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Characterization of skin Tumors in an Egyptian large tertiary center: A cross-section study

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***Abstract*---**Skin tumors are a global health problem caused by UV exposure with ethnic and geographical distribution. This research summarized Egyptian skin tumor features. A cross-sectional study was conducted in the Al-Hussein Teaching Hospital, Al-Azhar University, Cairo, Egypt. Patients' data were collected from the hospital-recorded registry from January 2010 to December 2020. Results: The age group, 19-59y, showed the highest prevalence, 57% (n=940), of skin tumors. The total number of skin tumor patients was 1649 (males 52.9% (n=872), females 47.1% (n=777). For benign skin tumors, the male-to-female ratio was 1: 0.96, and for malignant skin tumors, the male-to-female ratio was 1: 1.47. The frequency of skin tumors at the sun-exposed site (out of the total n= 1770) was 39.4% (n= 697) and the face showed the highest frequency 25.8% (n=457). The frequency of skin tumors at the non-sun-exposed sites was 60.6% (n=1073) of the total skin tumor number. Basal cell carcinoma (BCC) showed a frequency of 90.1% of cases affecting sun-exposed sites. Therefore, skin tumors have unique characteristics in Egypt, with malignant skin tumors being rare showing more predilection in males. Further studies are needed to emphasize the national characteristics of skin tumors in Egypt.

***Keywords*---**skin tumor, basal cell carcinoma, melanoma, ultraviolet.

1. Introduction

The skin is prone to developing a broad range of tumors, some of which are benign and others of which are malignant. These might arise from the epidermis, the dermis, the subcutaneous tissue, or the appendages (Bhatt et al., 2017). Epidermal-derived malignant skin tumors are categorized into malignant melanoma and nonmelanoma skin cancer (Higgins et al., 2018). The frequency and incidence of malignant skin tumors differ according to the epidemiological characteristics of the individuals. In Caucasians, the incidence rate of cutaneous melanoma and keratinocyte cancer comprises 40% of all

malignancies (Hubner et al., 2018; Schadendorf et al., 2015). Overexposure to ultraviolet radiation (UV), generated naturally by the sun (Liu et al., 2021) and artificially by sunbeds and other tanning equipment (Reichrath et al., 2020) is a recognized risk factor for developing melanoma (Burgard & Reichrath, 2020a). However, exposure to ultraviolet (UV) radiation is the main reason for the high percentage of skin cancer among Caucasians (Leiter et al., 2020). There is a rise in the incidence rates of cutaneous melanoma from 2-4/100,000 person-year to 10-15 per 100,000 person-year in the US and Europe, with high incidence rates in Australia and New Zealand, from 40 to 60 per 100,000 person-year (Bolick & Geller, 2021; Garbe & Leiter, 2009). However, the mortality rate rises less aggressively (Rubin, 2020). In 2020, the age-standard rate (ASR) of new melanoma cases was estimated to be 3.4 per 100,000 persons and the ASR of death from melanoma worldwide was 0.56 per 100, 000 person (Arnold et al., 2022). In addition, melanoma was classified as the fifth most prevalent form of cancer in the 27 Member States of the European Union (EU), and it was regarded as one of the 15 most common causes of death due to cancer in EU-27 (Koczkodaj et al., 2023). The most recent update from the American Cancer Society projections state that, nearly 98,000 new cases of melanoma will be diagnosed by 2023 (Lembo et al., 2022). Conversely, it was observed that keratinocyte cancer follows the same trend as cutaneous melanoma (Leiter et al., 2020). The incidence of keratinocyte cancer is higher than that of melanoma with an extremely low mortality rate (Rogers et al., 2015). On the contrary, the rates are markedly low in individuals with dark skin. In the United States (US), the incidence of epidermal skin malignancy is around 2% among African Americans (Higgins et al., 2018).

On the other hand, nonmelanoma skin cancer affects mostly Whites (96.3%), especially males, and to less extent Hispanics (2.9%) and Asians (0,8%) with female predominance (Loh et al., 2016). However, the rate of mortality and morbidity are unexpectedly elevated in individuals with dark skin (Higgins et al., 2018). Squamous cell carcinoma (SCC), basal cell carcinoma (BCC), and Merkel cell carcinoma are the most common nonmelanoma skin malignancies (Roland & Memon, 2023). BCC is the most common cutaneous malignancy in Caucasians, Asians, and Hispanics, and ranked second among African American skin malignancies. SCC is the second most common in Caucasians, Hispanics, and Asians (Higgins et al., 2018). The incidence of BCC in cases per 100,000 person-year was reported to be 360 while that of SCC was 207.5 in men with a trend to a disproportionate rise in women (Leiter et al., 2020). The risk factors for the development of SCC are immune suppression, continuous exposure to UV, skin scarring, and chronic inflammatory diseases (Table1) (Gupta et al., 2016). Another contributing risk factor is UV exposure, which triggers the process of carcinogenesis by causing DNA damage, resulting in the formation of mutations, and simultaneously compromising the host immune system's capacity to detect and eliminate malignant cells (Gruber & Zito, 2023). On the other hand, BCC develops as a result of exposure to UV-B radiation in Caucasians (Teng et al., 2021). Although benign skin tumors are comparatively uncommon worldwide, their prevalence has been steadily growing over the past several decades (Sinikumpu et al., 2014; Tukenmez Demirci et al., 2015). The epidermis, adnexal tissues, and dermis contribute to the development of skin tumors, making accurate categorization challenging (Shrivastava et al., 2019).

Benign skin tumors include melanocytic naevus (Macneal & Patel, 2023) seborrheic keratosis (Myroshnychenko et al., 2022) cherry angioma (Nazer et al., 2020) dermatofibroma (Myers & Fillman, 2023) and lipomas. Acrochordon was concluded to be the most common benign keratinocyte tumor, followed by appendageal and melanocytic tumors (Thapa et al., 2021).

Evidence-based data should be the foundation for effective health policies, treatments, and artificial skin reconstruction (Lembo et al., 2020), in specific groups. Given that the incidence of benign and malignant skin tumors varies geographically, it is critical to determine the prevalence of both benign and malignant skin cancers in Egypt. In addition, the demographic distribution of both benign and malignant skin tumors in Egypt would assist the authorities in charge of Egypt's healthcare in planning measures to limit the occurrence of the disease and directing their efforts toward proper therapy. As a result, this research was carried out to provide insight into the prevalence of skin tumors**,** as well as the demographic features of the patients in one of the large centers in Egypt. Many people from other Egyptian governorates visit Cairo to have treatment for a skin tumor. Therefore, a significant portion of the Egyptian population affected by skin tumors might be represented by our facility. Consequently, the results of this study would contribute to the effort exerted to demonstrate the prevalence of skin tumors in Egypt. Additionally, the findings of this study may serve as a guide for public health programs aimed at lowering skin tumor morbidity and mortality in Egypt.

Table1: Prevalence and Characteristics of Benign and Malignant Skin Tumors

Skin Tumor	**Mortality Rate (per 100,000 person-year)**	**Demographic Distribution**	**Risk Factors**	**Ref.**
Melanoma	High	Higher in Caucasians	UV exposure (natural and artificial), geographic variation	**(Burgard & Reichrath, 2020b)**
Keratinocyte Cancer	Low	Higher in Caucasians	UV exposure, immune suppression, chronic inflammation	**(Li et al., 2022)**
Squamous Cell Carcinoma (SCC)	High	Predominantly in Cauca-sians, Hispanics, and Asians	UV exposure, immune suppression, chronic inflammation, skin scarring	**(Urban et al., 2021)**
Basal Cell Carci-noma (BCC)	Low (compared to SCC)	Predominantly in Cauca-sians, Asians, and His-panics	UV exposure (particularly UV-B radiation)	**(Dika et al., 2020)**

Skin Tumor	Mortality Rate (per 100,000 person-year)	Demographic Distribution	Risk Factors	Ref.
Benign Skin Tumors	N/A	N/A	N/A	

2. Materials and Methods

2.1.Study design and setting
A cross-sectional study was conducted in the Al-Hussein Teaching Hospital which is affiliated with the Faculty of Medicine, Al-Azhar University, Cairo, Egypt. The data of the patients were collected from the hospital-recorded registry from January 2010 to December 2020, over four months.

2.2.Study population
Patients with skin tumors, either benign or malignant, and no other identified forms of cancer were included in the data collection. A benign skin tumor was presented as a macule, papule, nodule, keratotic, cystic, or subepidermal lesion. Bening skin tumor can be multiple, stable, and grow slowly, uniform in surface, color, and structure. Most of the lesions are symmetrical in shape, with no bleeding or ulceration and if so, it may be due to recent trauma, and no tendency for metastasis. Malignant skin tumor was presented as plaque, nodule, or ulcer. Malignant skin tumor are usually solitary, grow rapidly, ulcerate and bleed, and tend to metastasize (Higgins et al., 2018; Khandpur & Ramam, 2012).

The diagnosis of a skin tumor had to have been validated by a skin biopsy, which ought to have been diagnosed by a trained dermatopathologist and ought to have been connected to the clinical examination. Excisional biopsy, shave biopsy, and punch biopsy were the three types of biopsies that were performed to diagnose a skin tumor. The method of skin biopsy that was performed was determined by the type, location, and extent of the lesion. Only the data that were documented by an expert dermatologist were considered valid. For reasons of confidentiality, the patient's name has been masked and anonymized. As a direct result, a total of 1649 instances were determined to be appropriate for the research.
In addition, recorded data from the clinical examination of the patients were included:

a. General examination: vital signs (pulse, blood pressure, respiratory rate, and temperature), consciousness status, head and neck examination, chest examination, and abdominal examination results.
b. Local Examination of the skin lesion and draining lymph nodes.

We also considered collecting family history of the same skin pathology including the history of specific habits such as smoking, history of other conditions such as hyper-tension, pharmacological history, and surgical history.

2.3 Data Selection and Processing
All the registered patients were included in the study. The patients were categorized as follows

1. Age
2. Sex.
3. Patient residence per governorate.
4. Tumor pathological type
5. Type behavior: benign or malignant.
6. Site of the tumor, which is classified into:
   a. Sun-exposed sites which are the scalp, face, ear, and neck.
   b. Non-sun exposed sites are the oral cavity, tongue, chest, breast, abdomen, back, axilla, upper limbs, lower limbs, genitalia, groin, and perineum.

2.4.Outcomes

The frequencies and patterns of benign and malignant skin tumors (pathology) concerning: age, sex, geographical distribution, sun exposure as well as the hange in the frequency of malignant tumor over time (Trend). The association between the occurrence of malignant skin tumor and risk factors including age, *sex*, and site. The comparison between skin tumor in the sun-exposed sites and non-exposed sites.

2.5.Administrative and ethical design

Official permission was obtained from Al-Azhar University Hospitals and the head of the Dermatology, Andrology, and Venereology department to collect data from the department archive. The Institutional Review Board (IRB) of the Faculty of Medicine, Al-Azhar University gave its approval. Informed consent was obtained for two distinct aspects of this study. For the retrospective record-dependent, registry-based study, informed consent was not required as per ethical guidelines due to its retrospective nature. However, for the publication of images, prior informed consent was obtained from participating patients. Patients were provided with comprehensive details regarding the study's objectives, the utilization of their images, as well as the potential risks and benefits involved. They were assured of the confidentiality of their identities, and their consent was entirely voluntary. The consent procedure was conducted in accordance with ethical guidelines and legal requirements. Verbal consent was obtained from all patients, and original signed consent forms are securely retained at our institution.

2.6 Statistical analysis plan

Quantitative parametric data were presented as mean and standard deviation (SD) and qualitative variables were presented as frequency and percentage (%). Independent T-test, chi-square, and Fisher's exact test were done to study the association of characteristics between patients with benign and malignant tumors. Mann-Kendall trend test (using R software, package "trend") was done to study the presence of a trend in the proportion of malignant cases over time. Logistic regression was performed to assess the association between factors and malignant results. IBM SPSS 28 for Windows software was used for the analysis, and a P-value < 0.05 is considered statistically significant.

3. Results

3.1 Descriptive and inferential statistics

Table 2*:* Characteristics of studied patients (N=1649)

	Mean	**SD**
Age	37.28	21.22
	N	**%**
Sex		
Female	777	47.1
Male	872	52.9
Type of Tumor		
Benign	1039	63.0
Malignant	610	37.0
Tumor location		
Face	315	19.1
Lower limb	274	16.6
Upper limb	242	14.7
Back	183	11.1
Scalp	159	9.6
Abdomen	142	8.6
Nose	98	5.9
Groin	75	4.5
Chest	70	4.2
Neck	47	2.9
Genitalia	44	2.7
Lip	44	2.7
Ear	34	2.1
Tongue	22	1.3
Axilla	10	0.6
Perineum	6	0.4
Breast	3	0.2
Oral cavity	2	0.1

Table 2 presents the characteristics of 1,649 patients enrolled in the study. The patients had a mean age of 37.28 years, 47.1% of patients were female and 52.9% were male. The majority of patients had benign tumors (63.0%), while 37.0% had malignant tumors (Figure 1). Regarding tumor location, the most common sites are the face (19.1%), followed by the lower limb (16.6%), upper limb (14.7%), and back (11.1%). While the least common sites are the oral cavity (0.1%), breast (0.2%), premium (0.4%), and axilla (0.6%) (Figure 2).

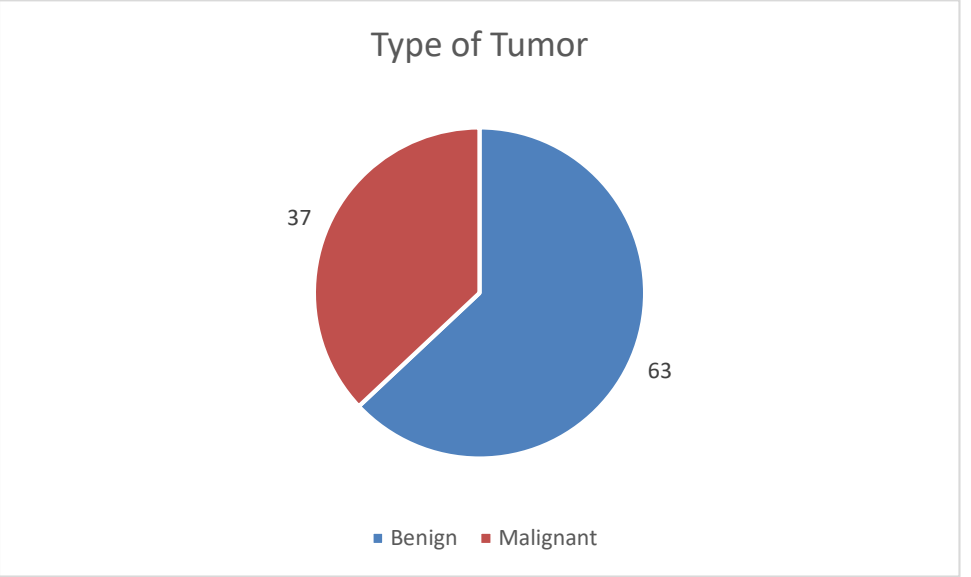

Figure 1: Type of tumor of the studied patients

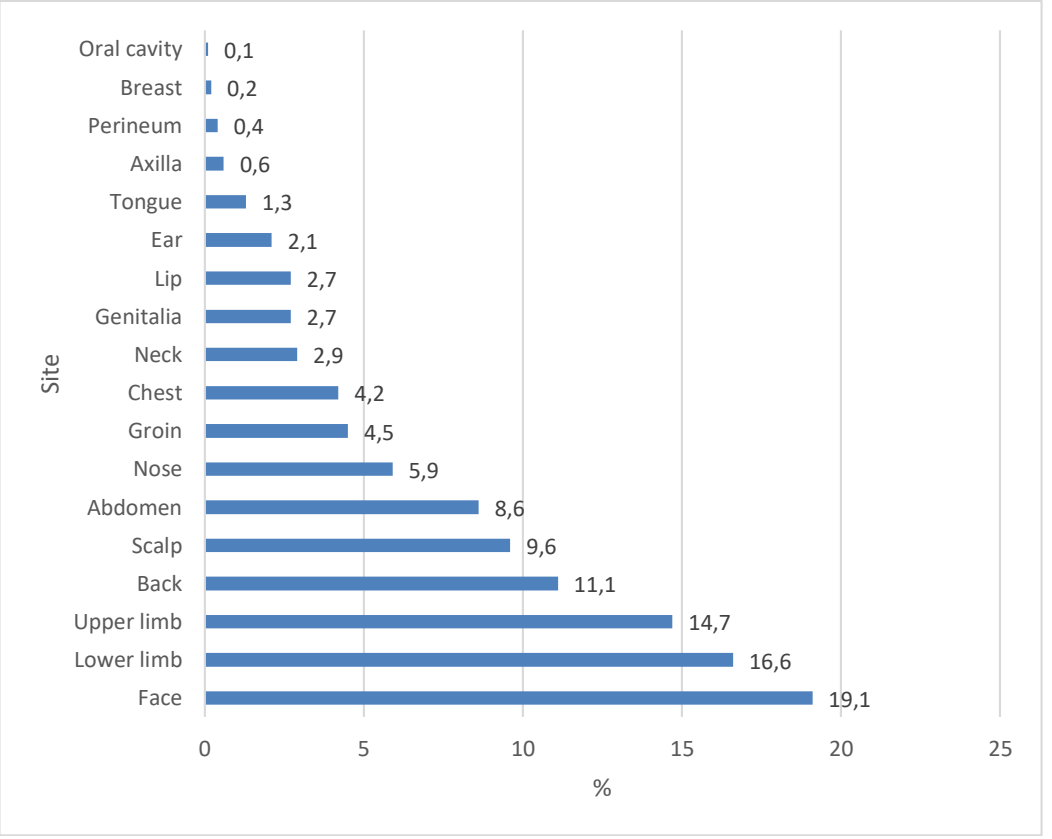

Figure 2: Tumor location of the studied patients

Table 3: Comparison of characteristics between patients with benign and malignant tumors

	Benign		Malignant		P-value
	Mean	**SD**	**Mean**	**SD**	
Age	30.43	19.06	48.94	19.59	**<0.001**
	N	**%**	**N**	**%**	
Sex					**<0.001**
Female	530	51.0%	247	40.5%	
Male	509	49.0%	363	59.5%	
Tumor location					
Oral cavity	2	0.2%	0	0.0%	0.534
Tongue	17	1.6%	5	0.8%	0.163
Chest	49	4.7%	21	3.4%	0.216
Breast	0	0.0%	3	0.5%	**0.050**
Abdomen	75	7.2%	67	11.0%	**0.009**
Back	91	8.8%	92	15.1%	**<0.001**
Axilla	5	0.5%	5	0.8%	0.513
Upper limb	167	16.1%	75	12.3%	**0.036**
Lower limb	157	15.1%	117	19.2%	**0.032**
Genitalia	13	1.3%	31	5.1%	**<0.001**
Groin	72	6.9%	3	0.5%	**<0.001**
Perineum	6	0.6%	0	0.0%	0.091
Scalp	100	9.6%	59	9.7%	0.975
Face	194	18.7%	121	19.8%	0.464
Nose	59	5.7%	39	6.4%	0.553
Ear	25	2.4%	9	1.5%	0.199
Lip	17	1.6%	27	4.4%	**0.001**
Neck	32	3.1%	15	2.5%	0.464

Independent T-test, chi-square, and Fisher's Exact test were done to study the association of characteristics between patients with benign and malignant tumors. The mean age of patients with malignant tumors (48.9 years) was significantly higher than that of patients with benign tumors (30.4 years, P<0.001) (Table 2, Figure 3). The distribution of sex differed significantly between patients with benign and malignant tumors (P<0.001), with a higher percentage of males in the malignant tumor group (59.5%) compared to the benign tumor group (49.0%) (Table 3, Figure 4).

Regarding tumor location, significant differences were observed for the percentage of patients with tumors in the breast (0.0% in benign tumors vs. 0.5% in malignant tumors, P=0.050), abdomen (7.2% in benign tumors vs. 11.0% in malignant tumors, P=0.009), back (8.8% in benign tumors vs. 15.1% in malignant tumors, P<0.001), upper limb (16.1% in benign tumors vs. 12.3% in malignant tumors, P=0.036), lower limb (15.1% in benign tumors vs. 19.2% in malignant tumors, P=0.032), genitalia (1.3% in benign tumors vs. 5.1% in malignant tumors, P<0.001), groin (6.9% in benign tumors vs. 0.5% in malignant tumors, P<0.001), and lips (1.6% in benign tumors vs. 4.4% in malignant tumors, P=0.001) (Table 3, Figure 5).

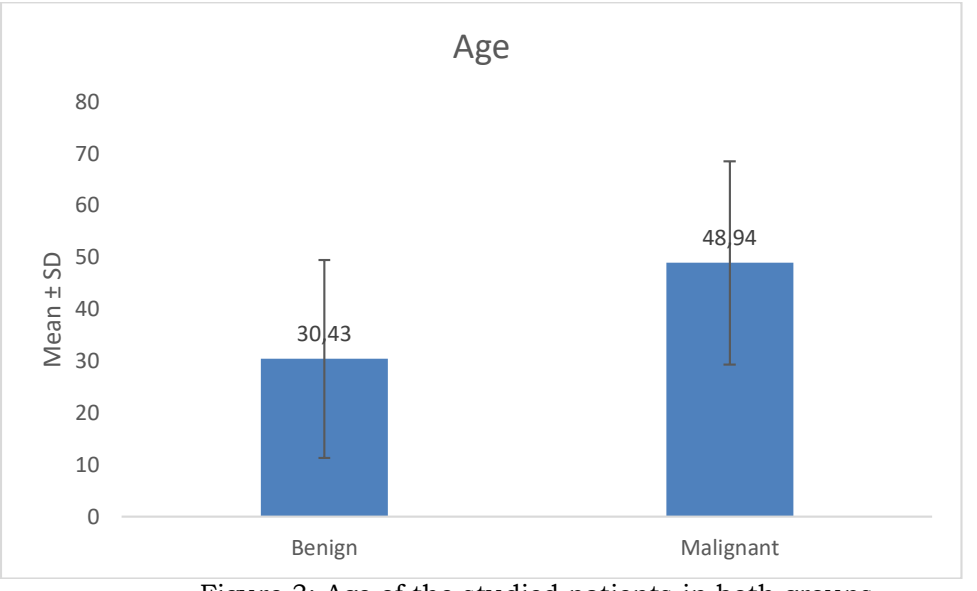

Figure 3: Age of the studied patients in both groups

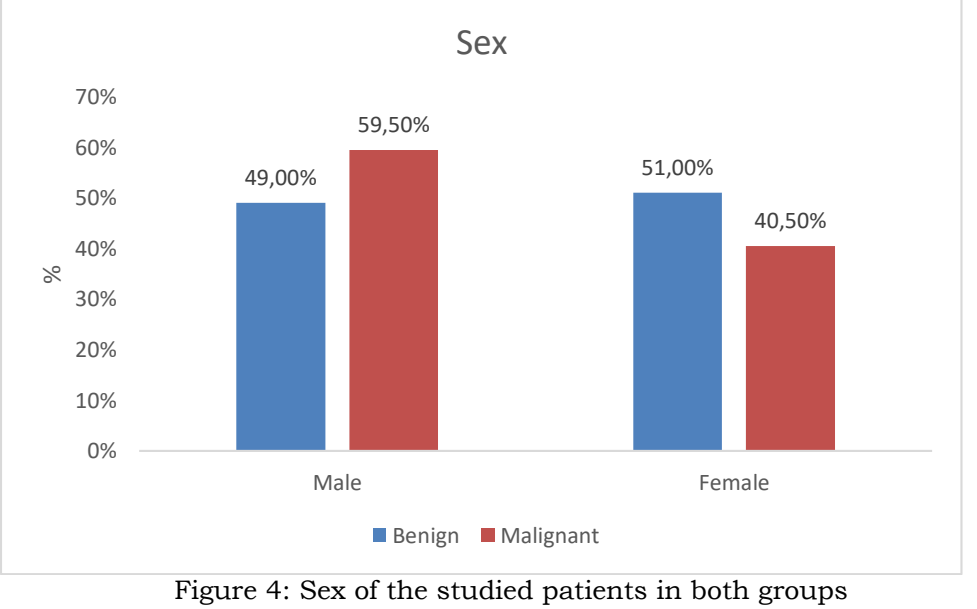

Figure 4: Sex of the studied patients in both groups

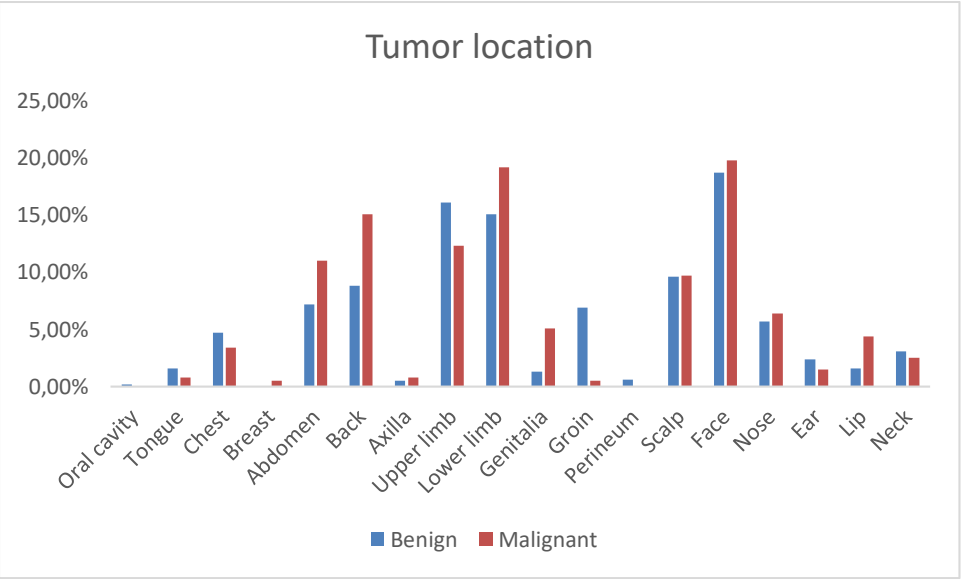

Figure 5: Tumor location of the studied patients in both groups

Table 4: The percentage of malignant cases per year in patients with skin tumor

Year	Benign Tumor		Malignant Tumor		Total	P-value*
	N	%	N	%		
2010	37	64.9%	20	35.1%	57	0.640
2011	47	56.0%	37	44.0%	84	
2012	69	58.0%	50	42.0%	119	
2013	73	67.6%	35	32.4%	108	
2014	89	63.6%	51	36.4%	140	
2015	77	72.0%	30	28.0%	107	
2016	99	66.4%	50	33.6%	149	
2017	143	63.3%	83	36.7%	226	
2018	159	64.6%	87	35.4%	246	
2019	156	63.4%	90	36.6%	246	
2020	90	53.9%	77	46.1%	167	
Total	1039	63.0%	610	37.0%	1649	

* For the Mann-Kendall trend test

The Mann-Kendall trend test was done to study the presence of a trend in the percentage of malignant cases per year. There was no statistically significant trend, P=0.640 (Table 4).

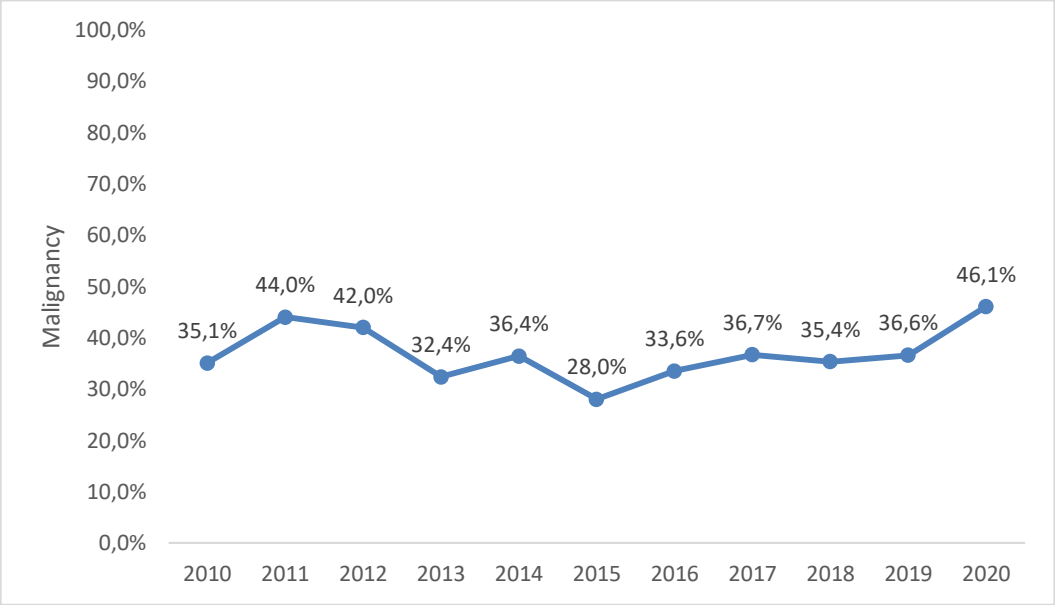

Figure 6: Percentage of malignant cases per year

Based on the data provided, the percentage of malignancy among all tumors diagnosed in the years 2010 to 2020 ranged from 28.0% in 2015 to 46.1% in 2020. There were fluctuations in the percentage of malignancy over the years, with the highest percentage observed in 2020 (46.1%) and the lowest in 2015 (28.0%). The percentage of malignancy in the other years ranged from 32.4% in 2013 to 44.0% in 2011 (Figure 6).

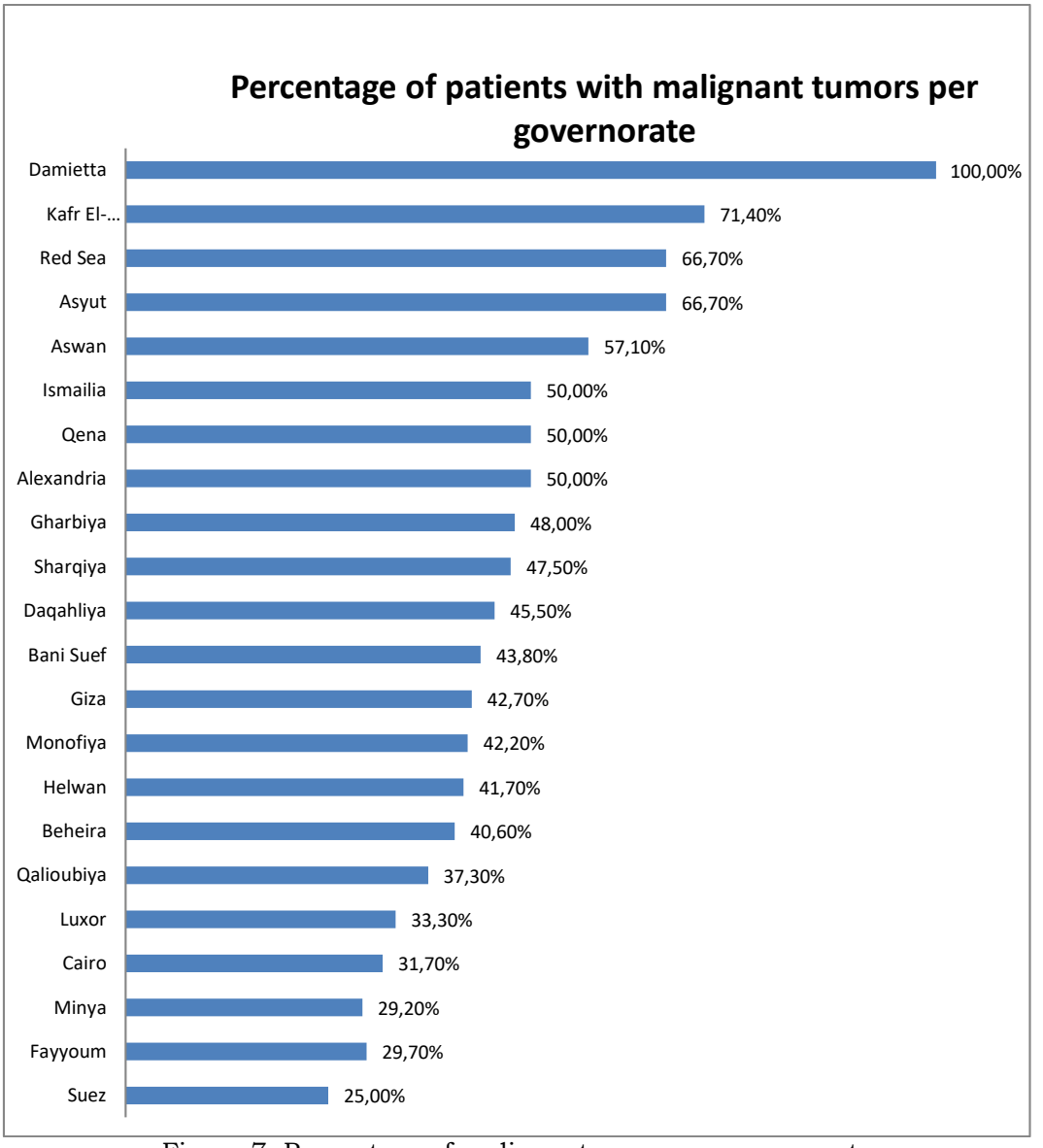

Figure 7: Percentage of malignant cases per governorate

The figure shows the percentage of patients with malignant tumors by governorate in Egypt. The data ranges from 0.0% in Port Said to 100.0% in Damietta. The governorates with the highest percentages of patients with malignant tumors were Kafr El-Sheikh (71.4%), Asyut (66.7%), and Red Sea (66.7%), while the governorates with the lowest percentages were Fayyoum (29.7%), Minya (29.2%), and Suez (25.00%) (Figure 7).

Table 5: Multiple logistic regression for the factors associated with having malignant results

	OR	P-value	95% C.I. for OR	
			Lower	Upper
Age (in years)	1.06	**<0.001**	1.05	1.06
Sex (male)	1.25	0.069	0.98	1.58
Tongue	0.67	0.482	0.21	2.07
Abdomen	2.34	**<0.001**	1.55	3.52
Back	4.43	**<0.001**	3.00	6.53
Upper Limb	1.12	0.524	0.79	1.60
Lower Limb	2.16	**<0.001**	1.57	2.99
Genitalia	6.17	**<0.001**	2.94	12.94
Groin	0.06	**<0.001**	0.02	0.18
Ear	0.67	0.379	0.28	1.62
Lip	2.26	**0.023**	1.12	4.55

Reference categories are “female” for the sex, and “No” for other variables. Age is a continuous variable and having a malignant result is the outcome of interest. OR: Odds ratio, CI: Confidence interval, Statistical significance at P<0.05. Multiple logistic regression was performed to assess the association between factors and malignant results. Age was associated with having malignant results as each unit increase in age resulted in increasing the odds of malignant results (OR=1.06; 95%CI: 1.05 to 1.06; P< 0.001).

Regarding tumor location, patients who had abdomen tumor had significantly higher odds of having malignant results compared to those who did not have abdomen tumor (OR=2.34; 95%CI: 1.55 to 3.52; P< 0.001), patients who had tumor in back had significantly higher odds of having malignant results compared to those who did not have tumor in back (OR=4.43; 95%CI: 3.00 to 6.53; P< 0.001), patients who had tumor in lower limb had significantly higher odds of having malignant results compared to those who did not have tumor in lower limb (OR=2.16; 95%CI: 1.57 to 2.99; P< 0.001), patients who had tumor in genitalia had significantly higher odds of having malignant results compared to those who did not have tumor in genitalia (OR=6.17; 95%CI: 2.94 to 12.94; P< 0.001), patients who had tumor in groin had significantly lower odds of having malignant results compared to those who did not have tumor in groin (OR=0.06; 95%CI: 0.02 to 0.18; P< 0.001), and patients who had tumor in the lip had significantly higher odds of having malignant results compared to those who did not have tumor in genitalia (OR=2.26; 95%CI: 1.12 to 4.55; P=0.023) (Table 5).

Table 6: Number and percentage of benign and malignant cases for each affected site (sun-exposed sites)

Sun Exposed Sites	Total No. of Cases	No. of Benign Cases	% of Benign Cases	No. of Malignant Cases	% of Malignant Cases
Scalp	159	100	62.9%	59	37.1%
Face	315	194	61.6%	121	38.4%
Nose	98	59	60.2%	39	39.8%
Lip	44	17	38.6%	27	61.4%
Ear	34	25	73.5%	9	26.5%
Neck	47	32	68.1%	15	31.9%
Total No. of Sun exposed Cases	**697**	**427**	**61.3%**	**270**	**38.7%**

For each sun-exposed site, the total number of tumor cases and the proportion of those that are benign (n= 427, 61.3%) were higher than that of malignant skin tumor (n=270, 38.7%). Ear is a sun-exposed site with the highest frequency of benign tumors (73.5%) and the lip showed the highest frequency in the occurrence of malignant tumors (61.4% (Table 6).

Table 7: Number and percentage of benign and malignant cases for each affected site (non-sun ex-posed sites)

Non-Sun Exposed Sites	Total No. of Cases	No. of Benign Cases	% of Benign Cases	No. of Malignant Cases	% of Malignant Cases
Oral Cavity	2	2	100%	0	0%
Tongue	22	17	77.3%	5	22.7%
Chest	70	49	70%	21	30%
Breast	3	0	0%	3	100%
Abdomen	142	75	52.8%	67	47.2%
Back	183	91	49.7%	92	50.3%
Axilla	10	5	50%	5	50%
Upper Limbs	242	167	69%	75	31%
Lower Limbs	274	157	57.3%	117	42.7%
Genitalia	44	13	29.5%	31	70.5%
Groin	75	72	96%	3	4%
Perineum	6	6	100%	0	0%
Total No. of Non-Sun Exposed Cases	**1073**	**654**	**61%**	**419**	**39%**

- For each sun-exposed site, the total number of tumor cases and the proportion of those that are be-nign (n= 654, 61.00%) were higher than that of malignant skin tumor (n=419, 39.00%). Perineum is a non-exposed site with the highest

frequency of benign tumors (100%) and the breast showed the highest frequency in the occurrence of malignant tumors (100%) (Table 7).

Table 8: The relationship between malignant and benign tumor corresponding to sun exposure sites

TUMOR TYPE	SUN-EXPOSED	NON-EXPOSED	OR	CHI-SQUARE X^2	95% CONFIDECE INTERVAL	P-VALUE
MALIGNANT (N.%)	270 (38.7)	419 (39%)	0.987	0.017	0.81-1.2	0.89
BENIGN (N.%)	427 (61.3)	654 (61%)				
TOTAL (N)	697	1073				

4. Discussion

Skin tumors result from the proliferation of skin components, ranging from benign lesions to premalignant and aggressive tumors. Most skin tumors are benign, appearing as smooth papules, nodules, or keratotic/cystic lesions with slow growth. The presence of multiple lesions typically indicates a benign condition. Malignant tumors are often solitary, irregular, rapidly growing plaques or nodules that may ulcerate. While some arise de novo, others originate from pre-existing benign tumors. Metastasis is a possibility for some tumors (Khandpur & Ramam, 2012). Fair-skinned persons (types I, II, and III) are more susceptible to skin tumors (Narayanan et al., 2010) as well as the elderly compared to the young and children (Burgard & Reichrath, 2020a). The risk factors for the development of skin tumor are chronic skin conditions, impaired immunity, the existence of specific genes, a family history of skin cancer, chemical or ionizing radiation exposure, and smoking (Hussein, 2005). Recently, the WHO and the International Labor Organization (ILO) have paid attention to exposure to ultraviolet rays (UVR) as a determinant environmental risk factor for melanoma and SCC (Paulo et al., 2019). The incidence of malignant skin tumor, namely melanoma and SCC, as well as mortality rates has been reported in different European countries as well as Australia, Canada, Norway, and the United Kingdom (Sorahan, 2007; Stenehjem et al., 2021) upon occupational exposure to UVR (Teng et al., 2021). Melanin protects against UVR-induced skin damage and cancer (Brenner & Hearing, 2008). Two types of melanin have been recognized, eumelanin and pheomelanin (Thawabteh et al., 2023). Radio- and photo-protective eumelanin contains antioxidant and sunscreen effects. In contrast, pheomelanin, which is less photostable, has long been implicated in mutagenesis following exposure to short-wavelength UVR (Slominski et al., 2022a).

However, UVR-exposed dark-skinned have a lower melanoma rate than Whites in the same area. Melanoma types and distribution vary between groups. The superficial spreading sub-types afflict male trunks and female lower limbs and hips in White people. Dark-skinned people can get acral lentiginous melanoma,

mainly in the hips and lower limbs (Basurto-Lozada et al., 2021). Whites have 20 times more melanoma than Blacks (Gupta et al., 2016). Epidermal melanin may prevent skin cancers.

The context of the study

Studying the frequency of skin tumors in Egypt is of utmost importance for policy-making and management planning. Therefore, the current study aimed to explore the frequencies of skin tumor in the Egyptian population. It was found that age is a risk factor for developing malignant skin tumors, as skin malignancy frequency tends to be higher in old age patients, while benign skin tumors were more frequent in younger-aged patients. Although males are more prone to have malignant skin tumors than females, sex was not found to be a risk factor based on the logistic regression. The results had insights into the variation in the incidence of malignant tumors across governorates in Egypt, which may be attributed to differences in environmental, genetic, and lifestyle factors. These findings may have important implications for cancer prevention, screening, and treatment strategies in different regions of Egypt.

Face, lower limb, and upper limb were found to be the most common sites for skin tumors, either benign or malignant. However, the breast, abdomen, and back had significantly the highest frequency of malignancy compared to benign skin tumor. Certain sites were found to be more likely to have malignant than benign skin tumor including the abdomen, back, and lower limb. On the other hand, the groin was more likely to have a benign tumor.

The findings of this study suggested that the percentage of malignancy among all tumors diagnosed in the population may have changed over time, which may have important implications for cancer prevention, screening, and treatment strategies. However, further research is needed to confirm these observations and explore their potential causes and consequences. Concerning sun exposure, the frequency of benign was higher than malignant skin tumor in both sun-exposed and non-exposed sites. There was no significant difference between sun-exposed and non-exposed sites.

Agreement and disagreement with the literature

Several studies have been conducted in Egypt to assess the disease burden, prevention strategies, and healthcare requirements. Evidence from the literature showed that malignant skin tumor is common between the age of 20-59 years (Katalinic et al., 2003) with a high frequency above the age of 50 years (Hussein, 2005; Katalinic et al., 2003). In a study conducted in Saudi Arabia, 95% of the recorded patients between 2003 and 2016 had been diagnosed with either BCC or SCC with a mean age of 59 years. However, nearly a quarter of the recorded patients were younger than 50 years of age (AlSalman et al., 2018). This study indicated, in line with previous research, that the majority of cases of skin cancer occur in people who are in the middle of their age range. Most of the enrolled patients were below 50.

Although it was reported that there was no sex difference regarding benign and malignant skin tumors (El-Khalawany et al., 2023), a multicenter study showed that the onset of benign skin tumors appears earlier in females with slight male predominance (Slominski et al., 2022b). However, the findings of this study emphasized the malignant skin tumor predominance in males and benign skin tumor predominance in females with a ratio of 1:1.5 and 1:1 respectively. The explanation of this apparent contradiction is reasoned by the study design. Contrary to (El-Khalawany et al., 2023) who focused on benign skin tumor, this study explored the frequency of both types of skin tumors -being and malignant. Our study concurred with the literature that BCC is the most common malignant skin tumor, however, the findings of our study showed the highest percentage of BCC (90%) compared with the other studies (71-80%) (Hussein, 2005; Katalinic et al., 2003).

Malignant melanoma was reported to be of high incidence in Europe with more predilection to women (El-Khalawany et al., 2023). Contrary to the European features of skin tumor, malignant skin tumor was reported to be rare in Egypt, and malignant melanoma constitutes 5% of malignant skin tumors (Hussein, 2005). According to the results of our research, *Mycosis fungoides* is the most prevalent malignancy, and basal cell carcinoma (BCC) has the greatest prevalence in sun-exposed areas among our recorded participants. Therefore, the characteristics of a skin tumor in Egypt are significantly distinct from the characteristics of a skin tumor in Europe.

Strengths and limitations

The examination of both benign and malignant skin malignancies in patients attending a university hospital in Cairo, with a particular focus on sun exposure-related skin tumor, is the primary contribution of this study, and its greatest strength. Exposure to the sun is not correlated with malignancy tumor of the skin. Rather, it is the site that can be considered a risk factor for developing malignant skin tumor.
Additionally, there is an increasing trend in the diagnosis of skin tumor and referral from some governorates. This reflects the interest of the healthcare authorities in leveling up the quality of diagnosis of skin tumor and augmentation of the referral system to tertiary hospitals for proper management. The main limitation of this study is that data was collected from only one database belonging to Al-Azher University. Consequently, the findings may be subject to challenge by data quality, availability, and relevance. Moreover, epidemiology study has inherited limitations in terms of confounding factors, heterogeneity, and changes over time and space.

Recommendations

Based on the results of this study, primary prevention initiatives should be implemented to raise awareness of the most prevalent skin lesions, such as BCCs. In the Egyptian population, basal cell carcinoma is the malignant skin tumor that occurs most often. Moreover, there is a need of applying sunscreen to lessen the influence of ultraviolet light on the skin, specifically targeting those over the age of 40. In addition, as the incidence of malignant skin tumors in the

Egyptian population is subject to annual rises, more detailed investigations on skin tumor should be conducted. Finally, healthcare facilities and referral systems should be boosted for early detection of malignant skin tumor in the governorates that lack referral to tertiary hospitals. In addition, Multicenter research should be conducted. They contribute to the credibility of our study's findings, and as a consequence, decisions will be founded on reliable and analyzed facts.

5. Conclusion

Egypt has a much lower incidence of skin tumors when compared to European countries. Malignant skin tumors are very uncommon, and their distribution between men and women is almost identical. Aging and special sites are considered the risk factors for malignant skin tumor. Moreover, sun exposure is not considered a risk factor for malignant skin tumor. In the context of medical practice, a thorough examination of the skin is a significant and necessary component of the overall medical examination. Even though the findings of the research characterized skin tumors in Egypt, a nationwide study is required to produce a trustworthy database for the formulation of evidence-based recommendations and the making of decisions about healthcare policy.

6. Conflicts of Interest

The authors declare that no conflict of interest.

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