Pattern of Cutaneous Lesions in Individuals with Oculocutaneous Albinism in South-Western Nigeria

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ABSTRACT

Background: Oculocutaneous albinism (OCA) is a heterogeneous genetic disorder with a huge medical, social, psychological, occupational and economic burden. The cutaneous features and complications of albinism vary depending on the type of albinism.

Objective: The study objective was to describe the pattern of cutaneous lesions in people with oculocutaneous albinism.

Method: This cross-sectional study involved forty-eight individuals with oculocutaneous albinism resident in Osun, Oyo, and Ondo states, South-Western Nigeria. The study participants had their skin examined by Dermatologists, and histology was performed on biopsy specimens of skin lesions with an unclear clinical diagnosis and those with suspicion of malignancy.

Results: The study participants were aged between 11 and 61 years (mean age 34.5 ± 11.3 years). The majority of the participants (60.4%) work predominantly outdoors. All but one (97.9%) of the participants had at least one photo-dermatosis, while 12.7% had other non-photo-induced dermatoses. Dermatoheliosis (77.1%) and solar lentigines (66.7%) were the two most common photo-dermatoses. More than half of the study participants (52.1%) had pre-malignant skin lesions (actinic keratosis), while malignant skin tumours were observed in 18.8%.

Conclusion: The study shows there is a high burden of photo-dermatoses, including pre-malignant and malignant skin tumours, even among younger populations of people with oculocutaneous albinism.

Keywords: Albinism, photo-dermatosis, dermatoheliosis, pre-malignant, malignant, tumours.

Schéma des Lésions Cutanées chez les Patients atteints d'albinisme Oculocutané dans le Sud-ouest du Nigeria

ABSTRAIT

Contexte: L'albinisme oculo-cutané (AOC) est une maladie génétique hétérogène avec un énorme fardeau médical, social, psychologique, professionnel et économique. Les caractéristiques cutanées et les complications de l'albinisme varient selon le type d'albinisme.

Objectif: L'objectif de l'étude était de décrire le schéma des lésions cutanées chez les personnes atteintes d'albinisme oculocutané.

Méthode: Cette étude transversale a impliqué quarante-huit personnes atteintes d'albinisme oculocutané résidant dans les États d'Osun, d'Oyo et d'Ondo, dans le sud-ouest du Nigeria. La peau des participants à l'étude a été examinée par des dermatologues et une histologie a été réalisée sur des échantillons de biopsie de lésions cutanées avec un diagnostic clinique peu clair et sur celles avec suspicion de malignité.

Résultats: Les participants à l'étude étaient âgés de 11 à 61 ans (âge moyen 34.5 ± 11.3 ans). La majorité des

participants (60.4%) travaillent principalement à l'extérieur. Tous les participants sauf un (97.9%) avaient au moins une photo-dermatose, tandis que 12.7% avaient d'autres dermatoses non photo-induites. La dermatohéliose (77.1%) et les lentigos solaires (66.7%) étaient les deux photo-dermatoses les plus fréquentes. Plus de la moitié des participants à l'étude (52.1%) avaient des lésions cutanées pré-malignes (kératose actinique), tandis que des tumeurs cutanées malignes ont été observées chez 18.8%.

Conclusion: L'étude montre qu'il existe un fardeau élevé de photo-dermatoses, y compris des tumeurs cutanées pré-malignes et malignes, même parmi les populations plus jeunes de personnes atteintes d'albinisme oculo-cutané.

Mots clés: Albinisme, photo-dermatose, dermatohéliose, tumeurs prémalignes, malignes.

Introduction

Albinism is a heterogeneous group of autosomal recessive disorders characterized by a generalized reduction in pigmentation of the skin, eyes and hair.[1] This is due to deficiency or absence of tyrosinase, the enzyme responsible for melanin production in the Raper-Mason pathway. Albinism has a worldwide distribution and affects people of all ethnic groups, with a global prevalence of 1 in 20,000.[2] The incidence of albinism in Africa is variable, but this pigmentary disorder is common in Zimbabwe, South Africa, Tanzania and Nigeria.[3] Studies have shown incidence ranging from 1 in 2,700 to 1 in 10,000 people, with the highest incidence of 1 in 1,000 in Zimbabwe, while Tanzania has an incidence of 1 in 2,500.[4] Eastern Nigeria has a prevalence of 1:15,000.[5] Albinism can be oculocutaneous (OCA, which has seven subtypes, namely OCA-1 to OCA-7), ocular or syndromic (e.g. Chediak-Higashi syndrome, Hermansky-Pudlack syndrome, Griscelli syndrome, Elejalde syndrome and Cross-McKusick-Breen syndrome) in manifestations.[2, 6, 7, 3] Oculocutaneous albinism (OCA) type 1 is caused by a mutation in the tyrosinase (TYR) gene, resulting in the complete absence of tyrosinase enzyme activity (OCA-1A) or reduction in the enzymatic activities (OCA-1B). Mutations in OCA 2 gene, TYRP1 gene, SLC45A2 gene, SLC24A5 gene and C10orf11 gene are responsible for OCA-2, OCA-3, OCA-4, OCA-6 and OCA-7, respectively.[8] Meanwhile, the gene involved in OCA-5 is located on chromosome 4q24 with about 14 genes on this chromosome, but the exact gene responsible for OCA-5 has not been determined.[8]

Individuals with albinism are plagued with many physical (skin) and psychological problems. They are susceptible to the damaging effects of ultraviolet radiation due to a lack of protective support by melanin. Cutaneous lesions in individuals with albinism range from photodermatoses to various neoplastic conditions. It is known that many individuals with albinism develop pre-malignant or malignant skin tumours before 30 years of age, and skin cancers are a common cause of mortality in this group of people.[9,10] Skin cancers are usually seen in the head and neck region due to increased exposure to ultraviolet radiation in that region compared to the rest of the body, and this is particularly true in Nigeria, where sunlight can sometimes be intense.[10,11] Non-melanoma skin cancers such as basal cell carcinoma and squamous cell carcinoma are more commonly seen, and squamous cell skin cancer may develop *de novo* or from actinic keratosis. This is largely due to ultraviolet radiation-mediated DNA damage and P53 tumour suppressor gene mutation.[12,13]

Few studies have been conducted locally, focusing on either photo-dermatoses or malignant skin tumors among people with albinism.[5, 10, 14, 15] This study, however, determined the clinical characteristics as well as malignant and non-malignant cutaneous lesions in patients with oculocutaneous albinism. These are also related to their degree of sun exposure (predominant indoor or outdoor activities).

Methods

This was a community-based cross-sectional study involving forty-eight individuals with albinism residents in Osun, Oyo and Ondo states, South-Western Nigeria. The study participants were all invited, through their state coordinators, to Ile-Ife, Nigeria, for a community awareness programme on albinism and its management. Services provided during the programme included health education on albinism, photo-protection, appropriate career choice for people with albinism and free skin care

services. An interviewer administered proforma was used to obtain information such as socio-demographic data and occupational history from each study participant. Clinical examination was done by Dermatologists. Skin biopsies were performed for histological confirmation of the diagnosis of skin lesions with unclear clinical diagnoses and those with suspicion of malignancy. The data obtained was analyzed using IBM SPSS version 25. The study (data collection, analysis and write-up) was completed over six months.

Results

The study comprised forty-eight individuals with oculocutaneous albinism. The socio-demographic characteristics of the study participants are shown in Table 1 below. About two-thirds (62.5%) of the study participants were females, and the age ranged from 11 to 61 years, with a mean age of 34.5 ± 11.3 years. A larger percentage of the study participants (60.4%) work predominantly outdoor despite the skin damaging effects of ultraviolet radiation in people with albinism, but this is not significant between the male and the female participants ($p = 0.08$).

Most of the study participants (97.9%) had at least one cutaneous lesion (diagnosis), with many (89.4%) having multiple diagnoses. All but one had photodermatoses such as dermatoheliosis (77.1%), solar lentigines (66.7%), actinic keratosis (52.1%), and actinic cheilitis (27.1%). Histologically confirmed basal cell carcinoma and squamous cell carcinoma were present in 14.6% and 4.2% of the participants, respectively (Table 2). Some of the images are captured in figures 1 to 3 below. A female participant had a fungal infection (tinea pedis), while non-infective, non-photo-related skin lesions [acne vulgaris (2), contact dermatitis (1), corn (1) and male pattern baldness (1)] were seen in five other patients.

Though the proportion of subjects above the mean age of 34.5 years who had dermatoheliosis, actinic cheilitis, actinic keratosis and basal cell carcinoma were higher than their counterparts below the study mean age, these differences were not statistically significant. A larger percentage of the male subjects had actinic cheilitis and malignant skin cancers, while dermatoheliosis, solar lentigines and actinic keratosis were observed in a higher percentage of the female subjects than their male counterparts. This difference was particularly significant for actinic keratosis among the female subjects ($p = 0.044$). All the observed skin lesions, except basal cell carcinoma, were more among those who engaged in outdoor occupations than those whose occupations were predominantly indoor, and this difference is statistically significant for solar lentigines ($p = 0.022$), as shown below in Table 3.

Discussion

The proportion of people with albinism with skin lesions found in this study is high, with most lesions being photo-related. Madubuko et al.,[14] found photodermatoses in 78.1% of patients with albinism in Benin. The climatic factor in Benin is similar to that of the participants in this study, and the prevalence of photodermatoses is high in both studies despite the younger population of patients with albinism in Madubuko's study compared to this study (mean age of 24±11 vs 34.5±11.3 years). It is known that older patients with albinism have a higher risk of photodermatoses due to increased duration of exposure to ultraviolet radiation.[15]

Dermatoheliosis was the most common finding in this study and was seen in 77.1% of the study participants. Variable proportions of photo-aged skin were found in other studies. [14, 16] For instance, Madubuko et al.,[14] in Nigeria and Samdani et al.,[16] in Pakistan reported photo-aging in 45.2% and 100% of their study participants, respectively. The higher prevalence of photo-aging in this study compared to the finding by Madubuko et al., [14] despite similar weather conditions, may be explained by the predominantly outdoor activities (occupation) our study participants engage in and their older age. Two of the patients admitted they constantly work under the direct sun as bricklayers for daily living. This act of 'self-neglect' emanated from a combination of ignorance and poverty. Also, a difference in prevailing type of albinism in the two studies (Madubuko's and ours) may be contributory, as the type of albinism influences susceptibility to photo-damage and, thus, the clinical manifestations. Clinically, the prevailing albinism type in our study was OCA type-2, while the prevailing type in the other study was not specified. An average

temperature during summer in Pakistan is higher than that of Nigeria (50º C vs 26.9º C), it is therefore not surprising the difference in the findings by Samdani et al.,[16] and this study.

The higher prevalence of photodermatoses (dermatoheliosis, solar lentigines and actinic keratosis) among the female subjects may be due to a higher proportion of females in predominantly outdoor occupations than their male counterparts (Table 1). Actinic Keratosis was found in over half (52.1%) of the study population. This is not unusual as some other studies [17, 18] have reported actinic keratosis in a similar proportion of the albinism population. Actinic keratosis is a pre-malignant skin lesion that requires appropriate care to prevent a possible malignant transformation.

The malignant skin tumours seen among the participants were the non-melanoma type. Basal cell carcinoma was the predominant type, and this is similar to the findings by Ramos et al.,[17] and Graziosi et al., [19] both in Brazil. Conversely, some other studies,[10,18,20,21] reported that squamous cell carcinoma is more prevalent among individuals with albinism. Despite the high prevalence of actinic keratosis in this study, the prevalence of squamous cell skin cancer was low. This may be explained by the universal availability of effective treatment options for actinic keratosis, with eventual prevention of its malignant transformation to squamous cell carcinoma. Also, the variable and unpredictable natural course of actinic keratosis, with possible spontaneous regression or persistence may be contributory. [22] Factors increasing risk of malignant transformation include the type and number of actinic keratosis, [23] which were not assessed in this study and may be another pointer to a need for follow up studies.

Conclusion

This study has documented various forms of dermatological diseases experienced by people with albinism. Most of the study participants live in a tropical region and are engaged in predominantly outdoor occupational activities, despite their genetic predisposition to photo-damage, and this contributes to the enormous dermatological problems experienced by this group of people. The study shows a high burden of photodermatoses, particularly pre-malignant and malignant skin lesions, even among the younger population of people with albinism (the study population is young, with an average age of 34.5 years). This high burden of skin lesions among this group of people warrants improved attention in the form of counselling and medical and social support to reduce the prevalence and complications of albinism. Genetic testing is recommended for people with oculocutaneous albinism, as this will help to further characterize the susceptibility to and the degree of skin lesions in different types of oculocutaneous albinism. Our study participants were educated on appropriate career options and photo-protective measures generally. Follow-up plans at hospitals with dermatological, ophthalmological, and plastic surgical services were made and implemented at their respective state of residence.

Conflict of interest: None to declare.

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Table 1. Socio-demographic Characteristics of the Study Participants

Variable	Subjects	Statistics	
	N=48 (%)	Statistical test	p-value
Gender			
Male	18 (37.5)		
Female	30 (62.5)		
Mean Age±SD (years)			
Male	37.5±12.6		
Female	32.5±10.3	-1.460*	0.151
Total	34.5±11.3		
Occupation (Outdoor)			
Male	8 (16.7)		
Female	21 (43.8)	3.072**	0.080
Total	29 (60.4)		

SD –Standard Deviation, N –Number, % -Percentage, * -Student's t-test, ** -Pearson Chi-square (χ^2)

Table 2 Cutaneous Lesions

Variable	Male	Female	Total
	N= 18 (%)	N= 30 (%)	N=48 (%)
Skin Lesions Present	17 (94.4)	30 (100)	47 (97.9)
Photodermatoses	17 (94.4)	30 (100)	47 (97.9)
Dermatoheliosis	12 (66.7)	25 (83.3)	37 (77.1)
Solar Lentigines	10 (55.6)	22 (73.3)	32 (66.7)
Actinic Cheilitis	6 (33.3)	7 (23.3)	13 (27.1)
Non-photodermatoses	2 (11.1)	4 (13.3)	6 (12.5)
Fungal	0 (0)	1 (3.3)	1 (2.1)
Non-infective dermatoses	2 (11.1)	3 (10)	5 (10.4)
Pre-malignancy (Actinic keratosis)	6 (33.3)	19 (63.3)	25 (52.1)
Malignancies	4 (22.2)	5 (16.7)	9 (18.8)
Basal Cell Carcinoma (BCC)	3 (16.7)	4 (13.3)	7 (14.6)
Squamous Cell Carcinoma (SCC)	1 (5.6)	1 (3.3)	2 (4.2)

N –Number, % -Percentage. Note: Some participants had more than one skin lesion.

Table 3Association between the Socio-demographic Characteristics and Skin Lesions

	Dermatoheliosis	S. Lentigines	A. Cheilitis	A. Keratosis	BCC	SCC
Mean Age (34.5 years)						
Age<34.5years, N=24(%)	18 (75)	19 (79.2)	6 (25)	12 (50)	2 (8.3)	2 (8.3)
Age≥34.5years,	19 (79.2)	13 (54.4)	7 (29.2)	13 (54.2)	5 (20.8)	0 (0)
χ^2	0.118	3.375	0.105	0.083	1.505	2.087
p-value	0.731	0.066	0.745	0.773	0.220	0.149
Gender						
Male, N = 18 (%)	12 (66.7)	10 (55.6)	6 (33.3)	6 (33.3)	3 (16.7)	1 (5.6)
Female, N = 30 (%)	25 (83.3)	22 (73.3)	7 (23.3)	19 (63.3)	4 (13.3)	1 (3.3)
χ^2	1.769	1.600	0.570	4.057	0.100	0.139
p-value	0.184	0.206	0.450	0.044	0.751	0.709
Occupation						
Outdoor, N = 29 (%)	25 (86.2)	23 (79.3)	8 (27.6)	17 (58.6)	4 (13.8)	2 (6.9)
Indoor, N = 19 (%)	12 (63.2)	9 (47.4)	5 (26.3)	8 (42.1)	3 (15.8)	0 (0)
χ^2	3.452	5.270	0.009	1.255	0.037	1.367
p-value	0.063	0.022	0.923	0.263	0.848	0.242

N –Number, % -Percentage, χ^2 –Pearson Chi-square, S. –Solar, A. –Actinic, BCC –Basal Cell Carcinoma, SCC –Squamous Cell Carcinoma.

NB: The majority of the patients had multiple lesions (diagnoses), and this is why the cumulative number (N) from all the lesions exceeded the number (N) for the mean age, gender and occupation.

Figure 1:
Multiple solar lentigines

Figure 2:
Actinic keratosis and deformed nose (post-surgery for BCC)

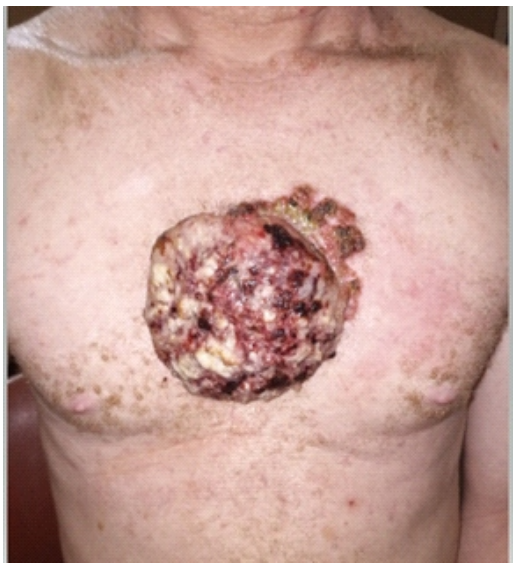

Figure 3:
Histologically confirmed squamous cell carcinoma in a 34-year old man with OCA