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HISTOMORPHOLOGICAL SPECTRUM OF CUTANEOUS KERATINOCYTIC TUMOURS: A FIVE- YEAR RETROSPECTIVE STUDY FROM ZARIA, NIGERIA

Kamarudeen Owolabi Sani[1], Modupeola Omotara Samaila[2], Haruna Asura Nggada[3], Balarabe Kabir [2], Zainab Ali Adamu[2], Shehu Salihu Umar[4], Mudashiru Biodun Lawal[5], Yusuf Kalli Gazali[2], Harrison David Lawan[5], Rimamskep Ifusumu[2], Nicholas Kwapmi[6], Sabitu Shuaibu[2], Ishaku Agahu Othman[6], Aminu Bello Liman[4]

1- Department of Pathology, Federal University Teaching Hospital, Birnin-Kebbi
2- Department of Pathology, Ahmadu Bello University Teaching Hospital, Zaria
3- Department of Pathology, University of Maiduguri Teaching Hospital, Maiduguri.
4- Department of Radiation and Clinical Oncology, Ahmadu Bello University Teaching Hospital, Zaria
5- Department of Anatomic and Forensic Medicine, Federal University Teaching Hospital, Lafia.
6- Department of Pathology, Federal Medical Centre, Jalingo, Taraba State.

Corresponding Author: Kamarudeen Owolabi Sani, Department of Pathology, Federal University Teaching Hospital, Birnin-Kebbi, abayomisani44@gmail.com

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ABSTRACT

Background: Cutaneous keratinocytic tumours represent a broad spectrum of benign and malignant skin lesions with diverse histomorphologic features and epidemiological patterns. Despite their clinical significance, there is limited region-specific data from Northern Nigeria, particularly regarding their distribution and morphological characteristics.

Objective: This study aimed to evaluate the histomorphologic spectrum and demographic distribution of cutaneous keratinocytic tumours in Zaria, Nigeria, over a five-year period.

Methods: A retrospective cross-sectional study was conducted at the Department of Anatomical Pathology, Ahmadu Bello University Teaching Hospital, Zaria, from January 2018 to December 2022. Archived haematoxylin and eosin-stained slides and formalin-fixed paraffin-embedded tissue blocks of histologically diagnosed cases were reviewed. Relevant clinical and demographic data, including age, sex, and tumour location, were extracted and analysed using SPSS version 20.

Results: A total of 182 cases were included, comprising 137 (75.3%) malignant and 45 (24.7%) benign tumours. There was a slight male predominance with a male-to-female ratio of 1.3:1. The age of patients ranged from 3 to 84 years, with a mean age of 43.4 years, and peak incidence was observed in the fifth and seventh decades. Squamous

cell carcinoma was the most common tumour, accounting for 67.0% of cases, followed by basal cell carcinoma (5.5%). Among benign lesions, verrucae were most frequent (20.9%). The head and neck region was the most commonly affected anatomical site (42.9%), reflecting a predilection for sun-exposed areas. A statistically significant association was observed between tumour behaviour and anatomical site ($\chi^2 = 8.90$, df=3 p = 0.0307) and age ($\chi^2 = 23.68$, df=8, p = 0.003).

Conclusion: Cutaneous keratinocytic tumours in this setting are predominantly malignant, with squamous cell carcinoma as the leading subtype. The findings highlight the need for increased public health awareness, early detection strategies, and improved access to diagnostic and treatment services to reduce the burden of advanced skin cancers in this population.

Keywords: Cutaneous keratinocytic tumours, squamous cell carcinoma, Zaria.

INTRODUCTION

The skin, which covers the entire body's exterior, is the largest organ in the body. Among its many roles, the skin protects against UV light damage, mechanical and chemical trauma, and microbial invasion.[1] The skin is composed of three layers: the epidermis, dermis, and hypodermis.[1] Keratinocytes make up 90% of the cells in the epidermal layer, with melanocytes, Langerhans cells, and Merkel cells accounting for the remaining 10%. Specialised cells such as sebocytes, eccrine and apocrine gland cells, and follicular epithelial cells make up the epidermal appendages.[2] Any of these different cell types can give rise to skin tumours.[2] Keratinocytic tumours are lesions arising from keratinocytes of the epidermis and adnexae.[2,3] These tumours, which range widely from benign proliferations to the malignant squamous cell carcinomas which tend to develop quickly and have the ability to spread, are common globally.[4] The prevalence of keratinocytic tumours varies between nations and regions, and this diversity is impacted upon by the economy, literacy, race and social norms, gender, age, and the concomitant presence of systemic disorders.[5,6] In the United States (US) and throughout the world, skin tumours are among the most frequently diagnosed tumours.[7] With over 5 million incident cases annually, malignant keratinocytic tumours are the most prevalent type of cancer treated in the United States.[8] More than 1 million new cases of squamous cell carcinoma of the skin are reported annually, making it the second most frequent form of skin cancer after the top five reportable malignancies treated in the United States combined.[8–10] About 95% of malignant keratinocytic tumours are a combination of basal cell carcinoma and squamous cell carcinoma, with squamous cell carcinoma accounting for 20% of all cutaneous malignancies.[11,12]

Most published data on keratinocytic tumours originate from Europe, North America, and Asia, while studies from sub-Saharan Africa remain relatively limited.[8-10] Consequently, there is inadequate region-specific information regarding the burden and spectrum of these tumours in many parts of Nigeria, particularly in Northern Nigeria.

Understanding the local distribution and histological characteristics of cutaneous keratinocytic tumours is important for improving diagnostic accuracy, guiding preventive strategies, facilitating early detection, and informing healthcare planning. Furthermore, differences in environmental

factors such as ultraviolet radiation exposure, chronic inflammatory skin conditions, occupational hazards, and health-seeking behaviour may influence the pattern of disease in this environment. Therefore, this study was undertaken to characterise the histomorphologic spectrum, demographic characteristics, and anatomical distribution of cutaneous keratinocytic tumours diagnosed at Ahmadu Bello University Teaching Hospital, Zaria, over a five-year period.

Aim

To determine the histomorphologic spectrum, demographic characteristics, and anatomical distribution of cutaneous keratinocytic tumours diagnosed at Ahmadu Bello University Teaching Hospital, Zaria, between January 2018 and December 2022.

Specific Objectives

1. To determine the frequency and histological subtypes of cutaneous keratinocytic tumours diagnosed during the study period.
2. To describe the age and sex distribution of patients with cutaneous keratinocytic tumours.
3. To determine the anatomical distribution of the various histological subtypes of cutaneous keratinocytic tumours.
4. To evaluate the association between tumour behaviour and selected demographic and anatomical characteristics.

MATERIALS AND METHODS

Study Design

This is a retrospective analytical study, conducted over a five-year period (from January 1, 2018, to December 31, 2022), that investigated the histological variants of cutaneous keratinocytic tumours. The research was carried out in the Department of Anatomical Pathology at Ahmadu Bello University Teaching Hospital in Zaria, Kaduna State, North West Nigeria.

Study Population

All histologically diagnosed cases of cutaneous keratinocytic tumours at the Department of Anatomical Pathology in the hospital from January 1, 2018, to December 31, 2022, were included in the study.

Inclusion and Exclusion Criteria

The study utilised formalin-fixed paraffin-embedded (FFPE) tissue blocks and Haematoxylin and Eosin (H&E) slides of histologically diagnosed cases of cutaneous Keratinocytic tumours from the Department during the study period. Cases with blocks that were missing or damaged were excluded from the study.

Ethical Approval

Approval for this research was obtained from the institutional Health Ethics Research Committee (HREC), ABUTH and the Department of Pathology, ABUTH. The ethical clearance number is ABUTHZ/HREC/H28/2023, and D.U.N.S number- 954524802.

Data Collection

The list of all histologically diagnosed cutaneous keratinocytic tumours registered in the department from January 1, 2018, to December 31, 2022, was retrieved from the patients' database and bench book. Relevant histology numbers and their corresponding clinical information, including age, sex, specimen nature, and tumour location, were extracted. This information was used to

retrieve the archival H&E slides and corresponding FFPE tissue blocks for review. For cases where the slides were faded, fresh sections were cut from the corresponding FFPE tissue blocks.

Microtomy and Tissue Preparation for Staining

Representative thin sections, 4 µm thick, of the paraffin-embedded tissue blocks of the selected cutaneous keratinocytic cases were cut with a microtome. These sections were floated on charged slides and incubated for ten minutes at 55°C to melt the wax. The sections were then de-paraffinized in two changes of xylene, each lasting ten minutes, to completely remove the wax. To prevent residual wax artefacts, the xylene volume was limited to 50 ml per fifty slides. The tissue sections were then passed through two changes of 100% ethyl alcohol, each for three minutes, to remove the xylene. Following this, the sections were passed through 95% and 70% ethyl alcohols, each for three minutes, and then placed in an aqueous wash buffer for five minutes. Staining was performed using Hematoxylin and Eosin (H&E). The slides were subsequently viewed using a light microscope.

Data Analysis

Analysis of collated data was carried out using the statistical program for social sciences (SPSS) Version 20.0. The results were presented using statistical tables and charts, and Photomicrographs for further illustrations.

RESULTS

Frequency distribution of Cutaneous keratinocytic Tumours

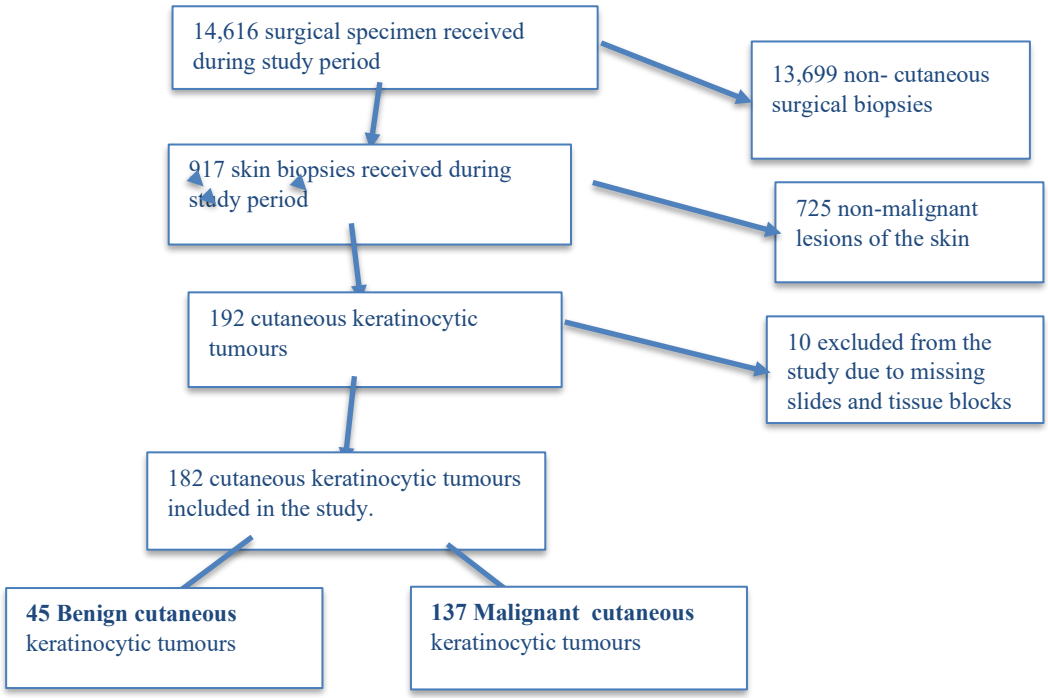


Figure 1: Flow Chart Showing the Details of the Study Protocol

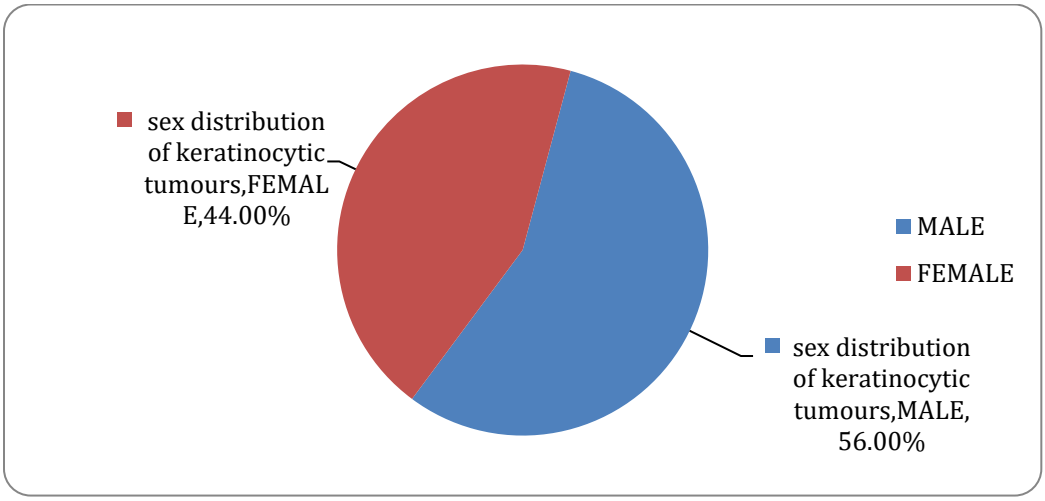


Figure 2: A Pie Chart Showing The Sex Frequency Distribution Of Cutaneous Keratinocytic Tumours in ABUTH Zaria (2018-2022)

Figure 2 shows the sex frequency distribution of cutaneous keratinocytic tumours. There were 102 (56.0%) males and 80 (44.0%) females, giving a male-to-female ratio of 1.3:1.

Age range Frequency Distribution

Table 1 shows the age frequency distribution of the cases of cutaneous keratinocytic tumours seen. The age ranged between 3 years and 84 years with a mean age of 43.4 years. The highest frequency of occurrence was in the 5th and 7th decades, with 36 cases (19.8%) each. This is closely followed by relatively high peaks in the 3rd and 6th decades, while the lowest frequency of occurrence was in the 1st and 9th decades, with five (2.7%) and four cases (2.2 %) respectively.

Table 1: Age and Frequency Distribution of Cutaneous Keratinocytic Tumours in ABUTH Zaria (2018-2022)

Age (In years)	**Frequency**	**Percentage (%)**
0-9	5	2.7
10-19	7	3.8
20-29	25	13.7
30-39	32	17.6
40-49	36	19.8
50-59	26	14.4
60-69	36	19.8
70-79	11	6.0
80-89	4	2.2
Total	**182**	**100**

Age range and Sex Frequency Distribution of Cutaneous Keratinocytic Tumours

Table 2 and Figure 3 show the age distribution in comparison with sex distribution of the cases of cutaneous keratinocytic tumours seen in the study. The table revealed that males outnumbered females slightly across all age groups except in the 2nd and 4th decades, where females outnumbered males. It also shows that the highest number of occurrences of these tumours in males was in the 5th decade, while they occurred more in females in the 4th and 7th decades of life. The least occurrence was in the 9th decade.

Table 2: Age range and Sex Frequency Distribution of Cutaneous Keratinocytic Tumours in ABUTH Zaria (2018-2022)

Age Range (Years)	Male	Female	Total number (%)
0-9	2	3	5 (2.7%)
10-19	1	6	7 (3.8%)
20-29	17	8	25 (13.7%)
30-39	15	17	32 (17.6%)
40-49	23	13	36 (19.8%)
50-59	17	9	26 (14.4%)
60-69	19	17	36 (19.8%)
70-79	6	5	11 (6.0%)
80-89	2	2	4 (2.2%)
Total	**102**	**80**	**182(100%)**

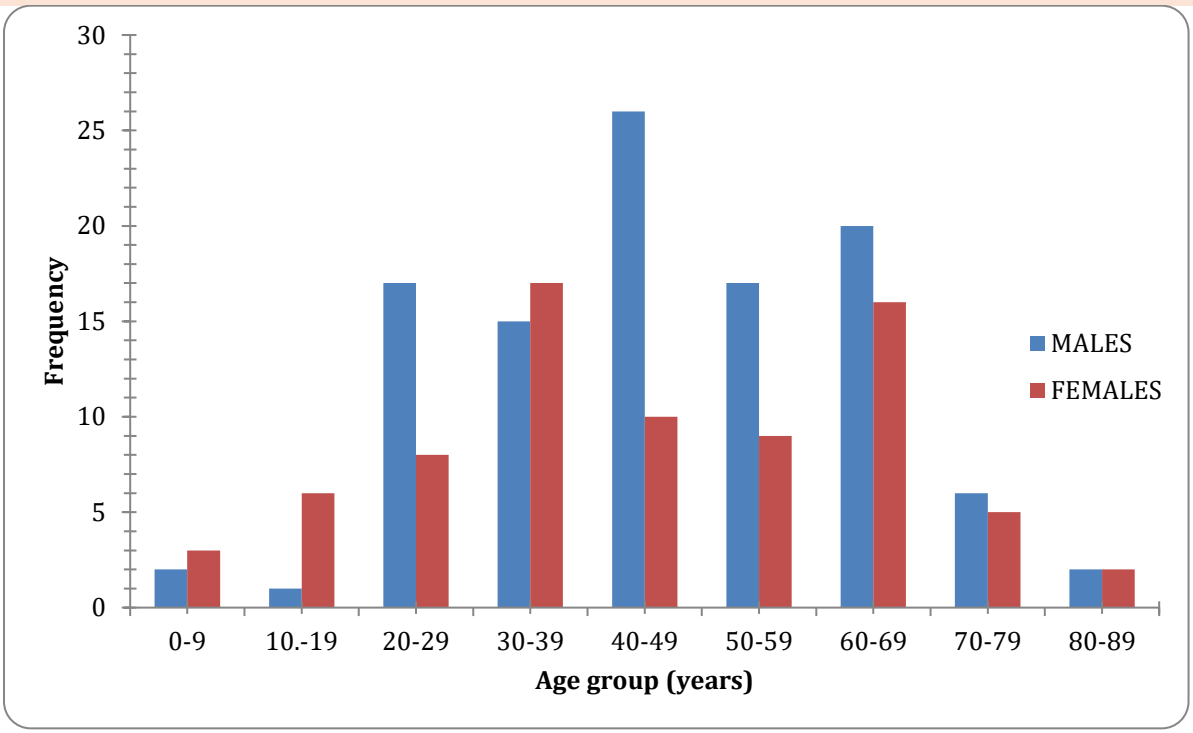


Figure 3: A Combined Bar Chart Showing Age Range and Sex Frequency Distribution in Both Sexes

Frequency Distribution of Cutaneous Keratinocytic Tumours

Six (6) histological types of tumours were encountered within this study period. Figure 4 shows the frequency distribution of the histological types of cutaneous keratinocytic tumours seen. Forty-five (45) tumours were benign cutaneous keratinocytic tumours, and one hundred and thirty-seven (137) were malignant cutaneous keratinocytic tumours. Of the benign tumours seen, 38 cases were diagnosed as Verrucae while seven cases were diagnosed as Seborrhoeic keratosis, representing 20.9% and 3.9% of all cutaneous keratinocytic tumours, respectively. Of the malignant cases seen, 122 cases were diagnosed as Squamous cell carcinoma (67.0%), ten cases were diagnosed as Basal cell carcinoma (5.5%), three cases were diagnosed as Bowen's disease (1.7%), and two cases were diagnosed as Keratoacanthoma (1.1%). Squamous cell carcinomas were the most frequent cutaneous keratinocytic tumours seen, and keratoacanthomas were the least frequent.

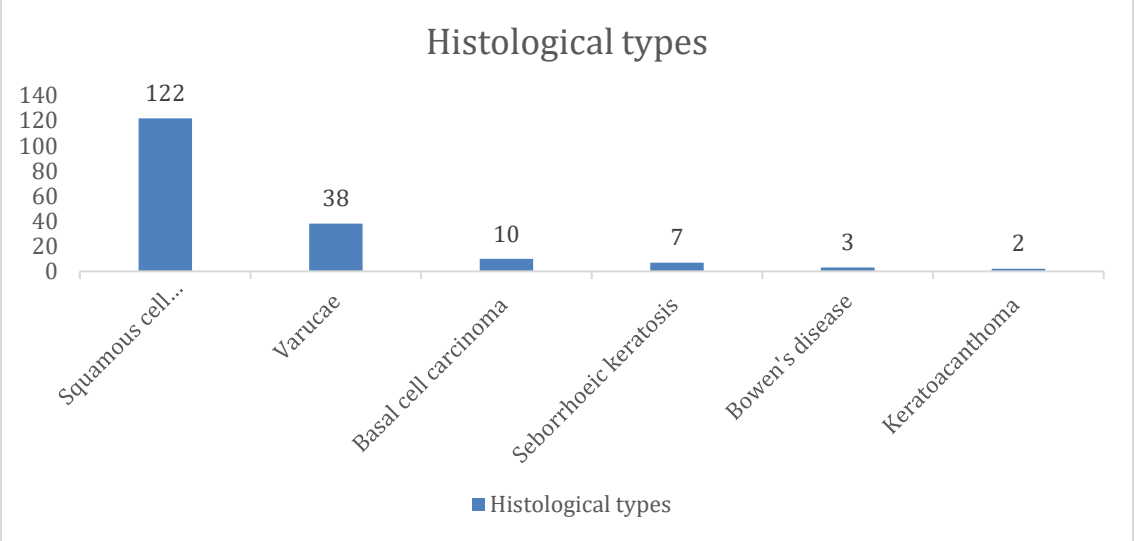


Figure 4: Bar chart showing frequency distribution of cutaneous keratinocytic tumours seen based on histological subtype in ABUTH Zaria (2018-2022)

Frequency of Distribution of Cutaneous Keratinocytic Tumours Based on Anatomical Site.
Table 3 shows the distribution of cutaneous keratinocytic tumours based on anatomic sites. The head and neck region showed the highest frequency of occurrence with 78 (42.9%) cases. The upper limb had the lowest frequency with 14(7.7%) cases. Other sites include the lower limb with 39 (21.4%) cases, genitoperineal region with 27 (14.8%) cases and trunk with 24 (13.2%) cases.

Table 4 below is a meta- table showing the specific anatomical sites where these tumours are located in relation to the different histological subtypes and frequency of these tumours.

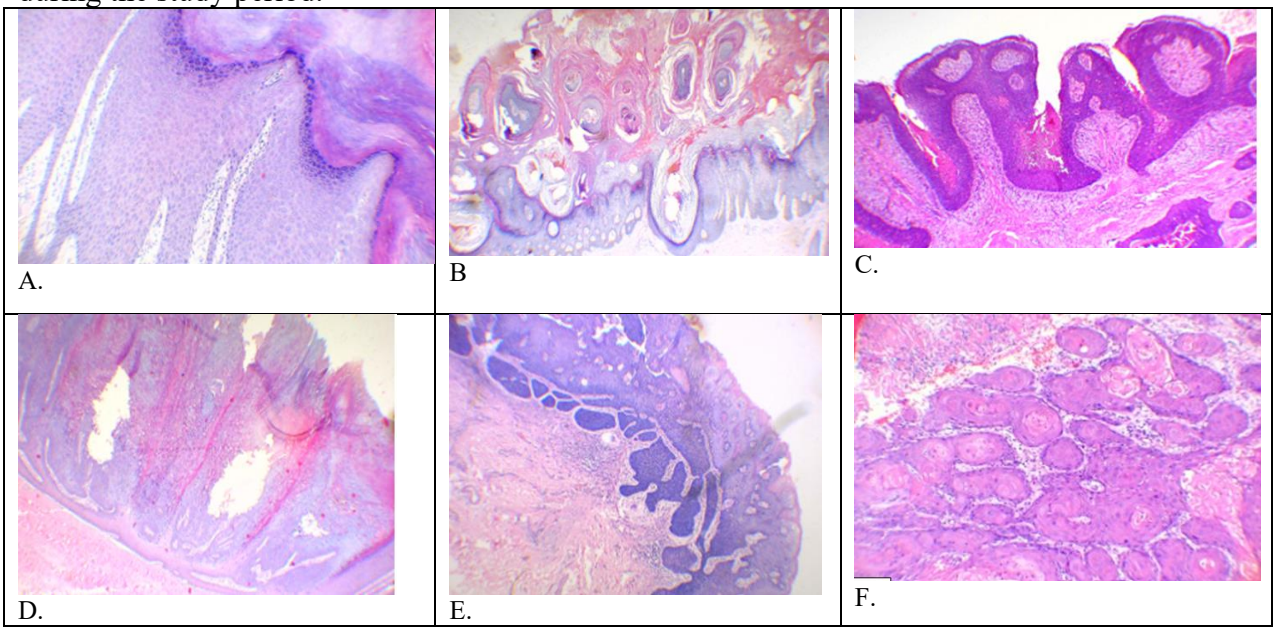
Association between Tumour Behaviour and Sex
The relationship between tumour behaviour (benign versus malignant) and sex was assessed using the Chi-square test. Although malignant tumours were more common among males, the association was not statistically significant (χ^2 (1, N=182)=0.073, p = 0.79).

Association between Tumour Behaviour and Anatomical Site
A statistically significant association was observed between tumour behaviour and anatomical site (χ^2 = 8.90, df=3 p = 0.0307), with malignant tumours occurring more frequently in sun-exposed regions of the head and neck.

Comparison of Mean Age between Benign and Malignant Tumours
A chi- square test of independence was performed to determine the relationship between age groups and tumour behaviour (benign versus malignant). The analysis showed a statistically significant association between age and tumour behaviour (χ^2= 23.68, df=8, p = 0.003). The

proportion of malignant tumours increases with advancing age, while benign tumours are relatively more common in younger age groups.

The photomicrographs below show the histologic types of cutaneous keratinocytic tumours seen during the study period.



(a)Photomicrograph showing hyperkeratosis, parakeratosis and acanthosis in a verrucae, magnification x100, H&E. (b) seborrhoeic keratosis with numerous horn and pseudo horn cysts, magnification x40, H&E (c) Photomicrographs of Bowen's disease within the overlying epithelium magnification x40, H&E. (d) Photomicrograph showing a cup shaped crater with centralized keratinous plug, magnification x40, H&E (e) Photomicrograph showing Superficial variant of BCC composed of basaloid small nodular proliferation of cells with connection to the epidermis, magnification x40, H&E.(f) Photomicrograph showing numerous nests having central keratin pearls formation in SCC, magnification x100, H&E.

*H&E –Haematoxylin and Eosin

Table 3: Distribution of Cutaneous Keratinocytic Tumours Based on Anatomical Site in ABUTH Zaria (2018-2022)

Anatomic Sites	Frequency	Anatomical Site Frequency (%)
Head		**73 (40.1%)**
Scalp	28 (15.4%)	
Face	37 (20.3%)	
Ear	8 (4.4%)	
Neck	5 (2.8%)	**5(2.8%)**
Upper Limb		**14 (7.7%)**
Arm	2 (1.1%)	
Forearm	3 (1.7%)	
Hand	9 (5.0%)	
Trunk		**24 (13.2%)**
Upper Trunk	16 (8.8%)	
Lower Trunk	8 (4.40%)	
Genitoperineal		**27 (14.8%)**
Pelvis/Perianal	11 (6.0%)	
Vulva	7 (3.9%)	
Penis	7 (3.9%)	
Scrotum	2 (1.1%)	
Lower Limbs		**39 (21.4%)**
Thigh	5 (2.7%)	
Leg	24 (13.2%)	
Foot	10 (5.5%)	
Total	**182**	**182 (100%)**

Table 4: Meta-table Showing Distribution of Cutaneous Keratinocytic Tumours Based on Demographic and Anatomic Sites in ABUTH Zaria (2018-2022)

	1st	2nd	3rd	4th	5th	6th	7th
Parameter	VC	SK	AK	BD	KA	BCC	SCC
Sex (M:F) Ratio	22/16 (1.4:1)	4/3 (1.3:1)	-	2/1 (2:1)	1/1 (1:1)	4/6 (1:1.5)	69/53 (1.3:1)
Age range with highest frequency	3rd decade	5th decade	-	5th,6th& 8thdecades	2nd& 3rd decades	4th decade	7th decade
Mean Age	31.2	39.3	-	57.3	19.5	43.0	49.0
Tumour Location							
Head and Neck	13	3	-	0	2	7	78
Upper Limb	8	0	-	0	0	0	14
Trunk	6	3	-	0	0	0	24
Genitoperian al	4	0	-	3	0	1	27
Lower Limb	7	1	-	0	0	2	39

SCC= Squamous cell carcinoma BCC= Basal cell carcinoma, KA= Keratoacanthoma, BD= Bowens disease/Bowenoid papulosis, SK= seborrhoeic Keratosis, AK= Actinic keratosis, VC= verrucae

DISCUSSION

This study was undertaken to provide local data on the histomorphologic spectrum of cutaneous keratinocytic tumours in Zaria, Nigeria, addressing the paucity of region-specific epidemiological evidence. The findings demonstrate important patterns in tumour distribution, morphology, and demographic characteristics, with significant clinical and public health implications.

A major observation in this study is the predominance of malignant keratinocytic tumours, which accounted for 75.3% of cases, compared to 24.7% benign lesions. This pattern suggests a tendency for patients to present late, possibly when lesions have progressed to malignant stages, or reflects selective biopsy practices where more suspicious lesions are prioritised for histological evaluation. This trend aligns with findings from similar studies within the region but contrasts with reports from developed countries, where benign lesions are more frequently diagnosed.[13,14,15] The implication is a potential gap in early detection and health-seeking behaviour, underscoring the need for improved public awareness and screening practices.

Squamous cell carcinoma (SCC) emerged as the most common keratinocytic tumour, constituting 67.0% of all cases. This finding is consistent with several African studies but

differs from Caucasian populations, where basal cell carcinoma predominates.[14-20] The higher prevalence of SCC in this environment may be attributed to factors such as chronic sun exposure, environmental carcinogens, chronic ulcers, and possible infectious etiologies.[14,15] The predominance of SCC, a tumour with known metastatic potential, further emphasises the burden of aggressive skin malignancies in this setting.

The study also revealed a slight male preponderance (male-to-female ratio of 1.3:1), which may be explained by increased occupational exposure to ultraviolet radiation among males, particularly in outdoor professions.[21,22] Additionally, cultural and behavioural factors may influence healthcare utilisation patterns between genders.

Age distribution showed that keratinocytic tumours occurred across a wide age range but peaked in the fifth and seventh decades of life. This supports the role of cumulative exposure to risk factors, particularly ultraviolet radiation, in tumour development. The relatively lower incidence in younger age groups further reinforces the chronic and progressive nature of these lesions.

Anatomically, the head and neck region was the most commonly affected site, accounting for 42.9% of cases. This finding strongly correlates with sun-exposed areas of the body and further highlights ultraviolet radiation as a key etiological factor.[21-23] The lower frequency of tumours in less exposed areas, such as the upper limbs, supports this observation.

The observed association between increasing age and malignant tumour occurrence is consistent with the cumulative effects of ultraviolet radiation exposure and progressive genetic damage over time. Similarly, the predominance of malignant lesions in the head and neck region further supports the established role of chronic sun exposure in keratinocytic carcinogenesis. These findings emphasise the importance of targeted preventive interventions, particularly among older individuals and populations with prolonged outdoor occupational exposure.

Overall, the patterns observed in this study suggest effects of environmental exposure, delayed presentation, and possible limitations in early diagnostic access. These findings highlight critical gaps in awareness, prevention, and healthcare delivery that must be addressed.

Study Limitations

This study was limited by its retrospective design and dependence on information available in pathology request forms and archival records. Important variables such as occupation, duration of lesion, ultraviolet exposure history, immunosuppression status, socioeconomic characteristics, family history, and other clinical risk factors were not consistently documented and therefore could not be analysed. The study was also hospital-based and may not fully reflect the true burden of cutaneous keratinocytic tumours within the general population. Future prospective multicentre studies incorporating these variables are recommended to provide a more comprehensive understanding of the epidemiology and risk factors associated with these tumours.

CONCLUSION

This study demonstrates that cutaneous keratinocytic tumours in Zaria, Nigeria, are predominantly malignant, with squamous cell carcinoma being the most common histological subtype. The tumours showed a slight male predominance, occurred predominantly among middle-aged and elderly individuals, and exhibited a predilection for sun-exposed anatomical sites, particularly the head and neck region.

The predominance of malignant lesions highlights the potential impact of delayed presentation, environmental risk factors, and limited access to specialised healthcare services. These findings underscore the need for increased public awareness regarding skin cancer, promotion of sun-protective behaviours among high-risk populations, strengthening of early detection programs, and improved access to histopathological diagnostic services.

Furthermore, policymakers and healthcare stakeholders should prioritise skin cancer prevention strategies and community-based educational interventions aimed at reducing the burden of advanced disease. Future multicentre prospective studies incorporating clinical, occupational, and environmental risk factors are recommended to further elucidate the epidemiology and pathogenesis of cutaneous keratinocytic tumours in Nigeria.

Declarations

Conflicts of Interest: Nil

Funding: Nil

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