



**International Journal of TROPICAL DISEASE  
& Health**

**36(3): 1-13, 2019; Article no.IJTDH.49248**  
**ISSN: 2278-1005, NLM ID: 101632866**

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## **African Skin: Different Types, Needs and Diseases**

**Olumayowa Abimbola Oninla<sup>1\*</sup>, Samuel Olorunyomi Oninla<sup>2</sup>,  
Bolaji Ibiesa Otike-Odibi<sup>3</sup>, Mufutau Muphy Oripelaye<sup>1</sup>,  
Fatai Olatunde Olanrewaju<sup>1</sup> and Tahir Mohammed<sup>4</sup>**

<sup>1</sup>*Department of Dermatology and Venereology, Obafemi Awolowo University, Ile-Ife, Osun State, 220282, Nigeria.*

<sup>2</sup>*Department of Paediatrics and Child Health, Ladoke Akintola University of Technology, Osogbo, Osun State, Nigeria.*

<sup>3</sup>*Department of Internal Medicine, Dermatology Unit, University of Port-Harcourt, Rivers State, Nigeria.*

<sup>4</sup>*Department of Medicine, Dermatology Unit, Ahmadu Bello University Teaching Hospital, Zaria, Kaduna State, Nigeria.*

### **Authors' contributions**

*This work was carried out in collaboration among all authors. Authors OAO and SOO designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors OAO, MMO and FOO managed the second drafting and corrections of the study. Authors OAO, BIO and TTM managed the literature searches. All authors read and approved the final manuscript.*

### **Article Information**

DOI: 10.9734/IJTDH/2019/v36i330143

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(3) Asli Kaptanoglu, Marmara University, Turkey.

Complete Peer review History: <http://www.sdiarticle3.com/review-history/49248>

**Review Article**

**Received 16 March 2019**

**Accepted 01 June 2019**

**Published 10 June 2019**

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### **ABSTRACT**

Microscopic structures in the skin are basically the same in all races. Differences are found in histology and physiology of the skin resulting in different skin types, needs and prevailing skin diseases. Skin pigmentation (with the photo-protective properties), and the barrier function of the stratum corneum are the main differences between African and Caucasian skin. The geographic distribution of UV radiation (UVR) has a positive correlation with geographical location. The darker-skinned populations are closer to the equator where there are high amounts of

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\*Corresponding author: Email: [mayooni@yahoo.com](mailto:mayooni@yahoo.com);

UVR especially in the tropical regions of the world. African skin has the greatest variability in skin color. Africa has both white and dark skinned individuals with the darker-skinned populations being mostly around the equator.

Leslie Baumann introduced four parameters that more accurately characterized skin types than previous classification of dry, oily, normal and combination skin. These are dry or oily – D/O; sensitive or resistant – S/R; pigmented or non-pigmented – P/N, and wrinkled or unwrinkled skin – W/T. Combinations of these further produced sixteen skin phenotypes. Dark skinned individuals often have the PT types while the light skinned mostly have the NW types.

Skin needs basically depends on the type. Identifying the skin type is fundamental to providing the right skin care. According to Baumann, the fundamental elements of skin care are mild cleansing, hydrating (moisturization with humectants and emollients), replenishing (with lipids, ceramides and fatty acids) and skin protection (UV protection and increased humidity).

Skin diseases are associated with skin type. Eczema is more typical in people with DS combinations while acne is associated with OS skin type (especially OSNT and OSPT). Prevalence of skin diseases varies within African communities from 35% to 87% with skin infections affecting 22-46% and eczemas 13-21% of patients in various studies.

*Keywords: African skin; skin diseases; skin types.*

## 1. INTRODUCTION

Skin is the outermost covering of the body and by dry weight the largest organ of the body covering 1.7 square metres and constituting 15% of the body weight [1,2,3]. Skin diseases affect a quarter to a third of the general population, and constitutes about one-fifth of all consultations by the general practitioners (GP) [4]. The GPs see about 24% of the general population for skin diseases each year and refer 6% of them (1% of the population) for specialist care by the Dermatologist.[5] Although rarely life threatening, many skin diseases are chronic diseases, [6] and usually associated with significant psychological morbidity [7,8,9].

Skin care is therefore a paramount need of man. Fundamental to skin care is the knowledge of the skin types, needs and diseases peculiar to that type. The skin types, needs and diseases are influenced by the race/ethnicity/regions, age, gender, environmental, dietary, body sites and cosmetic factors.

The skin structure is basically the same in all races when examined under the microscope. Morphological differences, however, exists in the histology and physiology of the skin. The main differences between African and Caucasian skin properties are in the degree of pigmentation (with the photo-protective properties), and the barrier function of the stratum corneum. Some findings also reveal that African and Caucasian skin does not only differ in the upper epidermis but also in their dermal functions and dermal-epidermal cellular interactions.

La Ruche et al. [10] in their review of experimental findings in the black skin reports that:

1. Compared with white skin, stratum corneum is equal in thickness but more compact: About twenty cell layers are observed in blacks versus sixteen layers in whites.
2. The lipid content of the epidermis in the black skin is also somewhat higher resulting in greater cellular cohesion. Hence, the difficulty in stripping off the black horny layer.
3. These two findings could also account for a slightly inferior permeability of black skin to certain chemicals.
4. The hair of blacks is naturally more brittle and more susceptible to breakage and spontaneous knotting than that of whites due to the weak intercellular cohesion between cortical cells.
5. The higher electrical resistance of black skin makes the black epidermis less hydrated than the white epidermis
6. Anatomically, the amount of sweat glands in black and white skins is identical and varies with climatic changes but not with racial factors.
7. Sweating is thought to be similar in both races, but blacks withstand humid heat better while whites cope better with dry heat.

Girardeau et al. [11] in their study found the following differences in morphology and the relevant biological functions:

1. Neither epidermis thickness nor superficial dermis thickness was significantly different in African versus Caucasian skin. However, the dermal-epidermal junction (DEJ) length in African skin was about threefold that in Caucasian skin. African skin as a result shows a greater convolution of the DEJ.
2. No differences were noticed as regards elastic and collagen fibre organization.
3. A higher papillary fibroblast activity exists in the black skin. These are mainly.
  - a. A significantly higher level of monocyte chemoattractant peptide-1 (MCP-1) protein in cell cultures from African donors when compared with that from Caucasians.
  - b. A significantly higher level of MMP-1 and tissue inhibitor metalloproteinase protein 1 (TIMP-1) protein expression.
  - c. The ratio of papillary to reticular fibroblast expression of keratinocyte growth factor (KGF) was found to be twofold greater in cell cultures from African donors compared with that from Caucasian donors.

KGF is a member of fibroblast growth factor family (FGF-7) with a distinctive pattern of target-cell specificity which is predominantly epithelial cells leading to their proliferation, migration and morphogenesis [12]. It induces suprabasal cell proliferation [13]. This may account for the increased cellular layers and compactness of the epidermis in black skin.

## 2. WHAT DIFFERENCES DO WE HAVE IN SKIN PIGMENTATION?

Melanin is the most important substance responsible for skin color and is the main determinant of the dark skin in dark skinned individuals. The more the melanin, the darker a person will be. For light skinned individuals, a reduced melanin pigment with the bluish-white color of the connective tissue determines the skin color. The redness of the skin is determined by the hemoglobin in the venous blood circulating in the dermis.

A positive correlation has been found between geographical location and geographic distribution of UV radiation (UVR). Darker-skinned populations are found in those closer to the equator where there are high amounts of UVR especially the tropical regions, and lighter-skinned populations have been found in those far away from the equator (Figs. 1 - 7) [14,15,16].

The distribution and size of melanosomes in the skin, and the type of melanin also determines the skin color. There are two types of melanin produced by melanocytes. The most common is eumelanin which is a brown-black polymer of dihydroxyindole carboxylic acids, and their reduced forms derived from tyrosine. It can be found in hair, areola, and skin, and the hair colors that are gray, black, blond, and brown. It is more abundant in people with dark skin. Pheomelanin, has a pink to red hue. It is found in large quantities in red hair, the lips, nipples, glans of the penis, and vagina [17,18,19].

The genetic mechanisms underlying human skin color variation is still not completely understood. Genetic studies have led to the discovery of various genes that affect skin color in specific populations. Different allele frequencies of these genes exist and these are responsible for the variation in skin coloration even in the same populations.

The melanocortin 1 receptor (MC1R) gene is primarily responsible for determining whether pheomelanin and eumelanin is produced in the human body.

Skin color types (using Fitzpatrick's skin type) [20,22].

### Type 1

Type 1 is extremely sensitive to sunburns. They are usually white in skin color with red or blond hair. They never tan. People of Northern European countries or British are a good example.

### Type 2

Usually burns with a very low ability to tan, White but with a fair complexion. Examples are those of Asian heritage (Koreans or the Japanese). They may also be of European Heritage with a fair complexion and blue eyes.

### Type 3

A type 3 is more able to withstand sunburn. They may get a mild burn sometimes, but they tan gradually. A type 3 might be Latin or Mediterranean heritage. Greek, Armenian, Spanish, and Mexican are good examples of typical type 3 skin tone.

### Type 4

The Type 4's naturally have moderate brown skin tone. They do burn, but minimally. Usually brown

eyed with dark hair, a person of Indian American descent or those from India are good examples.

### Type 5

Type 5's very rarely burn and tan very easily. They have a dark brown skin tone and may have African or Central/South American Ancestry.

### Type 6

Type 6 never has burns. Their skin tone is very dark and they never tan. Most type 6's has an African or African American descendency. A person of Nigerian descent is a perfect example.

## 3. WHAT THE AFRICAN SKIN NEEDS

“The secret to maintaining your African skin and keeping it beautiful is to keep it NATURAL” Determine the type of skin and give the appropriate skin care. SKIN CARE IS COLOR BLIND. The need of the skin in all races, ethnicity or regions, age or gender is basically

dependent on the skin type though these factors may play some roles in the type of skin a person has.

For instance, a black skin person may have dry skin and a white skinned person can also have it. With the black skin having increased transepidermal water loss, reduced stratum corneum hydration than the white skin, and increased environmental temperature, black skin may be more prone to dryness [23,24].

There are four (4) elements of fundamental skin care (as stated in Baumann Skin Types Indicator) [25].

1. Mild cleansing
2. Hydrating using moisturizer (humectants and emollients)
3. Replenishing with lipids, ceramides and fatty acids
4. Protecting from UV protection and increased humidity

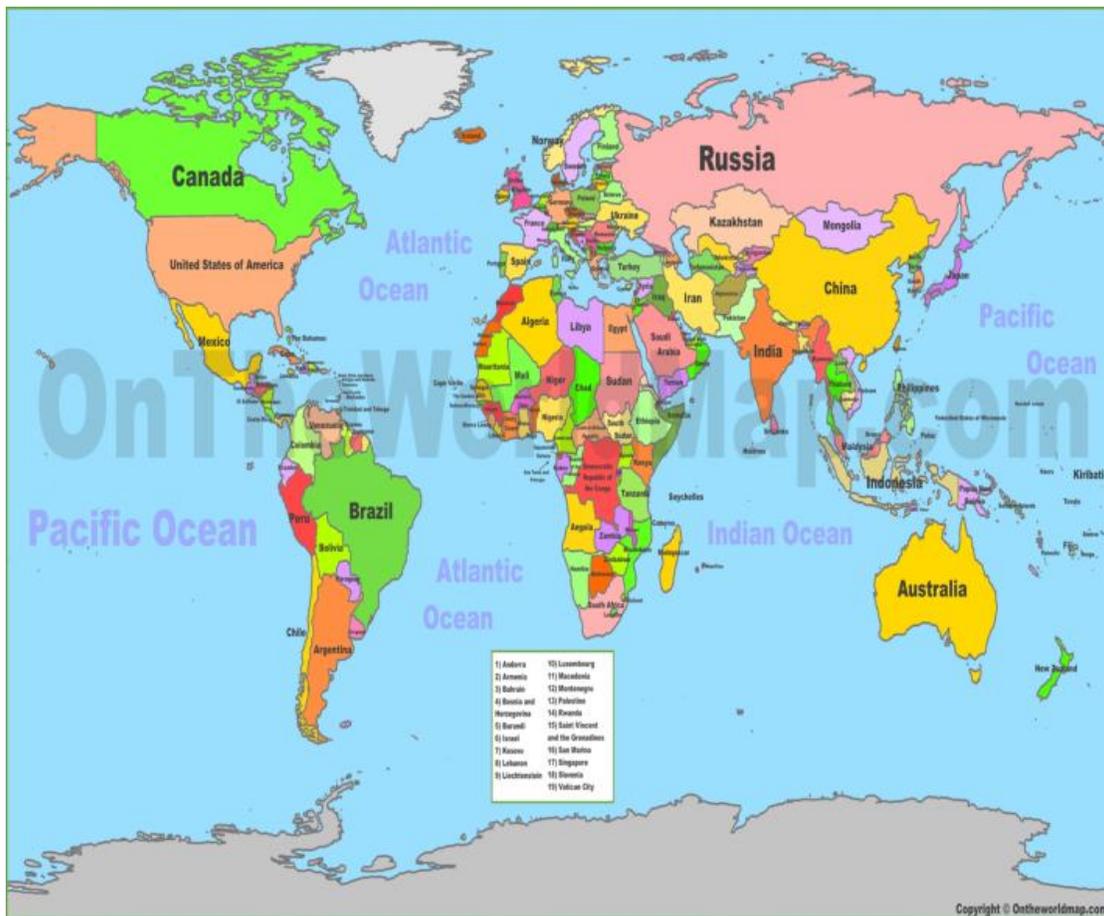


Fig. 1. World map showing countries

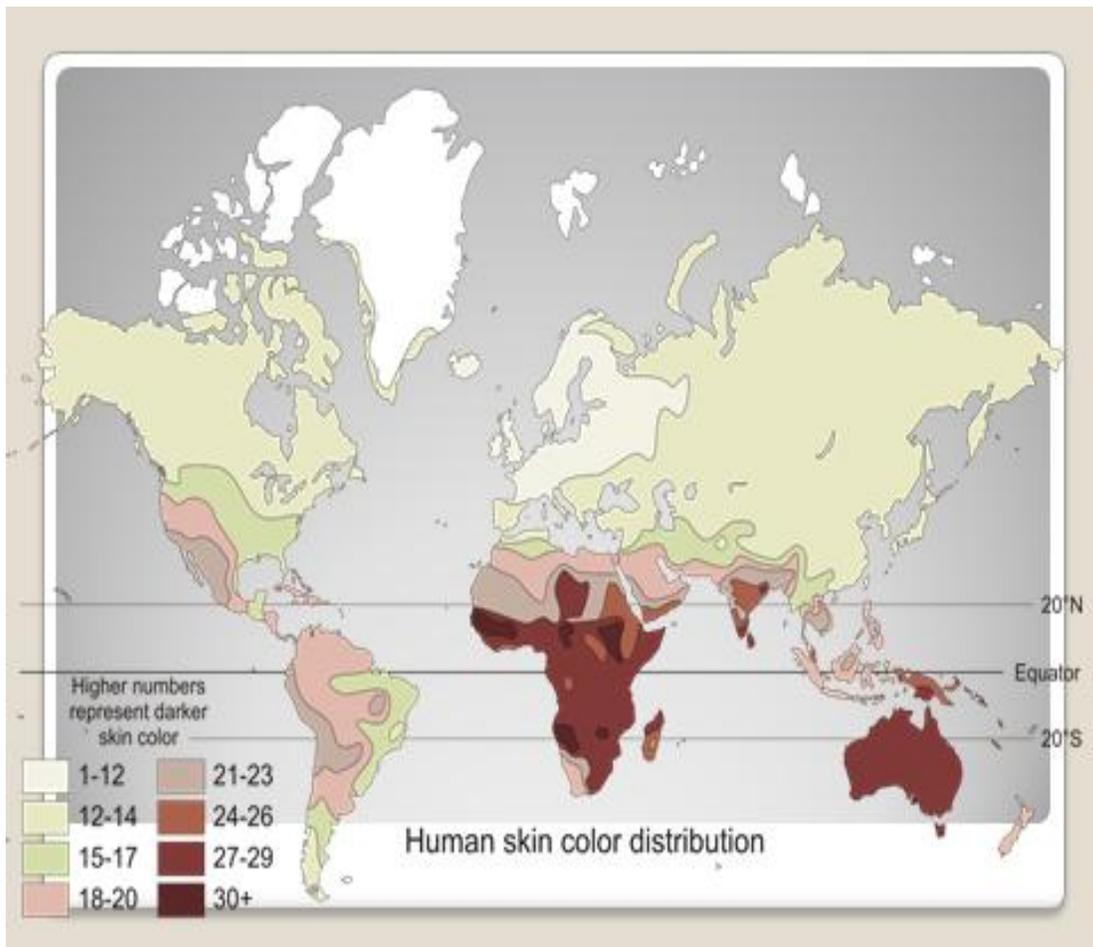


Fig. 2. World map - Skin color distribution [16]

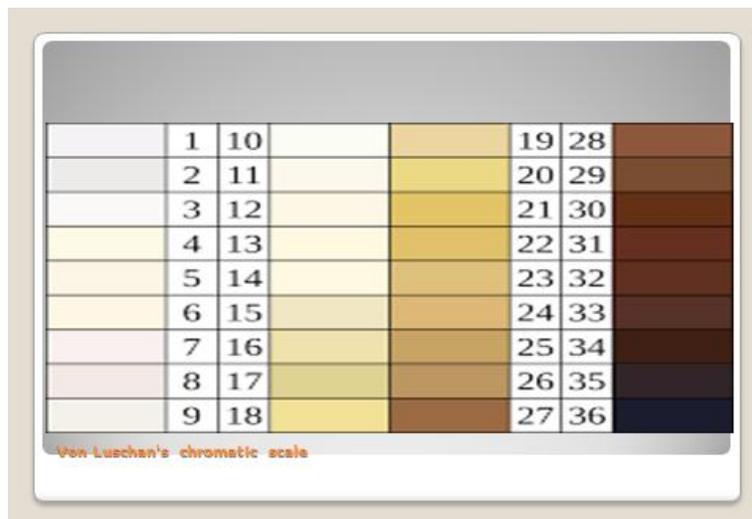
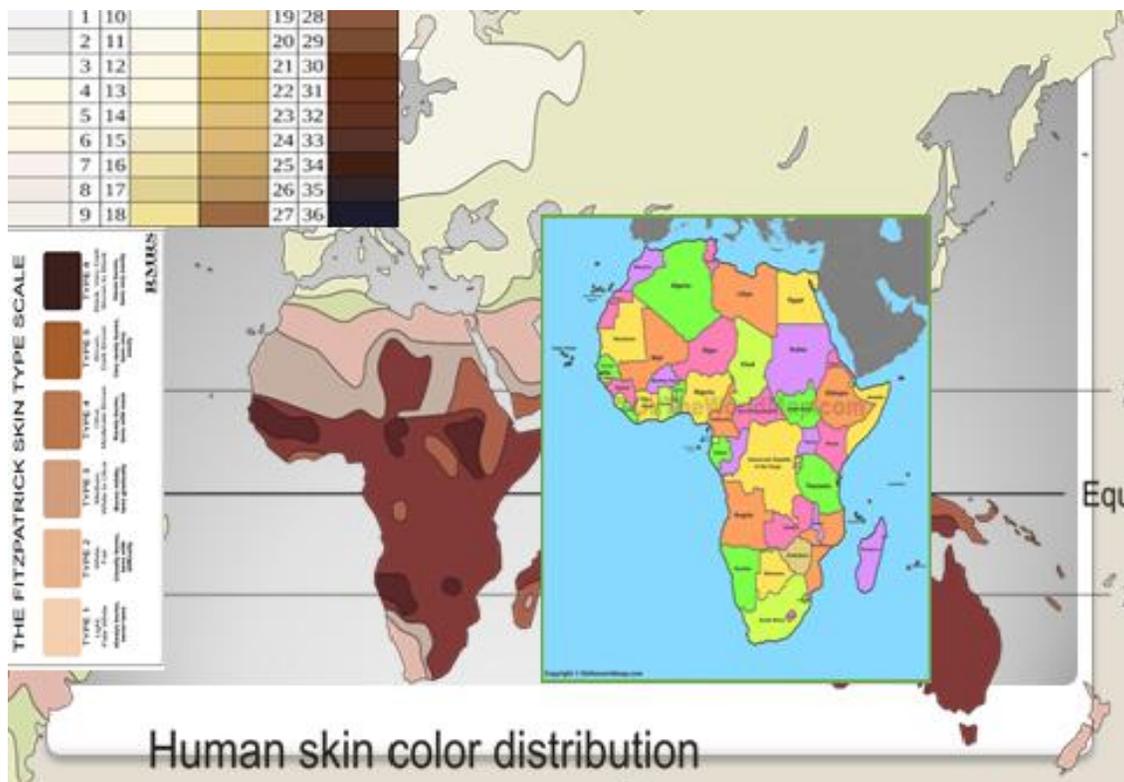


Fig. 3. Von Luschan's chromatic scale

[https://upload.wikimedia.org/wikipedia/commons/thumb/3/3c/Felix\\_von\\_Luschan\\_Skin\\_Color\\_chart.svg/2000px-Felix\\_von\\_Luschan\\_Skin\\_Color\\_chart.svg.png](https://upload.wikimedia.org/wikipedia/commons/thumb/3/3c/Felix_von_Luschan_Skin_Color_chart.svg/2000px-Felix_von_Luschan_Skin_Color_chart.svg.png)



**Fig. 4. The Fitzpatrick skin color chart (Thomas B. Fitzpatrick, 1975)**  
<http://www.arpana.gov.au/pubs/RadiationProtection/FitzpatrickSkinType.pdf>



**Fig. 5. Skin color distribution in Africa**

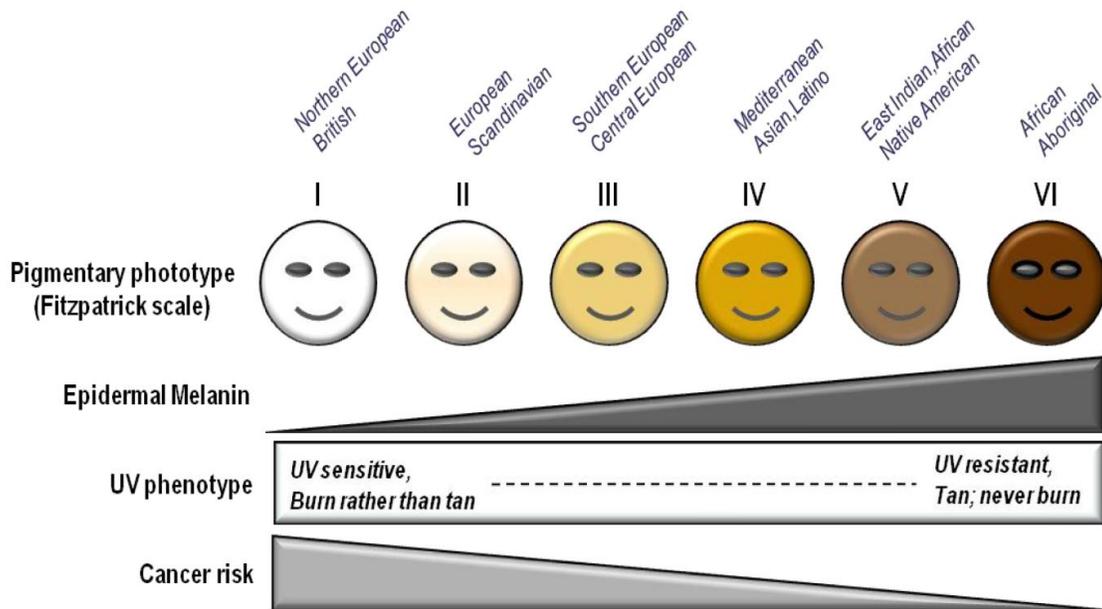


Fig. 6. Skin color types – phenotypic appearance according to Fitzpatrick classification from understanding skin types for laser hair removal [20]

Fitzpatrick Type	Also called	Sun-burning	Tanning behavior	Von Luschan's chromatic scale
I	Light, pale white	Always	Never	0-6
II	White, fair	Usually	Minimally	7-13
III	Medium, white to light brown	Sometimes	Uniformly	14-20
IV	Olive, moderate brown	Rarely	Easily	21-27
V	Brown, dark brown	Very rarely	Very easily	28-34
VI	Very dark brown to black	Never	Never	35-36

Fig. 7. Comparison of skin color types (Human Skin Color – Wikipedia) [21]

### 3.1 Identifying the Skin Type

Identifying the skin type is fundamental to skin care. Previous categories of skin types are dry, oily, normal and combination skin. Leslie Baumann, in 2008, introduced 4 parameters that more accurately characterize skin types (10).

The 4 parameters are:

- a) Dry or oily - D/O
- b) Sensitive or resistant - S/R
- c) Pigmented or nonpigmented - P/N
- d) Wrinkled or unwrinkled skin - W/T.



**Fig. 8. Baumann skin types - Bingo card**™. © 2014 MetaBeauty Inc - Used with permission. All rights reserved [26]

Variations of these parameters produced 16 possible skin phenotypes (Fig. 8). They have been adopted by researchers in genetic research to identify the genes involved in various skin conditions such as dryness, aging, pigmentation and sensitivity. They have also been of use in selection of patients for clinical research trials, and in recommending proper skincare ingredients and products to patients by dermatologists and aestheticians.

Baumann skin types revealed that certain combinations are associated with distinct skin conditions and challenges. Some conditions associated with skin types are:

Dark skin – more in individuals characterized as PT types; light skin is depicted mostly as NW types. DRPW types often have a history of sun exposure manifested by wrinkles and solar lentigos.

Rosacea – observed mostly in people OSNW skin types than others.

Eczema – mostly seen in those with DS combinations (DSNT, DSPT, DSPW and DSNW) than other combinations.

Acne – associated with OS skin type (especially OSNT and OSPT types) more than any other skin type.

### 3.2 Skin Diseases in Africa

Skin diseases presenting to dermatologists in different regions of Nigeria and Africa were studied in a comparative study reported by Oninla et al. 2014 [27]. The study depicts the global incidence and prevalence of dermatological diseases and conditions in Nigeria and Africa. The article will be discussed in order to provide the knowledge of the most common dermatoses in Africa.

### 3.3 Excerpts from the Study

A high prevalence of skin diseases (21–87%) has been reported from developing countries all over the world by WHO [28]. The prevalence varies within African communities from 35% to values as high as 87% [29,30,31,32]. Skin problems are a great cause of morbidity and sometimes mortality as well as the cause of a majority of hospital consultations [33]. Dermatologists therefore need to reduce this disease burden in different African communities.

With the result obtained by Dermatologists in Ile-Ife/Ilesha in Osun State, a comparison was done with the reports from 4 geopolitical zones in Nigeria (See Table 1). The first 20 dermatoses in each skin center which constituted 63 – 69% of the skin conditions seen were compared [34,35,36,37].

**Table 1. Comparison of dermatoses reported by dermatologists in different geographical zones in Nigeria**

<b>Comparison of first 20 dermatoses reported by dermatologists in different geographical zones in Nigeria</b>									
<b>Present study Ile-Ife/Ilesha 2009-2012 (n =1013)</b>		<b>Ogunbiyi et al. Ibadan 1994-1998 (n = 1091)</b>		<b>Nnoruka Enugu 1999-2001 (n = 2871)</b>		<b>Yahya Kaduna 2000-2005 (n = 5982)</b>		<b>Onayemi et al. Sokoto 1999-2001 (n =900)</b>	
<b>Dermatoses</b>	<b>%</b>	<b>Dermatoses</b>	<b>%</b>	<b>Dermatoses</b>	<b>%</b>	<b>Dermatoses</b>	<b>%</b>	<b>Dermatoses</b>	<b>%</b>
Dermatophytes	9.8	Atopic eczema	5.8	Dermatophytes	8.3	Atopic dermatitis	13.8	Pityriasis versicolor	6.7
Acne	9.5	Vitiligo	5.7	Contact dermatitis	5.3	Acne vulgaris	6.7	Scabies	5.2
Pityriasis versicolor	4.6	Urticaria	4.6	Atopic dermatitis	4.8	Dermato-phytes	6.0	Tinea corporis	5.0
Viral warts	3.8	Tinea versicolor	4.5	Lichen planus	4.8	Contact dermatitis	5.8	Candidiasis	4.9
Lichen planus	3.7	Ring -worm	4.5	Acne vulgaris	4.3	Urticaria	3.6	Acne vulgaris	4.3
Seborrhoeic eczema	3.6	Pruritus	4.2	Pityriasis rosea	4.1	Papular urticaria	3.5	Seborrheic eczema	4.0
Urticaria/ Angioedema	3.6	Scabies	4.2	Acne keloidalis nuchae	3.7	Lichen simplex chronicus	3.0	Lichen simplex	3.9
Onchocerciasis	3.2	Alopecia	3.4	Pseudofolliculitis barbae	3.4	Viral wart	2.9	Urticaria	3.7
Pruritus	3.1	Lichen planus	3.4	Seborrhoeic dermatitis	3.3	Candidiasis	2.8	Bacterial folliculitis	3.1
Pityriasis rosea	2.6	Seborrheic dermatitis	2.9	Vitiligo	3.2	Pityriasis versicolor	2.4	Viral warts	2.9

**Table 2. Comparison of pattern of skin disorders at dermatology clinics in four regions of Africa**

<b>Comparison of pattern of skin disorders at dermatology clinics in four regions of Africa</b>									
<b>Study at Ile-Ife Nigeria</b>	<b>%</b>	<b>Ghana</b>	<b>%</b>	<b>Tunisia</b>	<b>%</b>	<b>Ethiopia</b>	<b>%</b>	<b>South Africa</b>	<b>%</b>
Infections	31.7	Infections	46.3	Infections	38.60	Infections	25.4	Eczema	31.2
Eczemas	17.0	Dermatitis	18.4	Hair/ sebaceous gland disorders	14.30	Photo-dermatoses	22.9	Infections	22.1
Disorders of Skin appendages	14.6	Generalized pruritus	10.5	Allergic disorders	13.60	Dermatitis (excluding seborrhoeic)	22.1	Acne	16.0
Papulo-squamous disorders	8.5	Autoimmune	5.0	Tumors	7.80	Acne/Rosacea/ Perioral dermatitis	5.8	Benign tumours	5.9
Skin tumours	7.2	Acne and acne rosacea	4.6	Keratinization disorders	5.40	Seborrhoeic dermatitis	3.4	Psoriasis	2.9
Urticaria/ erythemas	5.6	Urticaria	4.4	Pigmentary disorders	4.70	Pruritus	3.2	Malignant tumours	2.8
Pigmentary disorders	4.6	Drug reactions	3.6	Vascular disorders	1.70	Lichen planus/ Psoriasis	2.2	Urticaria	1.8
Drug reactions	3.6	Hair disorders	1.2	Drug reactions	0.70	Urticaria	1.9	Vitiligo	1.2
Connective tissue disease	1.4	Pigmentary disorders	1.0	Auto-immune disorders	0.50	Drug reaction	1.5	Chloasma	1.2
Bullous disorders	0.6	Skin tumors	1.0	Genodermatoses	0.22	Collagenoses	0.1	Lupus erythematosus	1.1
Others	5.1	Others	4.0	Others	12.48	Others	10.8	Others	13.8

The most common skin problems (obtained by calculating the average percentage frequency for all 5 centers) were:

Superficial fungi infections - 13.1% (Dermatophytes 6.8%; pityriasis versicolor 4.0%; candidiasis 2.3%).

Eczemas – 10.7% (atopic dermatitis 4.9%; contact dermatitis 3.2%; seborrheic dermatitis 3.2%).

Papulosquamous diseases -- 6.2% (Lichen planus 3.0%; Pityriasis rosea 2.4%; Psoriasis 0.8%).

Acne vulgaris – 5.5%  
Urticarial – 3.6%  
Vitiligo - 3.2%  
Scabies - 2.3%

A study comparison of the dermatoses in 4 regions of Africa - North, South, East and West was also carried out [38,39,40,41]. ICD (International classification of diseases) 10 was used for the grouping of these conditions. The use of ICD allows for comparison of these diseases which are diverse in different localities, and are also reported by different researchers in variable patterns.

Skin infections/infestations were the most common dermatoses affecting 2 to 5 out of every 10 patients (22.1 – 48.3%) seen at different dermatology clinics across Africa (Table 2). Eczematous conditions were next affecting approximately 2 out of every 10 patients with skin conditions.

#### 4. CONCLUSION

Skin needs basically depends on the type. Identifying the skin type is fundamental to providing the right skin care. According to Baumann, the fundamental elements of skin care are mild cleansing, hydrating (moisturization with humectants and emollients), replenishing (with lipids, ceramides and fatty acids) and skin protection (UV protection and increased humidity).

Skin diseases are associated with skin type. Eczema is more typical in people with DS combinations while acne is associated with OS skin type. Prevalence of skin diseases varies within African communities from 35% to 87% with skin infections affecting 22-46% and eczemas 13-21% of patients in various studies. The

knowledge of the skin type in Africans is paramount to the diagnosis and management of skin diseases affecting them as well as preventing these diseases. Studies in the Africans are needed to determine skin types qualitatively using Baumann skin types – chart and software, and quantitatively using physical measuring devices such as sebumeters, tewameters and cutometers.

#### CONSENT AND ETHICAL APPROVAL

It is not applicable.

#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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