is one of the important prognostic factors for this disease. Early recognition can result in recognizing the disease with a low Clark level, which improves disease prognosis [36]. Safaei Naraqi *et al.* [20], in a study on 47 melanoma patients, showed that 40.4% of patients were at Clark level III. Moreover, 61.4% of patients showed Clark level IV. Since acral lentiginous melanoma has a longer radial growth period, a high Clark level reveals the disease's long-term history and poor prognosis [35,36].

In Eftekhari *et al.*'s review of melanoma cancer registration data from Razi Hospital (Tehran), the most frequent location for melanoma was the lower extremity (38.9%). The most frequent subtype for melanoma based on histopathology was acral lentiginous melanoma (38.3%). There was a statistically significant difference between histological subtypes of melanoma and Breslow thickness [37].

In a study conducted in south Iran [7], most

melanoma patients came to the doctor at an advanced level of disease, mostly with problems in inguinal lymph nodes since acral lentiginous melanoma has a poor prognosis.

The clinical form of acral lentiginous melanoma and the involvement of extremities are prevalent in our region, as in Africa, East Asia, and Latin America. Most patients come to doctors at advanced levels of disease due to delayed referrals, lack of follow-up by the patient, lack of recognition at the initial care level, or lack of access to specialty centers. We recommend instructing society through public media and holding specialty workshops to familiarize physicians with melanoma. It is recommended to conduct cohort studies in several centers with more patients and register more information about patients in cancer registry centers.

CONCLUSION

The clinical form of acral lentiginous melanoma and the involvement of extremities are prevalent in our region. Most patients go to doctors at an advanced level due to delayed referrals, lack of follow-up by patients, lack of recognition at the initial care level, and lack of access to specialty centers. We recommend educating the public through media and holding special workshops for physicians for better familiarity with melanoma.

Abbreviation

GIS: Geographic Information System

Conflict of interest: None declared.

REFERENCES

1. Mohammadi M, Mirzaei M, Ahmadi A. Comparing of the epidemiology of skin cancer in the Kurdistan and Yazd in 2012. J Shahid Sadoughi Univ Med Sci. 2015;23(4):2119-27.
2. Azizi F, Janghorbani M, Hatami H. Epidemiology and control of common disease in Iran. Publications in association with the Institute of Endocrinology and Metabolism, 3rd Edition. Tehran; 2011.
3. McClendon B T, Prentice-Dunn S. Reducing skin cancer risk: an intervention based on protection motivation theory. J of Health Psychology. 2001;6(3):321-8.
4. Norballa M. The survey of skin in Yazd. Iran J Dermatol. 2007;10:9-13.
5. Almahroos M, Kurban AK. Ultra-violet carcinogenesis in non-melanoma skin cancer: incidence in relation to geographic location and in-migrant population. Skin Med. 2004;3:29-35.
6. Markovic SN, Erickson LA, Rao RD, et al. Malignant melanoma in the 21st century, part 1: epidemiology, risk factors, screening, prevention, and diagnosis. Mayo Clin Proc. 2007;82(4):490- 513.
7. Handjani F, Saki N, Parhizgar A, et al. Epidemiology of malignant melanoma over a thirty-two-year period (1981-2013) in southern Iran. Middle East J Cancer. 2016;7(4):199-202.
8. Esmailnasab N, Moradi G, Zareie M, et al. Survey of epidemilogic status and incidence rates of cancers in the patients above 15 years old in Kurdistan province. Sci J Kurdistan Univ Med Sci. 2007;11(4):18-25.
9. Kavoussi H, Ebrahimi A. Treatment and cosmetic outcome of superpulsed CO_2 laser for basal cell carcinoma. Acta Dermatovenerol Alp Pannonica Adriat. 2013;22:57–61.
10. Allen DC. Malignant melanoma: histopathology reporting: Springer; 2013.
11. Erdei E, Torres SM. A new understanding in the epidemiology of melanoma. Expert Rev Anticancer Ther. 2010;10:1811–1823.
12. Schadendorf D, van Akkooi ACJ, Berking C, et al. Melanoma. Lancet. 2018;392(10151):971-984.
13. Ferdosi S, Saffari M, Eskandarieh S, et al. Melanoma in Iran: a retrospective 10-year study. Asian Pac J Cancer Prev. 2016;17:2751–5.
14. Reya T, Morrison SJ, Clarke MF, et al. Stem cells, cancer, and cancer stem cells. Natur. 2001;414(6859):105-111.
15. Elder D, Elenitasis R. Lever's Histopathology of the skin.9th Ed. Philadelphia, USA: Lippincott Williams & Wilkins; 2005.
16. Steven G, Berg S, Ronald A, et al. Silverberg's Principles and practice of surgical pathology and cytopathology. 4th Ed. Edinburgh, Schottland: Churchill Livingstone, Elsevier; 2006.
17. Gungor T, Altinkaya SO, Ozat M, et al. Primary malignant melanoma of the female genital tract. Taiwan J Obstet Gynecol. 2009;48(2):169-75.
18. Peterson AD, Downes H, Robinson J. Skin cancer risk assessment. J Am Acad Dermatol. 2004;50(3):8.
19. Nosrati A, Yu WY, McGuire J, et al. Outcomes and risk factors in patients with multiple primary melanoma. J Invest Dermatol. 2018;139(1):195-201.
20. SafaiiNaraghi 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.
21. Shamloo N, Safi Y, GHanadan A, et al. The Epidemiology of oral, head and neck malignant melanoma in an Iranian population during 11-year period. J Res Dent Sci. 2015;12(3):133-136.
22. Foster AD, Sivarapatna A, Gress RE. The aging immune system and its relationship with cancer. Aging Health. 2011;7:707–718.
23. Chaudru V, Chompret A, Bressac-de Paillerets B, et al.

Influence of genes, nevi, and sun sensitivity on melanoma risk in a family sample unselected by family history and in melanoma-prone families. J Natl Cancer Inst. 2004;96:785–795.

24. Volkovova K, Bilanicova D, Bartonova A, et al. Associations between environmental factors and incidence of cutaneous melanoma. Review. Environ Health. 2012;11(Suppl 1):S12.
25. Xia L, Han D, Yang W, et al. Primary malignant melanoma of the vagina: a retrospective clinicopathologic study of 44 cases. Int J Gynecol Cancer. 2014;24:149-55.
26. Kaskel P, Kind P, Sander S, et al. Trauma and melanoma formation: a true association? Br J Dermatol. 2000;143:749-753.
27. Zhang N, Wang L, Zhu GN, et al. The association between trauma and melanoma in the Chinese population: a retrospective study. J Eur Acad Dermatol Venereol. 2014;28:597–603.
28. Jung HJ, Kweon SS, Lee JB, et al. A clinicopathologic analysis of 177 acral melanomas in Koreans: relevance of spreading pattern and physical stress. JAMA Dermatol. 2013;149:1281–1288.
29. Feller L, Khammissa RA, Kramer B, et al. Basal cell carcinoma, squamous cell carcinoma and melanoma of the head and face. Head Face Med. 2016;12:11.
30. Rees JR, Zens MS, Gui J, et al. Non melanoma skin cancer and subsequent cancer risk. PLoS One. 2014;9(6):1–8.
31. Papa G, Grandi G, Pascone M. Collision tumor of malignant skin cancers: a case of melanoma in basal cell carcinoma. Pathol Res Pract. 2006;202:691-4.
32. Debniak T. Familial malignant melanoma-overview. Hered Cancer Clin Pract. 2004:15;2(3):123-9.
33. Bhattacharya A, Young A, Wong A, et al. Precision diagnosis of melanoma and other skin lesions from digital images. AMIA Jt Summits Transl Sci Proc. 2017: 26;2017:220-226.
34. Markovic SN, Erickson LA, Rao RD, et al. Malignant melanoma in the 21st century, Part 1: epidemiology, risk factors, screening, prevention, and diagnosis. Mayo Clin Proc. 2007;82:364–380.
35. Bradford PT, Goldstein AM, McMaster ML, et al. Acral lentiginous melanoma: incidence and survival patterns in the united states, 1986–2005. Arch Dermatol. 2009;145(4):427–434.
36. MacKie RM, Bray CA, Hole DJ, et al. Incidence of and survival from malignant melanoma in Scotland: an epidemiological study. Lancet. 2002;360:587–591.
37. Eftekhari H, Fahim SH, Aryanian Z, et al. A retrospective large original study of cutaneous melanoma. Pakistan J Med Health Sci. 2021;15(6):1-4.