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Photodamage Effect of UV Rays on Skin on outdoor workers

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Abstract

Background: Skin is the outermost covering of the human body that serves as a barrier from extrinsic etiological challenges including physical, chemical and biological insults. Ultraviolet (UV)-B (280–320 nm) is the lead environmental agent responsible for causing skin pathologies, overexposure of ultraviolet radiation, particularly UV-B radiations, due to high energy and shorter wave length which are causes for most of the pathological states of skin. Skin cancers are classified into two main categories, non-melanoma skin cancer (NMSC) and cutaneous melanoma (CM). While melanoma originates through the transformation of melanocytes, NMSC arises from other epidermal cells, mainly keratinocytes, are subdivided into basal cell carcinoma (BCC) and squamous cell carcinoma (SCC). Skin cancers are considered to be one of the most preventable malignancies. By protecting the skin and limiting the amount of unprotected exposure to UVR, skin cancer risk can be decreased.

Objective: To describe the demographic and clinical features of skin cancer and evaluate the harmful effects of excess UVR exposure on human skin.

Patients and Methods: A cross-sectional stud was conducted at the dermatology department in Baquba teaching hospital in Diyala, Iraq. A total of 100 patients were included, in the study, who attended the outpatient clinic of dermatology department of Baquba teaching hospital, from first of September 2020 to end May 2021.

Results: A total of 100 patients diagnosed as skin cancer, were eligible for the study, aged between 30-80 years, The majority of them aged 41-50 years (39%), 50% of them were males and 50% were females, The majority of the patients, were laborer (31%), and 22% of them were housewives, Regarding residence, the majority of the patients (32%) lived in Kalar, and 27% resided in the Baquba, while just 3% from Mendeley, 83%percent of the patients, had white skin while just 17% of them had brown skin, and no one had black skin color, Regarding the affected site of the body, the face was the most common affected site of the body, found in (52%) of the patients. While face and neck were the most common affected site in 35% of the patients, and the least affected site was the face and hand found in 4% of the patients. Of the total patients, 99% were exposed to normal light while just 1% exposed to additional artificial light. Most of the patients (65%) said that they were exposed to the light over, all the season, while 24% of them were exposed to light just in summer, 8% and 3% of them were exposed in spring, summer and spring respectively. No one was exposed to light in autumn or winter,

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Just 4% of the patients had family history of skin cancer. There were 79% of the patients diagnosed as basal cell carcinoma; 14% had actinic keratosis, 5% had sun burn; and 2% had seborrheic keratosis. Regarding the patients with (BCC), most of the patients aged less than 70 years. Females were 50.6% of the patients with BCC, while males were 49.4%. The mean age of females was (53.6±12.9 years) was the same for males (53.6±11.6 years), females were affected by BCC in < 50 and ≥70 age group more than males, while males were affected more in 50-69 age group. Sixty-five percent of the patients had white skin while just 14% of them had brown skin. Regarding the affected site of the body, the face was the most common affected site of the body, found in (53.2%) of the patients, while face and neck were the most common affected site in 34.2% of the patients, and the least affected site was the face and hand found in 5.1% of the patients.

Conclusion: Outdoor workers, especially those without protective measures, and in high altitude areas, are more liable to develop skin cancer especially basal cell carcinoma, so it is important to use sun-protective measures.

Keywords: Photodamage, UV Rays ,Skin

Introduction

Skin is the outermost covering of the human body that serves as a barrier from extrinsic etiological challenges including physical, chemical and biological insults[1].

Ultraviolet (UV)-B (280–320 nm) is the lead environmental agent responsible for causing skin pathologies, overexposure of ultraviolet radiation particularly UV-B radiations due to high energy and shorter wavelength which are causes for most of the pathological states of skin [1,2].

Ultraviolet radiation (UV) exposure is recognized as a major environmental risk factor for both melanoma and keratinocyte cancers (Melanoma and non-melanoma skin cancers), both tumor entities currently represent the most common type of cancer among fair-skinned populations, with exceedingly increasing incidence rates worldwide in recent decades [3,4].

The rising incidence rates of non-melanoma skin cancers are probably caused by a combination of increased exposure to ultraviolet (UV) or sun light, increased outdoor activities, changes in clothing style, increased longevity, ozone depletion, genetics and in some cases, immune suppression [4,5].

Skin cancers are classified into two main categories, non-melanoma skin cancer (NMSC) and cutaneous melanoma (CM). While melanoma originates through the transformation of melanocytes, NMSC arises from other epidermal cells, mainly keratinocytes. Malignancies of keratinocytes, depending on the originating epidermal layer, are subdivided into basal cell carcinoma (BCC) and squamous cell carcinoma (SCC) [6].

Basal cell carcinoma is the most common malignancy in Caucasians worldwide, Squamous cell carcinoma is the second most common epidermal cancer, with an incidence of approximately 1035 or 472 per 100,000 person-years in men and women, respectively. Primary risk factors for both basal cell carcinoma and squamous cell carcinoma include light skin color, UV radiation exposure, and chronic immunosuppression [7].

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Melanoma is much more common in whites than in other ethnic groups. Overall, the lifetime risk of developing melanoma is about 2.4% in Caucasians, 0.1% in Blacks, and 0.5% in Hispanics [8].

Skin cancers are considered to be one of the most preventable malignancies. By protecting the skin and limiting the amount of unprotected exposure to UVR, skin cancer risk can be decreased [9].

The primary purpose of screening is to detect skin cancers earlier in their clinical course than would happen in usual care, allowing earlier and more effective treatment and thereby leading to a reduction in skin cancer morbidity and mortality [10].

Visual whole-body skin examination is the most common method for skin cancer screening performed by primary care physicians to identify and manage patients at high risk for future melanoma through clinical assessment. These risks include a person's age and sex, history of previous melanoma and no melanoma skin cancer; family history of melanoma, number of nevi (common and atypical), skin and hair pigment, response to sun exposure, and evidence of actinic skin damage [11].

A variety of treatment options are available and include surgical excision, cry therapy, radiation therapy (RT), and topical agents. Although surgical excision is considered to be the primary treatment approach for curative treatment of BCC and cSCC, RT can play an integral role in both the definitive and adjuvant settings [12].

Patients and Methods

A cross-sectional study was conducted at dermatology department in Baquba teaching hospital,32%from Kalar city and 27% reside in the Baqaba, while 3%from mendeley, Diyala province, Iraq.

The target population was the patients who attended the outpatient clinic of dermatology department of Baquba teaching hospital. A total of 100 patients were included in the study from 1st September, 2020 to 31st May, 2021.

Data were collected from medical records and questionnaires. Data collection was done through interviews with patients directly using a questionnaire that was used before for study skin cancer.

Informed consent was taken from patients to participate in the study and they were informed that their identity would not be revealed and that work was done for research purpose. The questions were in Arabic l and English copy, and consisted of two parts:

The first part included socio-demographic characteristics of the patients: age, sex, occupation.

The second part was designed to collect information about patients and skin cancer characteristics and clinical features: family history, type of skin, site of the body exposed to sun, exposure season, source of UV, previous plastic surgery, use of protection.

Administrative approvals were granted from the following:

Approval of administration obtained from Diyala Health Directorate.

Verbal consent was obtained from patients after explaining study objectives. All personal information was kept anonymous. Data were exclusively used for the sake of this study.

Statistical analysis

Data were fed to the computer and were analyzed using IBM SPSS software package (statistical package for social sciences program) version 24, and Microsoft Excel (2016).

ORIGINAL RESEARCH
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Qualitative data were expressed as frequency and percentages by frequency table. Graphically, the data were presented as bar and pie diagrams. Quantitative variables were presented as means and standard deviations (SD).

Results

A total of 100 patients diagnosed as photodermatosis, malignancies and non-malignancies skin cancer, were eligible for the study, aged between 30-80 years; majority of them aged 41-50 years (39%), 50% of the patients were males and 50% were females.

The majority of the patients were laborer (31%), and 22% of them were housewives. Eighty-three percent of the patients had type-III skin, while just 17% of them withtype-IV, and no one had type- III colour.

Regarding the affected site of the body, the face was the most common affected site of the body, found in (52%) of the patients, then face and neck were the most common affected site in 35% of the patients, and the least affected site was the face and hand found in 4% of the patients, the majority of the patients (62%) exposed to the sun from 6-8 hours. Of the total patients, 99% were exposed to normal light while just 1% was exposed to additional artificial light.

Most of the patients (65%) said that they were exposed to the light over all the season, 24% of them were exposed to light just in summer, 8% and 3% of them were exposed in (spring and summer), spring respectively. No one was exposed in autumn or winter.

Just 4% of the patients had a family history of skin cancer, and no one had a history of plastic surgery. Regarding equipment protection, 13% of the patients wear a Ghutra, 8% of them wear hat, and no one wears glasses or mask.

There were 79% of the patients diagnosed as basal cell carcinoma. 14% had actinic keratosis, 5% had sun burn, and 2% had seborrheic keratosis, as shown in Table (1).

Table (1): Distribution of the patients according to the diagnosis

Diagnosis	No.	%
BCC	79	79%
Actinic keratosis	14	14%
Sun burn	5	5 %
Seborrheic keratosis	2	2%

Regarding the patients with BCC, their mean age was 53.4±12.1 years (range 35-79), and most of the patients aged less than 70 years. Females were 50.6% of the patients with BCC, while males were 49.4%. The mean±SD age of females was (53.6±12.9 years) and the same for males (53.6±11.6 years). Females were affected by BCC at < 50 and ≥70 age group more than males, while males were affected more in 50-69 age group. Sixty-five percent of the patients had type-III skin while just 14% of them with type skin. Of the total patients with BCC, 5.1% had a positive family history.

Regarding the affected site of the body, the face was the most common affected site of the body which accounts (53.2%), while the face and neck accounted 34.2% of the patients, and the least affected site was the face and hand in which accounted 5.1% of the patients Table (2).

ORIGINAL RESEARCH
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Table (2): Distribution of the patients with BCC according to their affected part of the body

Exposed part of the body	No.	%
face	42	53.2
face & neck	27	34.2
face & head	6	7.6
face& hand	4	5.1
Total	79	100

Regarding residence, the majority of patients (30.4%) lived in Kalar, and 26.6% resided in the Baquba, while just 3% were from Mendeley, as shown in Table (3).

Table (3): Distribution of the patients with BCC according to their residence

Residence	No.	%
Kalar	24	30.4
Baquba	21	26.6
Hamrin	13	16.5
Khanaqin	9	11.4
Saadia	5	6.3
Jalawla	4	5.1
Mendeley	3	3
Total	79	100

Discussion

Solar ultraviolet radiation is the main cause of skin cancer, that is a major health problem especially for outdoor workers, whose exposure is habitual during the hours around solar noon where solar UV radiation is most intense. The only way to prevent this problem is by the better use of sun protection [13].

In the present study, 79% of the patients were diagnosed as basal cell carcinoma, 14% had actinic keratosis, 5% had sun burn, and 2% had seborrheic keratosis, the (Henning J S, 2010) study found out that 8% (n=205) of the total visits were for skin cancer. This includes: basal cell carcinoma, squamous cell carcinoma, mycosis fungoides and melanoma. Actinic keratosis comprised 5% of the total visits (n=129), (Grandahl, K., 2018) study [13] found that 88.9% of the patients had a history of sunburn at work.

The current study found out the equipment protection, 13% of the patients wear Ghutra, 8% of them wear hat, no one wear glasses or mask, these results were comparable with what was found by (Grandahl, K., 2018) study [13], which reported the proportion of outdoor workers that use sun protection at work, was for shade seeking around noon 4.2%, sunscreen 34.5%, wide-brimmed hat 25.3%, and long trousers and shirt with sleeves 42.4%.

Similar to the present study, which found out the majority of the patients were labourers and farmers, the previous study (Papadopoulos I., 2020) reported that the majority of people who were mainly engaged in building work and farming.

The current study demonstrated that BCC consisted (79%) of the lesion that caused by UV exposure, in contrast to Al Hasnawi S (Al Hasnawi S, 2009) [14] who reported that

ORIGINAL RESEARCH
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the BCC was the commonest skin cancer in Iraq, BCC was 43% of all skin cancers.

The current study found out that 79 patients, diagnosed as BCC were enrolled in current study in a period of 9 months, while Al-Zoubaidi MS et al study (Al-Zoubaidi MS, 2016) [15] demonstrated that 39 patients with basal cell carcinoma were found in a period of 22 months, the study was done carried out at department of Dermatology in Baghdad Teaching Hospital, Medical City. But, another study carried out in Pakistan (Laishram R, 2010) [16] found that SCC was the most common consisting of 43.6% cases followed by BCC with 32.6% cases.

The mean age of patients with BCC was 53.4±12.1 years (range 35-79), while Al-Zoubaidi MS study (Al-Zoubaidi MS, 2016) [15] showed that their ages ranged from 30-87 with a mean and SD of 64.114 ± 12.68 years. In the latter the patients were older than the patients in the current study. Although elderly patients spend more time sitting in shaded areas and not working in outdoors so the risk of skin cancers increases with lifelong accumulated UVB dose.

Similar to present study, a study carried out by previous Mohammed HA study (Mohammed HA,2017) [17] found that the patients age ranged from 10 to 84 years with mean age of 55.64 ±14.6and most of them were above forty years old.

The current study noted that there was no predominance among sex (50.6% females and 49.4% males, while significant predominance among males was reported by a study carried out by Al-Zoubaidi MS et al study (Al-Zoubaidi MS, 2016) 15 who found that 82% males and 18% females with male-to-female ratio 4:1. While Mohammed HA et al study (Mohammed HA,2017) reported that there were 44.74% males and 55.26% females.

The current study demonstrated that the most common affected site was the face (53.2%). This finding was in agreement with others 15 who found that 72.6% of the lesions were located on the face. Similarly, other studies [16,17] demonstrated that BCC was most commonly implicated in the face. Mohammed HA et al study [17], found that 94.73% of lesions were located in the sun exposed areas and 5.27% in other areas of the body.

These results supported the fact that the most common cause of skin cancer is sun exposure.

In the present study, the second affected location was face and neck (34.2%) followed by face and hand 5.1%, while Al-Zoubaidi MS study [15] showed that the second affected site was the scalp that found in 16.12% of the total lesions and the rest of the lesions (11.3%) distributed on the different sites of the body (neck and hand).

Although the current study agrees with another study [15] in that the common site affected was face, other distribution was different, it might be related to the methods which the two studies were calculated by.

In the present study, males and females were the same age in contrast to Al-Qarqaz F study [18] that reported males tend to get BCC at a younger age than females.

In the present study 65% of the patients were exposed to the light over all the season, 24% during the summer-time, also (Henning J S, 2010) [19] found that the majority of the patients worked outdoors during the summer-time.

ORIGINAL RESEARCH
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The current study demonstrated that the majority of the patients (30.4%) live in Kalar which is a high latitude area mean that the frequency of its occurrence that depends on the geographical area; these results are consistent with those obtained in a study carried out by (Qureshi A, 2008) [20], in these areas people experience relatively high levels of sun exposure. Papadopoulos., 2020 study [21] carried out in Greek, demonstrated that since the increase in altitude is accompanied by an increase in exposure to ultraviolet radiation, one would expect that skin damage due to photoaging and precancerous and cancerous lesions would be the same in the two populations or slightly more pronounced in the highlands because of altitude.

Conclusions

We conclude that sun exposure diseases are associated with persons who are young and middle age group, laborers and farmers, resident in high altitude areas, those with white skin, face was mostly affected. And the exposure is mainly in summer season, the use of sun protection at work was largely neglected in outdoor workers and few of them used Ghutra or hat, basal cell carcinoma was the most common cancer in Diyala, found in young and middle age group, resident in high altitude areas, those with white skin and face was mostly affected, as the basal cell carcinoma is the most common skin cancer, it should be under constant study, in order to monitor its epidemiology and its trend.

Recommendations

Recommended strategies for personal sun protection, such as shade, clothing, sunglasses and sunscreen, further research and data are required to assess the incidence of skin cancer and any associated factors, the effectiveness of personal sun protective measures.

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Ethical clearance: The project for this study was taken from the College of Medicine/ University of Diyala ethical committee.

Conflict of interest: Nill

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دراسة تأثير الأشعة فوق البنفسجية كسبب لسرطان الجلد على العمال خارج المنزل

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الملخص

خلفية الدراسة: الجلد هو الغطاء الخارجي لجسم الإنسان فهو يعمل كحاجز من المؤثرات الخارجية بما في ذلك الاضرار الجسدية والكيميائية والبيولوجية. الأشعة فوق البنفسجية (320-280) B-(UV نانومتر) هو العامل البيئي الرئيسي المسؤول عن التسبب في أمراض الجلد ، والتعرض المفرط للأشعة فوق البنفسجية وخاصة الأشعة فوق البنفسجية نوع B فهو وبسبب الطاقة العالية والطول الموجي الأقصر يسبب معظم الحالات المرضية للبشرة. تصنف سرطانات الجلد إلى فئتين رئيسيتين، سرطان الجلد غير الميلانيني NMSC وسرطان الجلد الجلدي (CM) في حين ينشأ الورم الميلانيني من خلال تحويل الخلايا الصباغية ، ينشأ NMSC من خلايا البشرة الأخرى ، وخاصة الخلايا الكيراتينية. تنقسم الأورام الخبيثة من الخلايا القرنية ، اعتمادا على طبقة البشرة الأصلية ، إلى سرطان الخلايا القاعدية (BCC) وسرطان الخلايا الحرشفية (SCC). تعتبر سرطانات الجلد واحدة من أكثر الأورام الخبيثة التي يمكن الوقاية منها من خلال حماية الجلد والحد من كمية التعرض للأشعة فوق البنفسجية ، يمكن تقليل خطر الإصابة بسرطان الجلد.

اهداف الدراسة: لوصف السمات الديموغرافية والسريرية لسرطان الجلد وتقييم الآثار الضارة للتعرض الزائد للاشعة فوق البنفسجية على جلد الإنسان.

المرضى والطرائق: دراسة مقطعية أجريت في قسم الأمراض الجلدية في مستشفى بعقوبة التعليمي في محافظة ديالى، العراق. تم ضم ما مجموعه ١٠٠ مريض للدراسة من الذين يترددون على العيادة الخارجية لقسم الأمراض الجلدية في مستشفى بعقوبة التعليمي، من الأول من سبتمبر ٢٠٢٠ حتى نهاية مايو ٢٠٢١ . تم تغذية البيانات إلى الكمبيوتر وتحليلها باستخدام حزمة برامج IBM SPSS (حزمة إحصائية لبرنامج العلوم الاجتماعية) الإصدار ٢٤ ، و(Microsoft Excel 2016).

النتائج: ما مجموعه ١٠٠ مريض تم تشخيصهم بسرطان الجلد، كانوا مؤهلين للدراسة، تراوحت أعمارهم بين ٣٠-٨٠ سنة، ومعظمهم تراوحت أعمارهم بين ٤١-٥٠ سنة (٣٩٪)، ٥٠٪ من الذكور و ٥٠٪ كانوا من الإناث، وغالبية المرضى كانوا عمال (٣١٪)، و ٢٢٪ منهم ربات بيوت. فيما يتعلق بالسكن، غالبية المرضى (٣٢٪) يعيشون في كالار، و ٢٧٪ يقيمون في بعقوبة، في حين أن ٣٪ فقط كانوا من مندلي، وثلاثة وثمانين في المئة من المرضى لديهم بشرة بيضاء في حين أن ١٧٪ منهم فقط مع الجلد البني، وليس لأحد لون البشرة السوداء. فيما يتعلق بالموقع المصاب من الجسم، وكان الوجه الموقع الأكثر شيوعا المتضررة من الجسم، وجدت في (٥٢٪) من المرضى. في حين أن الوجه والرقبة كانا الموقع الأكثر اصابة في ٣٥٪ من المرضى، وكان الموقع الأقل تضررا هو الوجه واليد الموجودين في ٤٪ من المرضى. من بين إجمالي المرضى، تعرض ٩٩٪ للضوء الطبيعي بينما تعرض ١٪ فقط للضوء الاصطناعي الإضافي، معظم المرضى (٦٥٪) وقال انهم يتعرضون للضوء على مدى كل موسم ، ٢٤ ٪ منهم يتعرض فقط في الصيف ، ٨ ٪ و ٣ ٪ منهم يتعرضون في (الربيع والصيف) ، والربيع على التوالي ، لا أحد يتعرض في الخريف أو الشتاء ، فقط ٤ ٪ من المرضى لديهم تاريخ عائلي من سرطان الجلد. وفيما يتعلق بحماية المعدات، يرتدي ١٣٪ من المرضى الغترة، و٨٪ منهم يرتدون قبعة، ولا أحد يرتدي نظارات أو قناعا. وان ٧٩٪ من المرضى تم تشخيصهم بسرطان الخلايا القاعدية BCC، و ١٤٪ لديهم كيراتوسيس أكتيني، و ٥٪ لديهم حرق الشمس، و ٢٪ كان لديهم القرنية الدهنية. وفيما يتعلق بالمرضى الذين يعانون من BCC، كان متوسط أعمارهم ٥٣,٤±١٢,١ سنة (تتراوح أعمارهم بين ٣٥-٧٩)، ومعظم المرضى أعمارهم اقل من ٧٠ عاما. و من الإناث ٥٠,٦٪ من المرضى الذين يعانون من BCC، في حين كان الذكور ٤٩,٤٪. وكان متوسط عمر الأنثى (٥٣,٦±١٢,٩ سنة) هو نفسه بالنسبة للذكور (٥٣,٦±١١,٦ سنة)، والإناث المصابات ب BCC في سن ٥٠ <، ≤٧٠ سنة أكثر من الذكور، والذكور أكثر تضررا في الفئة العمرية ٥٠-٦٩. ٦٥ في المئة من المرضى لديهم بشرة بيضاء في حين أن ١٤٪ منهم فقط مع الجلد البني. وفيما يتعلق بالموقع المصاب من الجسم، كان الوجه هو الموقع الأكثر تأثرا من الجسم ، وجد في (٥٣,٢٪). من المرضى. في حين أن الوجه والرقبة كانا الموقع الأكثر تأثرا في ٣٤,٢٪ من المرضى ، وكان الموقع الأقل تضررا هو الوجه واليد الموجودين في ٥,١٪ من المرضى.

الاستنتاجات: العمل في الخارج خاصة بدون تدابير وقائية، وفي المناطق المرتفعة مرتبط بسرطان الجلد وخاصة سرطان الخلايا القاعدية، لذلك من المهم اتخاذ تدابير وقائية من الشمس.

الكلمات المفتاحية: ضرر ضوئي ، الأشعة فوق البنفسجية ، جلد

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تاريخ استلام البحث: ٢٢ آب ٢٠٢١

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