International Journal of Education and Cognitive Sciences
Volume 3, Number 1, 37-45, April 2022
https://iase-ijeas.com
ISSN: 3041-8828

Mapping of Incidence of Skin Cancer in Khuzestan Province, Iran; 2009-2013

Homayoun Yousefi[1]*, Khirollah Asadollahi[2], Salman Daliri[3], Changiz Rostami[4]

1- *Assistance professor, Thalassemia & Hemoglobinopathy Research center, Health research institute, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran*
2- *Associate professor, Department of Social Medicine, School of Medicine, Ilam University of Medical Sciences, Iran.*
3- *Associate professor, Preventing Psychosocial Damage Research Center, Ilam University of Medical Sciences, Iran.*
4- *MSc. Epidemiology, Department of Epidemiology, Health School. Ilam University of Medical Sciences, Iran.*

Keywords:
Cancer
Skin
Incidence
Khuzestan
Iran

We aimed to produce mapping geographical distribution patterns of skin cancer incidence with relation to geographical-climatic factors in Khuzestan province; 2009-2013. It was a descriptive and analytical study which has done on province; 2009-2013 information from all the patients who's were registered under cancer registry population based in Khuzestan. Data analyses were performed by using SPSS (version 16), independent t-test, Kruskai-Wallis test, and analysis of variance. Climatic factors mapping was performed using Arc GIS.ver10.3. Number of 2656 skin cancer patients were found from cancer registry population based in Khuzestan province. Average age of patients was 61.35±23.17 years old and percentage of Male and female was as 60.4% and 39.6% respectively. Cumulative incidence of skin cancer (5 years) among the population was 58.61/100000. Highest annual incidence was 12.76/100000 in 2010 and lowest incidence was 10.6/100000 in 2011. The relationship between skin cancer incidence and the cities of Khuzestan province was significant (p=0.04). The hot spots for skin cancer incidence in Khuzestan province were Behbahan, Ahvaz, Masjedsoleiman, Izeh, and Andimeshk. cancer skin incidence was not similar in different areas of Khuzestan province that in addition to demographic aspects, can be due to geographical and climatic factors. Therefore, it is recommended to conduct more studies on epidemiology and etiology to identify risk factors in different areas.

*** Corresponding author Email: epidemiology2021@gmail.com**

Introduction

Cancer is one of the most common public health problems in developed and developing countries [Amori et al. 2015 & Karimi et al. 2014]. Due to irreparable complications and costly procedures of cancer diagnosis and treatment, cancer has a particular place in the programs of health system [Mehrabi et al. 2004] and has a deep effect on developed and developing countries [Torre et al. 2015].

In 1960, it was believed that cancer only occurs in western and industrial counties while by now, the highest levels of cancer incidence can be observed in countries with average and low-income levels [Thom. 2010]. In Asia, Africa, and South America, 60% of new cases of cancer occur and it is expected that this level reaches to 70% after 20 years [www.who.int]. Skin cancer is the most common malignancy in the world that is accompanied by high incapability and low mortality (except melanoma that has high mortality) and has constituted about 40% of human malignancy [Mackie et al. 2004 & Parker et al. 1997]. Since this type of cancer can occur in young people, it can influence Years of Potential Life Lost (YPLL) [Rhodes et al. 2004]. Skin cancer in Unites States, Europe, and Australia that have people with white skin and blue and green eyes is more common [Leshin et al. 1999] and in recent years, the incidence of skin cancer has increased in these countries [Mackie et al. 2004 & Leshin et al. 1999 & Goldman. 1998 & Schaffer et al. 2004] that according to the conducted studies, the reason for this increase can be increased daily activities without enough clothing coverage, travel to seashores, long exposure to sunlight, increased longevity, decreased ozone layer thickness, and immune system weakness [Kricker et al. 1994 & Dfleming et al. 1990 & Mousavi et al. 2011]. Skin cancer is more common in males, white race, and high age [Mackie et al. 2004 & Leshin et al. 1999 & Ansing et al. 1993]. Although numerous genetic factors influence the incidence of skin cancer, the most important factors include exposure to sunlight and the type of skin [13]. In the United States, annually two million people get skin cancer and more than 50000 people die due to this disease [Taylor. 2004]. Prevention of cancer in some cases is possible through identification of risk factors [Wang et al. 2001]. According to the Department of Health and Human Services in United States, two-thirds of all cases of cancer in the United States are related to the vast spectrum of natural material and cases prepared by human that are released into the air [Wang et al. 2001 & HHS. 2003 & Irigaray et al. 2007]. Study on geographical changes, incidence rates, prevalence, and mortality of cancers provide valuable information about identification of causes and assessment of cancers [Glick. 1979 & Mayer. 1986].

Understanding the geographical distribution patterns of diseases such as cancer in a certain population may provide valuable information to identify the causes and prevention [Lee et al. 1999]. The issue of dispersion of diseases such as skin cancer and appointing them to specific geographical areas are among the approved issues that provide the context for a science known as medical geography that talks about the effects of different environmental factors on human health [Hoshor et al.2002]. The medical knowledge has used geographical studies and the relationship between disease and various climatic conditions can be discovered by disease pattern in geographical space [Hunter. 1974 & Jones et al. 1995]. Geographical Information System (GIS) can assess and classify the effect of environmental and socioecological factors on health [Kennedy. 1988 & Kennedy. 2002] and it seems that future studies without using GIS will not benefit from acceptable accuracy in classification and prediction of the disease [Wilkinson et al. 1998]. Medical geography that sometimes is called health geography is a part of medical studies that uses geographical techniques to study health and distribution of diseases in the world [Akorafas et al. 2002]. Cancer is one of the priorities in studies on all societies and in this regard, awareness of geographical dispersion of various tumors constitutes the first planning step. Epidemiological studies direct

attentions toward specific target groups to decrease economic costs for diagnosis and treatment with accurate planning. Geographical distribution pattern of cancer incidence in Khuzestan may be related to some environmental, racial, and individual (age and gender) factors and are under the influence of factors such as lifestyle, access to medical services, increased quality of life, and early diagnosis. Meanwhile, Khuzestan province is exposed to severe sunlight in most of seasons and is closer to equator compared with other provinces [Behrooz et al. 2011]. Moreover, most of people in this province are farmers and do not use sunglasses and sunscreen [Valavi et al. 2013]. Therefore, we aimed to produce mapping geographical distribution patterns of skin cancer incidence with relation to geographical-climatic factors in Khuzestan province; 2009-2013.

Materials and Methods

It was a descriptive and analytical study that has done on 2656 skin cancer patient those have been registered in cancer registry population based in Khuzestan province those located at the southwest region of Iran and with the area of 66055 square meter constitutes 3.7% of total country area. Its population in 2016 according to the census conducted by Iranian Statistics Center is 4531720 (6% of total population of the country). We got accept to use data from cancer registry population based in Khuzestan province. New cases of cancer were specified based on the location of patients in over the provinces. Topographical classifications of registered skin cancer during 2009-2013 were extracted and studied. In addition, information related to rainfalls were gathered from the Meteorological Organization of Khuzestan province and information related to vegetation, climatic regions and land uses were gathered from Organization of Natural Resources and Watershed Management of the province. Data has entered and analyzed by using SPSS (version 16) and for analytical purposes, we used independent t-test, Kruskai-Wallis test.

To determine the relationship between skin cancer and environmental parameters such as climatic condition, average annual rainfall, land use, and vegetation, means plot and scatter plot and Eta correlation coefficient were used. Climatic factors mapping including the maps of Khuzestan, land use, annual rainfall, vegetation, and climatic regions were performed using Arc GIS (version 10.3).

The procedures of this study were approved by Ilam ethics committee of Ilam Jundishapur University of Medical Sciences (), Ahvaz, Iran which were in accordance with the instructions of working on human subjects set by Helsinki treaty (2014). The data of the cases of skin cancer in demographic cancer center, information was gathered.

Results

Data of 2656 skin cancer shown that average age of patients was 29.17±61.35 where 60.4% (1605 patients) were male and 39.6% (1051 patients) were female. Ratio Male to female was 1.52.

Cumulative incidence of skin cancer in Khuzestan province during 2009-2013 was estimated 58.61/100000, highest level of annual incidence was related to 2010 with 12.76/100000 and lowest level was related to 2011 with 10.6/100000. Highest level of cumulative skin cancer incidence Behbahan, Ahvaz and Masjedsoleiman were 94.6/100000, 88.12/100000 and 75.58/100000 respectively. Lowest cumulative incidences were related to Shadegan (19.56/100000), Khorramshahr (27.49/100000), and Dezful (28.57/100000). Skin cancer incidences in different cities of the province were significantly different (p= 0.04). Behbahan, Ahvaz, Masjedsoleiman, Izeh, and Andimeshk were determined as the hot spots of skin cancer (hot spots are the regions that their incidence level is higher than the average level) (Figure 1).

Results of this region with average rainfall between 200 - 400 mm, highest incidence of skin cancer was observed (63.05/100000). Lowest level was related to the regions which the average rainfall was lower than 100 mm (36.2/100000 during five years). The difference in incidence levels based on rainfall was

not significant (p= 0.41) (Figure 2). Highest cumulative incidence during these five years was related to the dry climate was 63.46/100 and lowest incidence was humid climate with the incidence of 48.12/100000 (Figure 3). Although a positive relationship was observed between skin cancer and climate, this relationship was not statistically significant (p= 0.39).

The cumulative incidence of skin cancer in arable regions was at the highest level (70.49/100000) while in maritime was observed lowest level (Figure 4) that this difference between skin cancer incidence and vegetation in different regions of the province was not statistically significant (p= 0.32). Skin cancer incidence level in fishery pools was highest level (83.81/100000) and in masil regions was lowest level (44.83/100000). However, this difference was not statistically different (p= 0.44) (Figure 5).

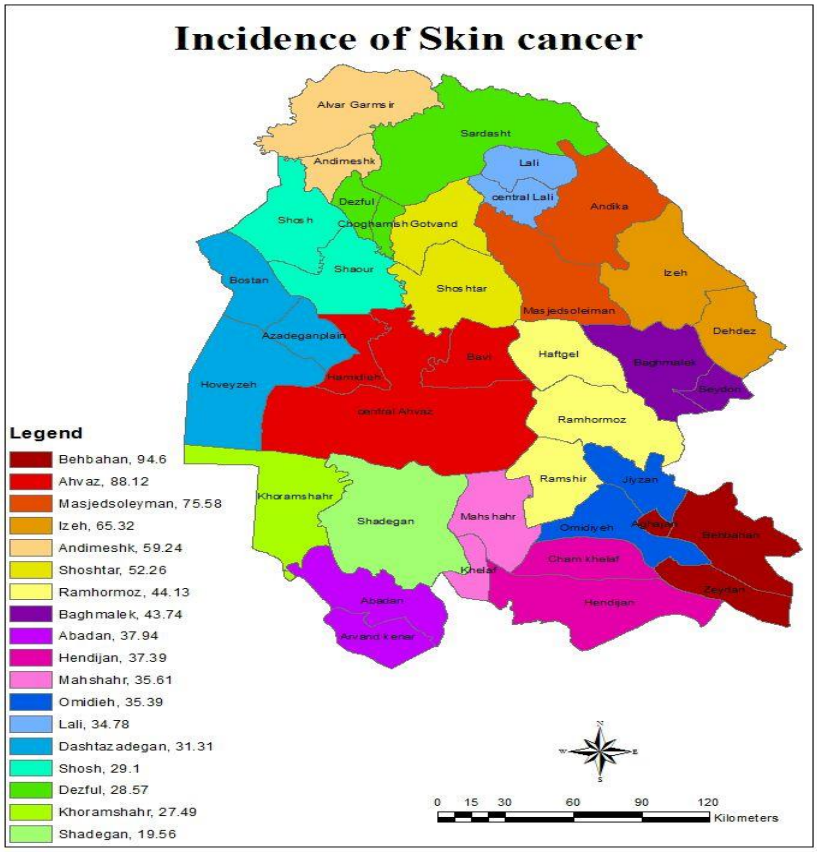

Figure 1. Skin cancer incidence in different cities in Khuzestan province

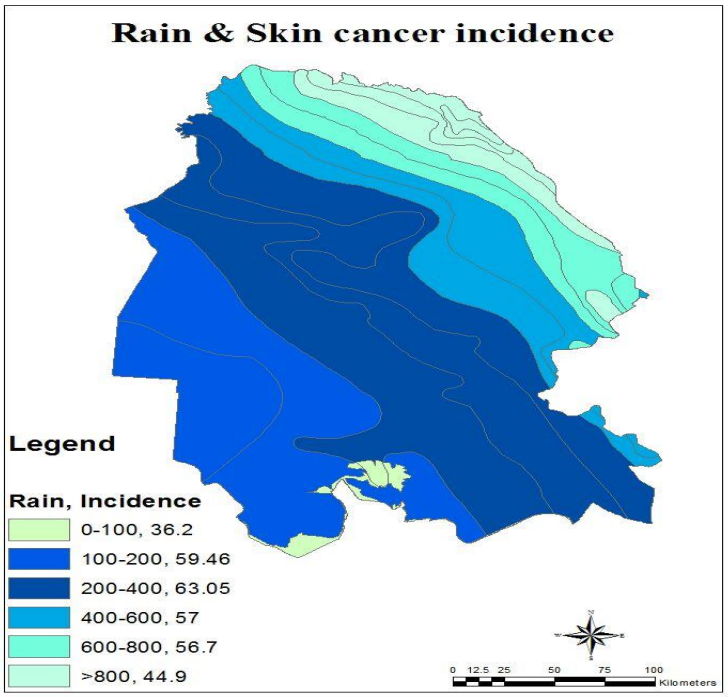

Figure 2. Skin cancer incidence based on average rainfall according to GIS method in Khuzestan province during 2009-2013

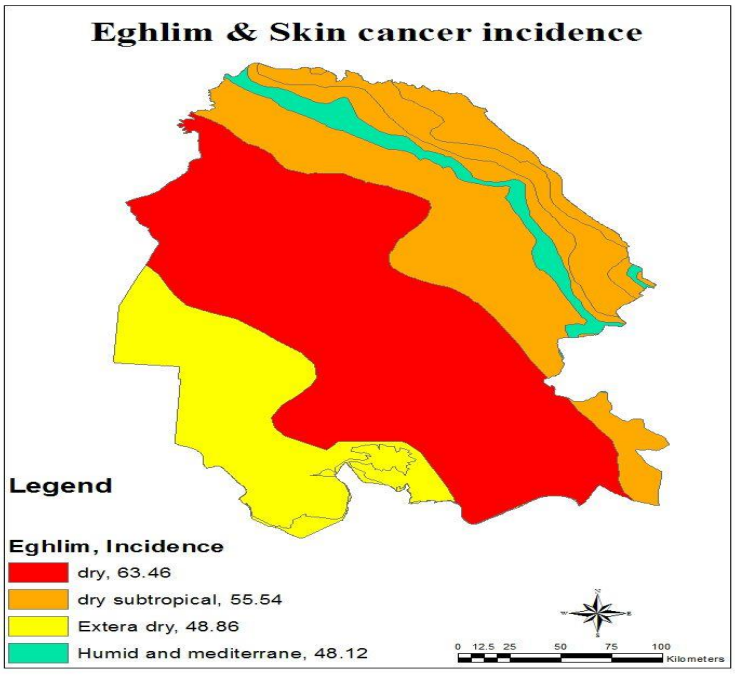

Figure 3. Skin cancer incidence based on climatic regions; Khuzestan province

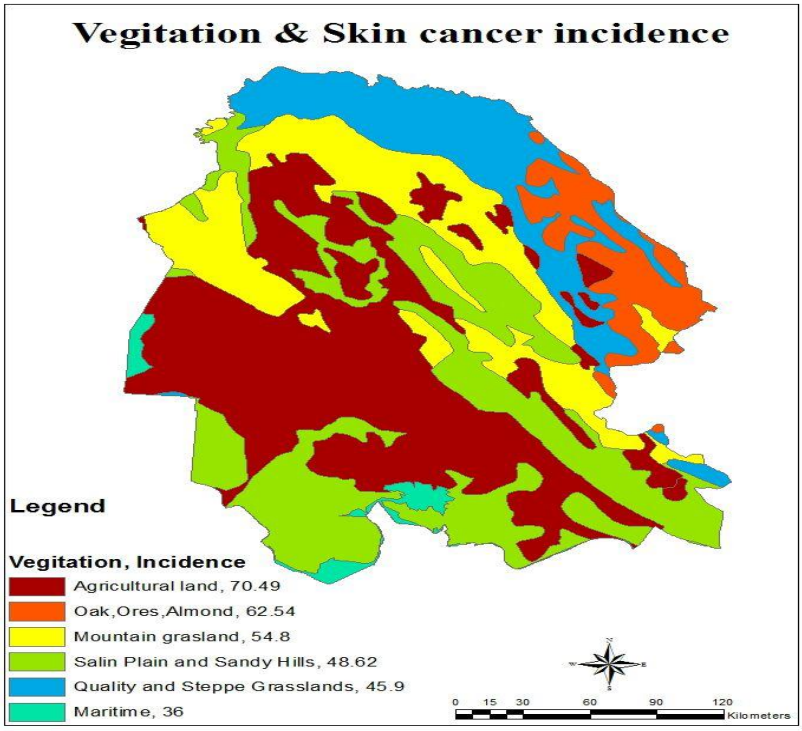

Figure 4. Skin cancer incidence and vegetation based Khuzestan province

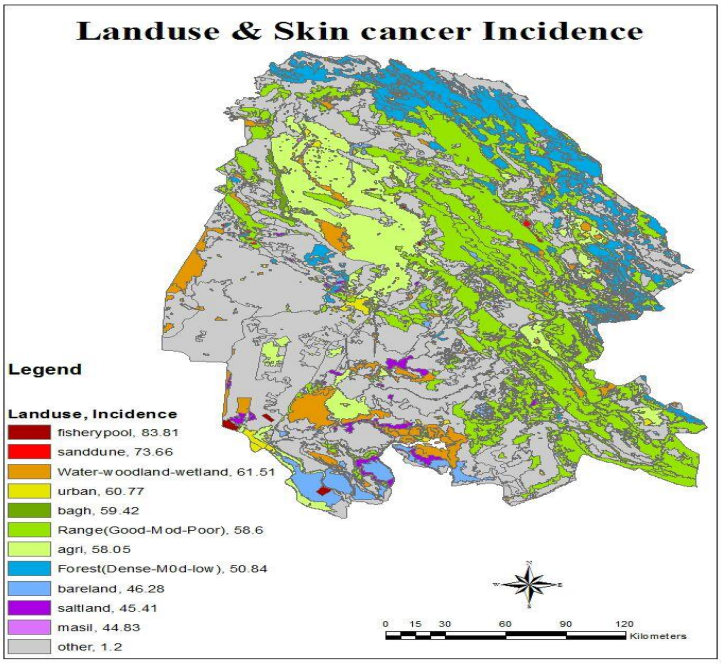

Figure 5. Skin cancer incidence and land use Khuzestan province

Discussion

Finding of this study has demonstrated that cumulative incidence of skin cancer in 2009-2013 was estimated 58.61/100000 Behbahan, Ahvaz, Masjedsoleiman, Izeh, and Andimeshk were determined as the hot spots of the disease. A big study in Iran had shown that, skin cancer incidence was estimated 14.7/100000 where highest level was related to Northern Khorasan (24.63/100000) and lowest level was related to Sistan and Baluchestan (8.7/100000) [Afzali et al. 2013]. Findings of present study has shown that significant relationship between skin cancer incidence and cities (p=0.04), but about other geographical-climatic factors, no significant difference was observed. For example in areas where the average rainfall was 200 -400 mm, the highest incidence of skin cancer has been observed 63.05/100000 during 5 years and in lowest level of incidence was related to the areas where rainfall level is less than 100 mm was 36.2/100000 during 5 years. In addition, the highest skin cancer incidence 63.46/100000 was related to dry climate. Lowest skin cancer incidence 48.12/100000 was related to moderate and humid climate/100000. A study in Khuzestan has found that 90% of patients with skin cancer were living in non-mountainous areas and out of them, 60% were male, in addition, it has been mentioned that skin cancer incidence has a considerable relationship with sunlight, age, and gender [Valavi et al.2013]. While another study found no significant relationship between arsenic environment and non-melanoma skin cancer [Wheeler et al. 2013]. Also a strong relationship was observed between daytime and incidence of non-melanoma skin cancer [Wheeler et al. 2012]. In Saudi Arabia study, no significant relationship was observed between skin cancer incidence and geographical distribution in this country [Al-Ahmadi et al. 2013]. Geographical and personal factors such as lifestyle, type of skin, vitamin D, and antioxidant protection are risk factors fot skin cancer [Volkovova et al. 2012]. Generally, high age and male gender are related to the incidence of skin cancer. There is a better awareness of women than men but this awareness is vanished after the age of 65. Younger patients have better awareness and this difference was more observe in women [Konstsntinos et al. 2008]. In a similar study on incidence of gastric cancer and its relationship with geographical-climatic factors based on GIS method, found incidence of gastric cancer was significant but other geographical-climatic variables such as vegetation, climate, and land use did not show any significant relationship with gastric cancer incidence [Rostami et al.2017]. It should be noted that no more similar study was available that investigated the relationship between skin cancer and geographical-climatic factors.

Conclusion

Skin cancer incidence was not similar in different cities of Khuzestan province and some cities showed higher incidence (that were statistically significant). This cancer is under the influence various geographical factors. Appropriate information about different cancers such as skin cancer in various geographical-climatic regions are helpful for treatment, identification of dangerous groups, and determination of risk factors, and early diagnosis [Hashemzadeh.2009]. Therefore, it is suggested that more studies are required regarding etiology and epidemiology to identify risk factors in different areas.

Declaration

Ethics approval and consent to participate

This research has done by Changiz Rostami, MSc. of Epidemiology as part of his dissertation, in Ilam University of Medical Sciences with code of Ethics **ir.medilam.rec.1395.91**. But Results of this paper was side information from the thesis.

***Consent for publication*:**

- All authors of the manuscript have read and agreed to its content and are accountable for all aspects of the accuracy and integrity of the manuscript in accordance with ICMJE criteria

- That the article is original, has not already been published in a journal, and is not currently under consideration by another journal.

Availability of data and materials

The datasets used during the current study are available from the first author on reasonable request.

Acknowledgment

We are grateful to all staff of Cancer Registry based population Center in Khuzestan province for their cooperation (Dr. Nemanee and Ms. Maryam Mombeiny and Azam Kaseb) , and also we are appreciate to Deputy of Research and Deputy of Health in Ahvaz Jundishapur University of Medical Sciences.

References

Afzali M, Mirzae M, Saadati H, Mazlomi-mahmodabadi SS. Skin of cancer Epidemiology and time trend changes occur in Iran. *Biomonthly Journal of Faiz*. 2013;17(5):501-11.

Akorafas G, Krespis E, Pavlakis G. Risk estimation for breast cancer development a clinical perspective. Surg Oncol. 2002;10(4):183-92.

Al-Ahmadi K, Al-Zahrani A. Spatial Autocorrelation of Cancer Incidence in Saudi Arabia. Int J Environ Res Public Health. 2013;10:7207-28.

Amoori N, Cheraghi M, Fallahzadeh H, Rahmani H. Lack of Association between Using Aspirin and Development of Non-Hodgkins Lymphoma: A Meta-analysis study. *Asian Pac J Cancer*. 2015;16 (2):787-92.

Amouzgar MH, Yazdanpanah MJ, Ebrahimirad M. Frequency of different skin cancer in Qaem hospital of Mashhad, from 1975-1995: A cross-sectional study. Iran J Dermatol. 2006;19:28-34.

Ansing AC, Heintz AP. Epidemiology and etiology of squamous cell carcinoma of the vulva. *Eur J Obstet Gynaecol Reprod Biol*. 1993;48:111-5.

Behrooz MA, Seif F, asl JF, Behrooz L. Variation of cosmic ultraviolet radiation measurements in Ahvaz at different months of year. *Jundishapur Sci Med J*. 2011;9:45-50.

Coolins GL, Nickoonahand N, Morgan MB. Changing demographics and pathology of nonmelanoma skin cancer in the last 30 years. Semin Cutan Med surg. 2004;23:80-3.

Darvishizadeh N. The retrospective study of non-melanocytic skin cancer in Emam Khomeini hospital of Ahwaz from 1373-1377. Iran J Dermatol. 1999;2:16-22.

Dfleming M, Hunt JR, Purdue GF. Marjolin's ulcers: A review and reevaluation of a difficult problem. Burn Care Rehab. 1990;11:460-69.

Glick B. The spatial autocorrelation of cancer mortality. SciMedGeogr. 1979;13:123-30.

Goldman GD. Squamous cell cancer: A practical approach. Semin Cutan Med Surg. 1998;17:80-95.

Hashemzadeh MS. Epidemiological Study of Lung Cancer in East Azerbaijan, Iran. J Cardiovasc Thorac Res. 2009;1(4):7-12.

HHS (U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES). 2003. Cancer and the environment: what you need to know. Washington, D.C:HHS

Hoshor A, Zartosht M. Geographical pathology Iran. 2002;1:4.

http://www.who.int/mediacentre/factsheets/fs297/en/ WCFsNWHOFCJAf.

Hunter J. The geography of health and disease. In The challenge of medical geography (Edited by:Chapel Hill). NC: University of North Carolina1974.

Irigaray P, Newby JA, Clapp R, Hardell L, Howard V, Montagnier L, et al. Lifestyle-related factors and environmental agents causing cancer: an overview. Biomedicine & pharmacotherapy. 2007;61:640-58.

Jones K, Duncan C. Individuals and their ecologies: analysing the geography of chronic illness within multilevel modeling framework. Health & Place. 1995;1(1):27-40.

Karami K, Cheraghi M, Amori N, Pedram M, Sobhani A. Common Cancers in Khuzestan Province, South West of Iran, during 2005-2011. Asian Pac J Cancer Prev. 2014;15 (21):9475-8.

Kennedy M. the global positioning system and GIS. Second Edition Taylor & Francis ed2002.

Kennedy S. A geographic regression model for medical statistics. Soc Sci Med. 1988;26(1):119-29.

Konstantinos L, Leiter U, Meier F, Eigentler T, Metzler G, Moehrle M, et al. Age and gender are significant independent predictors of survival in primary cutaneous melanoma. Cancer Causes Control. 2008;112(8):1795-80.

Kricker A, Armstrong BK, English DR. Sun exposure and non-melanocytic skin cancer. Cancer Causes Control. 1994;5:367-92.

Lee CV, LIrving J. Sources of spatial data for community health planning. Journal of Public Health Management and Practice. 1999;5:7-22.

Leshin B, LWhite W. Malignant neoplasm's of keratinocytes. In: Arndt KA, Leboi PE,

Robinson JK, Wintroub BU. Cutaneous medicine and surgery 1st Ed Philadelphia WB: Saunders Company. 1996:1378-440.

Marjani A, Kabir MJ. Male skin cancer incidence in Golestan province, Iran. J Pak Med Assoc. 2009;59(5):287-9.

Mackie RM, Quinin AG. Non-melanoma skin cancer and other epidermal skin tumors In: Burns T, Breathnach S, Cox N, Griffiths C. Rook' s textbook of dermatology. Oxford Blackwell Science Publication. 2004;36:1-36.

Mayer J. The role of spatial analysis and geographic data in the detection of disease causation. Soc Sci Med. 1986;17:1213-21.

Mehrabi Y, Yavari P, Abadi A. A study of cancer patterns among inpatients of public hospitals in Iran. Asian Pac J Cancer Prev 2004.387-92:(4)5.

Mobarak-Abadi A, Rajabi R, Khani Y, Almasi-Hashiani A. Epidemiology of skin cancer in Markazi Province, *Iran. Dermatology and Cosmetic*. 2013;4(3):120-6.

Mousavi F, Golestan B, Vaseie M, Vaseie L, Khajeh-Kazemi R. Knowledge, attitude, and practice of adults to the protective actions against sun in northwest Tehran, Iran. Arch Iran Med 2011;14:126-31.

Noorbala MT, Kafaie P. Analysis of 15 years of skin cancer in central Iran (Yazd). *Dermatol Online J*. 2007;13(4):1.

Parker S, Tong T, Bolden S, Wingo P. Cancer statistic 1997. CA cancer J Clin. 1997;47:5-27.

Rahnama Z. Relationship between age, gender and site of lesion with pathologic score in squamous cell carcinoma. *Iran J Dermatol*. 2002;1:5-10.

Rhodes LE, Rie Md ,Enström Y, Groves R, Morken T, Goulden V, et al. Photodynamic therapy using topical methyl aminolevulinate vs surgery for nodular basal cell carcinoma. Arch Dermatol. 2004;140:17-23.

Rostami C, Asadollahi K, Sayehmiri K, Cheraghi M. Incidence rate of gastric cancer and its relationship with geographical factors using GIS in Khuzestan Province between 2009 and 2013. Scientific Journal of Kurdistan University of Medical Sciences. 2017;29:129-139.

Schaffer JV, Rigel DS ,Kopf AW, Bolognia JL. Cutaneous Melanoma past, present and future. *J Am Acad Dermatol*. 2004;51: 65-9.

Taylor SR. SunSmart Plus: the more informed use of sunscreens. Med J Aust. 2004;180:36-7.

Thom, A. 2008. Cancer will be the leading cause of death globally in 2010. http://www.givegain.com/cgi-in/giga?cmd=cause_dir_news_Item&cause_id=1056&news_id=57430 (Date of access: 21 Jan 2010).

Torre L, Bray F, Siegel R, at A. Cancer Statistics. Cancer J Clin. 2015;65:87-108.

Valavi E, Rafie S, Pakseresht P, Siadat S. Prevalence of skin cancer in southwest of Iran. koomesh. 2013;15 (1):83 - 8.

Volkovova K, Bilanicova D, Bartonova A, Letašiová S, Dusinska M. Associations between environmental factors and incidence of cutaneous melanoma. Review. Environmental Health. 2012;11:1-13.

Wang L, CHEN S. Environment, genome and cancer. Academie des Sciences (III) Sciences del la vie. 2001;324:1085-91.

Wilkinson P, Grundy C, Landon M, Stevenson S. GIS in Public Health. In GIS and Health (GISDATA Series 6). Edited by: Gatrell AC, Löytönen M. Taylor & Francis ed1998.

Wheeler BW, Allen J, Depledge MH, Curnow A. Radon and skin cancer in southwest England: an ecologic study. Epidemiology. 2012;23(1):44-52.

Wheeler BW, Kothencz G, Pollard AS. Geography of non-melanoma skin cancer and ecological associations with environmental risk factors in England. *British Journal of Cancer*. 2013;109:235-41.

Yazdanfar A, Ghasemi E. Frequency of skin cancers in Hamedan from 1991 to 2007. *Dermatology and Cosmetic Journal*. 2011;(2):115-123.