



Iris Colour Pattern among University of Port Harcourt Students

¹*IO CHUKWUKA, ¹I. GBOBO, ²JI OKOROAFOR

Departments of * Surgery and ** Anatomy, College of Health Sciences, University of Port Harcourt, Nigeria

*Author for Correspondence

ABSTRACT

Eye colour is a polygenic character and is determined by the amount and types of pigments in the iris. Human beings and some animals have many phenotypic variations in their eye colour. The study was carried out to find out the iris colour patterns in students of the University of Port Harcourt and their associated phenotypic characteristics. A population of 1000 students living in the University hostels was examined in this study, 500 male and 500 female. The iris colour, skin and hair colours were checked and routine questions asked to rule out the presence of any ocular pathology. The predominant iris colour among them was dark brown iris which occurred in 65% of the students while the light brown iris colour occurred in 33% of students and the green colour iris occurred in 3% of students. There was an association between dark brown iris colour, black hair and brown skin while light brown iris colour was associated with fair skin and brown hair and the green iris colour associated with fair skin and brown hair. The study has shown that there is a positive association between the iris colour of the students of the University of Port Harcourt and the hair and skin colour.

Key words: Iris eye colour, Iris pigment, melanocytes, phenotype.

The iris, visible through the clear cornea as the colored disc inside of the eye, is a thin diaphragm composed mostly of connective tissue and smooth muscle fibers. It is situated between the cornea and the crystalline lens. The color(s), texture, and patterns of each person's iris are as unique as a fingerprint. The iris is composed of 3 layers, from the front to the back: endothelium, stroma, and epithelium. The iris divides the anterior compartment, the space separating the cornea and the lens, into 2 chambers: the larger anterior chamber (between the cornea and the iris), and the smaller posterior chamber (between the iris and the lens). The color of the iris, established genetically, is determined by the amount of pigment present in the iris structure. No pigment at all (in the case of an albino) results in a pink iris. Some pigment causes the iris to appear blue. Increasing amounts of iris pigment produce green, hazel and brown irises (or irides).

The presence of melanin pigment within the iris is responsible for the visual impression of human eye colouration with complex patterns also evident in this tissue, including Fuchs' crypts, nevi, Wolfflin nodules and contraction furrows.

The study of human eye colour as a physical trait is based on the developmental biology, morphology, chemistry and genetic determinants of the iris, which is part of the uveal tract of the eye (Sturm and Larsson,

2009). The iris is a small connective tissue and muscular structure of around 12 mm in diameter with a central opening called the pupil. It controls the amount of light entering the eye which is focused by the lens onto the retina so as to provide the sense of vision. It contracts in bright light making the pupil smaller and dilates in dark conditions making the pupil larger, which together with the source of the incident light can influence the perception of an individual's eye colour and iris pattern. In the brown iris there is an abundance of melanocytes and melanin in the anterior border layer and stroma whereas in the blue iris these layers contain very little melanin. As light traverses these relatively melanin-free layers, collagen fibrils of the iris scatter the short blue wavelengths to the surface, thus a blue iris is a consequence of structure not of major differences in chemical composition. Different shades of blue, and in irises with a limited amount of melanin, different shades of grey, green and hazel, are determined by the thickness and density of the iris itself and the extent of accumulation of white collagen fibres, as well as patches of tissue loss in the anterior border layer and stroma.

MATERIALS AND METHODS:

The study was carried out prospectively to find out the pattern of eye colour among students of the University of Port Harcourt. A

population of 1000 students living in the university hostels were examined; 500 male and 500 female.

A standard questionnaire was filled for each student and covered the iris anatomy, eye colour, and skin and hair colour. The eyes of the students were photographed with a Sony DSC-W110 Digital Camera under standard illumination. The students were asked to open their eyes wide to get a good view of the iris. The population for this study was from the hostels of the University of Port Harcourt; King Jaja Halls 1,2,3,4 and Nelson Mandela Hostels. Precautions were taken to make sure that there were no contact lenses in place by asking them to blink and look in all the extreme positions of gaze. Students with ocular pathology were excluded from the study.

RESULTS

The results show that the predominant iris colour among the University of Port Harcourt students was the dark brown iris with a total of 647 students (64%) of which 324 (65%) were male and 323 (64%) were female. The light brown iris colour followed the dark brown with a total number of 327 students (33%) with 169 being male and 158 being female. The least occurring iris colour was the green iris with a total of 26 students (3%) all of whom were female. (Table 1)

Table 2 shows the distribution of the hair colour of the 1000 sampled Uniport students based on their iris colours. The table shows three hair colours and the number of students with the individual iris colours represented under each hair colour. The prevalent hair colour was the black hair with a total of 582 students followed by the brown hair having 418 students. Table 3 shows the distribution of skin colour of the 1000 sampled.

TABLE 1: Frequency Distribution of Iris Colour among 1000 Uniport Students (500 males and 500 females).

IRIS COLOUR	FREQUENCY		
	MALE AND FEMALE	MALE	FEMALE
GREEN	26	7	19
L.BROWN	327	169	158
D.BROWN	647	324	323
TOTAL	500	500	1000

TABLE 2: Frequency Distribution of Hair Colour of 1000 Uniport Students (500 males and 500 females) with Different Iris Colours.

IRIS COLOUR	HAIR COLOUR		TOTAL
	BLACK	BROWN	
GREEN	447	200	647
L.BROWN	2	24	26
D.BROWN	133	194	327
TOTAL	582	418	1000

TABLE 3: Frequency Distribution of Skin Colour of 1000 Uniport Students (500 males and 500 females) with Different Iris Colours.

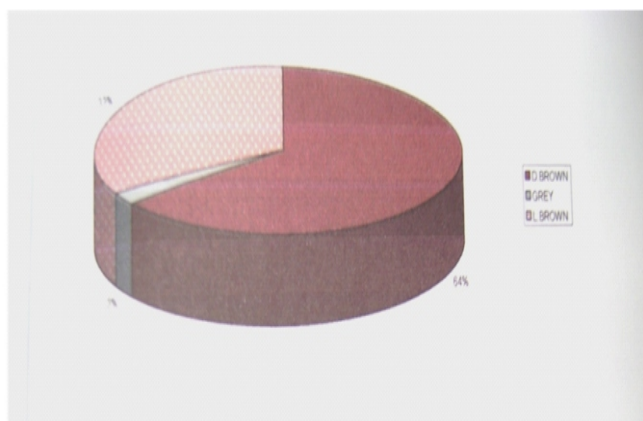
IRIS COLOUR	SKIN COLOUR			TOTAL
	BLACK	BROWN	FAIR	
GREEN	65	499	83	647
L.BROWN	1	11	14	26
D.BROWN	9	139	179	327
TOTAL	75	649	276	1000

TABLE 4: Frequency Distribution of Hair Colour of Sampled Male and Female Uniport Students with Different Iris Colours.

IRIS COLOUR	HAIR COLOUR				TOTAL
	BLACK		BROWN		
	MALE	FEMALE	MALE	FEMALE	
GREEN	243	204	81	119	647
L.BROWN	0	2	7	17	26
D.BROWN	84	49	85	109	327
TOTAL	327	255	167	243	1000

TABLE 5: Frequency Distribution of Skin Colour of Sampled Male and Female Uniport Students with Different Iris Colours.

IRIS COLOUR	SKIN COLOUR						TOTAL
	BLACK		BROWN		FAIR		
	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	
D.BROWN	44	21	257	242	23	60	647
GREY	1	0	5	6	1	12	26
L.BROWN	3	6	84	55	82	27	327
TOTAL	48	25	346	303	106	170	1000

**Figure 1:** Pie Chart Showing the Pattern of Iris Colour among 1000 Uniport Students (500 males and 500 females)**DISCUSSION:**

From the results, the prevalent iris colour among the University of Port Harcourt students was the dark brown iris with a total of 647 students (64%) of which 324 were male and 323 were female. The light brown iris colour followed the dark brown with a total number of 327 students (33%) with 169 being male and 158 being female. The least occurring iris colour was the green iris with a total of 26 students (3%) all of whom were female. Students with brown hair are mostly

Table 6: Test of Association between Iris Colour and Hair Colour; and between Iris Colour and Skin Colour.

Parameter	Calculated	Tabulated	P value	Significance	Inference
Iris colour and hair colour	100.08	5.99	0.000	P<0.05	Significant association
Iris colour and skin colour	203.00	9.48	0.000	P<0.05	Significant association

From table 6, there is a significant association between the iris colour and the skin colour and between the iris colour and hair colour at $p < 0.05$ level.

fair-skinned people with a light-brown iris, while those with black hair colour mostly have dark-brown iris colour. There was an association between dark-brown iris colour and black hair and brown skin. Light-brown iris colour was associated with fair skin and brown hair, while green iris colour was associated with fair skin and brown hair. In this study all the green coloured irides occurred in females. This is statistically significant ($p < 0.005$).

Unfortunately, there is no documentation of other African studies for comparison but it is believed that this study will be a basis of comparison for future studies on Africans and African descendants elsewhere.

A careful examination of people's irises makes it clear that there are characteristics other than eye colour that present in the human iris. The iris has been analyzed to show that it can display a degree of complexity encompassing over 240 degrees of freedom (Daugman, 2003), and is probably the most complex tissue structure that is readily available on the outside of the human body. Iris tissue forms complex patterns that contain many distinct features, which are currently used as biomarkers for a wide variety of different purposes. For example, since no two individuals have the same iris pattern, the tissue patterns that are present in the human iris can serve as a reliable basis for automatic personal identification. An increasing number of banks use the iris as a mean of identification rather than pin codes. At least 1 million frequent travelers to the UK will be able to enter the country without presenting a passport or explicitly asserting their identity. Instead, their iris patterns are captured by a video camera for comparison against a database of

authorized persons (Daugman, 2006). Furthermore, tissue markers in the iris are associated with eye diseases such as ocular melanoma, glaucoma, pigment dispersion and pseudoexfoliation syndrome (Asano et al., 1995), as well as neurological diseases such as Down's Syndrome (Donaldson, 1961), Neurofibromatosis type 1 (Lee and Stephenson, 2007) and Gillespie syndrome (Marien et al, 2008; Ticho et al, 2006) which suggests that the development of the iris and brain are linked.

Clinically, those with a lighter iris colour have been observed to have a higher prevalence of age-related macular degeneration (ARMD) than those with darker iris colours; lighter eye colours are also associated with an increased risk of ARMD progression. An increased risk of uveal melanoma has been found in those with a blue, green or grey iris colour. Recent reviews also suggest that people with dark brown eyes are at increased risk of developing cataract and should protect their eyes from direct exposure to sunlight.

Moreover, genes expressed in the iris are also associated with measures of normal personality (Larson et al., 2007), which points out that it is important to identify the genes that contribute to different iris patterns. Not only to better understand the development of different eye diseases that affect millions of people worldwide every year (Friedman et al., 2004), but also to better understand how early expressing genes in the iris, are linked to brain development, and thereby potentially can contribute to identifying networks of genes that influence different behavioural tendencies such as personality and sensuality.

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