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Variations in Anthropometric Parameters of Upper Eyelids and Palpebral Fissures in Nigerian Pupils and Students.

**Olawole OE and Abioye AI'R** 

Department of Anatomy, Faculty of Basic Medical Sciences, College of Health Sciences, University of Ilorin, P.M.B. 1515, Ilorin. 240003 Nigeria

**Corresponding Author:** Abioye AI'R E-mail: ewedogbon2003@yahoo.com; abrdabye@unilorin.edu.ng; +2348037251583; +2348055818413.

### ABSTRACT

The shape of the eyebrow and upper eyelid are distinctive facial landmarks. In cosmetic and reconstructive operations, maintenance of the anatomical relations of these landmarks ensures a pleasing postoperative appearance. The appearance of eyebrows and eyelids plays a major part in ethnic identification. This study hopes to provide a guideline for the plastic surgeons which can be used as a reference for assessment of the patients. These data can also be used to ensure a pleasing postoperative appearance in the area of cosmetic and reconstructive surgery. For this particular project, the focus is to establish a reference evelid anatomical data for the Nigerian students and pupils. Ninety (90) subjects comprising of thirty (30) from primary, thirty (30) from secondary and thirty (30) from the university levels, each level consisting of fifteen (15) males and fifteen (15) females. Photographs of the faces were taken with a ruler placed on the forehead and the following parameters were measured: widths of palpebral fissures of both eyes, heights of palpebral fissures of both eyes; heights of both upper eyelids; intercanthal distances between both medial canthi and interpupillary distances between both pupils. The results for primary school females' widths of palpebral fissures of left eyes (WPL), widths of palpebral fissure of right eyes (WPR), vertical dimensions of palpebral fissures of left eyes (VPL), vertical dimensions of the palpebral fissures of right eyes (VPR), heights of left upper eyelids (HLUE), heights of right upper eyelids (HRUE), intercanthal distances (ICD) and interpupillary distances (IPD) were respectively  $2.1933 \pm 0.1534$  cm;  $2.3067 \pm 0.1534$  cm; 2.300.1831 cm;  $1.4733 \pm 0.1831$  cm;  $0.5667 \pm 0.1234$  cm;  $0.5867 \pm 0.1407$  cm;  $3.0467 \pm 0.3067$  cm;  $5.1400 \pm 0.3269$  cm. The results for primary school males' WPL, WPR, VPL, VPR, HLUE, HRUE, ICD and IPD were respectively 2.28  $\pm 0.1656$  cm;  $2.4333 \pm 0.1234$  cm;  $1.4533 \pm 0.1598$  cm;  $1.4467 \pm 0.1552$  cm;  $0.5733 \pm 0.8837$  cm;  $0.5733 \pm 0.8837$  cm;  $3.1067 \pm 0.3634$  cm;  $5.3333 \pm 0.2320$  cm. The results for secondary school females' WPL, WPR, VPL, VPR, HLUE, HRUE, ICD and IPD were respectively  $2.4400 \pm 0.1957$  cm;  $2.5133 \pm 0.1767$  cm;  $1.3 \pm 0.3185$  cm;  $1.3267 \pm 0.1957$  cm;  $1.3257 \pm$ 0.2939 cm;  $0.6467 \pm 0.1187$  cm;  $0.6400 \pm 0.1352$  cm;  $3.08 \pm 0.361$  cm;  $5.4067 \pm 0.5239$  cm. The results for secondary school males' WPL, WPR, VPL, VPR, HLUE, HRUE, ICD and ICD were respectively 2.3939 ± 0.2017cm; 2.4400  $\pm 0.1765$  cm;  $1.1600 \pm 0.3291$  cm;  $1.1733 \pm 0.3369$  cm;  $0.5833 \pm 0.2187$  cm;  $0.5733 \pm 0.1907$  cm;  $3.3733 \pm 0.2890$  cm;  $5.6800 \pm 0.4693$  cm. The results for University females' WPL, WPR, VPL, VPR, HLUE, HRUE, ICD and IPD were respectively  $2.5733 \pm 0.2017$  cm;  $2.6667 \pm 0.2257$  cm;  $1.3067 \pm 0.1668$  cm;  $1.2667 \pm 0.1839$  cm;  $0.7200 \pm 0.1959$  cm;  $0.7133 \pm 0.1959$  cm;  $3.3333 \pm 0.2637$  cm;  $6.0067 \pm 0.2604$  cm. The results for University males' WPL, WPR, VPL, VPR, HLUE, HRUE, ICD and IPD were respectively  $2.6067 \pm 0.1944$  cm;  $2.7267 \pm 0.2658$  cm;  $1.2000 \pm 0.2390$  cm;  $1.2000 \pm 0.2390$  cm; 0.6400 m  $\pm 0.2028$  cm;  $0.6200 \pm 0.2242$  cm;  $3.2333 \pm 0.3374$  cm;  $5.9467 \pm 0.5330$  cm. Analysis of the results was done using independent t-test of all the parameters between two defined groups. This test was carried out using Medcalc, a software of medical statistics calculator. Analysis showed that there was no statistically significant difference between the structures of both eyes regardless of the age or sex. It also showed that as an individual grows and moves from primary school through the secondary to the University, there are increases in various parameters of the eyes such as width of palpebral fissure, Intercanthal distance, Interpupillary distance, vertical dimensions of the palpebral fissure, while in early stages from growth from 8 yrs to 16 yrs mostly in females, there is reduction in the height of the upper evelids. With the result of this study I conclude that with age, no differentiation is created between both eyes in both genders and as a child grows and moves through the education system in Nigeria, there is an increase in the size of the palpebral fissures.

**Key words;** Primary School, Secondary School, University, Males, Females, Widths of Palpebral Fissures, Vertical Dimensions of Palpebral Fissures, Intercanthal Distances, Interpupillary Distances, Heights of Upper Eyelids.

## INTRODUCTION

An **eyelid** is a thin fold of skin that covers and protects an eye. With the exception of the prepuce and the labia minora, it has the thinnest skin of the whole body. The levator palpebrae superioris muscle retracts the eyelid to "open" the eye. This can be either voluntarily or involuntarily. The human eyelid features a row of eyelashes which serve to heighten the protection of the eye from dust and foreign debris, as well as from perspiration. "Palpebral" (and "blepharo") means relating to the eyelids. Its key function is to regularly spread the tears and other secretions on the eye surface to keep it moist, since the cornea must be continuously moist. They keep the eyes from drying out when asleep. Moreover, the blink reflex protects the eye from foreign bodies.<sup>[1]</sup>

Palpebral fissure is the anatomic name for the separation between the upper and lower eyelids. In adults, this measures about 10mm vertically and 30mm horizontally.<sup>[2]</sup> The medial and lateral canthi are the meeting points of the upper and lower eyelids medially and laterally respectively. Several similar works have been done by several authors including Barretto<sup>[3]</sup> et al tried to determine if any significant differences exist between normal white and black adults. In Cartwright<sup>[4]</sup> et al's article on "Measurements of upper eyelid and eyebrow dimensions in healthy white individuals", she did a study on the eyebrow height, upper eyelid crease height, and amount of visible pretarsal skin on white subjects who had no facial abnormalities. In 'Topographic anatomy of the eyelids, and the effects of sex and age' research, Van Den Bosch<sup>[5]</sup> et al aimed to describe the effects of sex and age on eyeball, eyelid, and eyebrow position. Oyimbo et al <sup>[6]</sup> did an Anthropometric Study of Ocular Dimensions In Adult Ijaws of Nigeria. Liu <sup>[7]</sup> consolidated the published journals from the Chinese journal Ophthalmology that has make their contribution to the analyzing of the Chinese orbits and dimension known as "Principles and Practice of Ophthalmic Plastic and Reconstructive Surgery",.

#### **MATERIALS AND METHODS**

Target schools were chosen on the basis of their easiness to access, these schools include Primecare Nursery and Primary School, Agboba (PNPS), Ilorin University of Ilorin Secondary School, Ilorin (USS), and University of Ilorin, Ilorin (UI). Thirty samples were taken from each of the above mentioned schools, 15 males and 15 females. In PNPS, samples were taken at random from classes primary 3 to Primary 5, in USS, random samples were obtained from students in classes SS1 and SS2, and in UI random samples were obtained from students of the Faculty of Basic Medical Students. The classes used for data collection were used due to their availability at the time of data collection. Subjects were approached with the use of questionnaire and the data needed was obtained by placing the above formulated right-angled rulers on the face of the subject and their photographs were taken. Data recordings were made by viewing pictures on the laptop computer.

When pictures are viewed on the computer system, the following parameters are measured for all the groups and between males and females in each group. Widths of palpebral fissures of left eyes (WPL). (The width of the palpebral fissure is the distance between the lateral and medial canthi.), Widths of palpebral fissures of right eyes (WPR). Heights or Vertical Dimensions of Palpebral fissure os the distance between the upper eyelid and the lower eyelid). Heights or vertical dimensions of palpebral fissures (ICD) (distance between the medial canthi of both eyes). Heights of left upper eyelids (HLUE). Heights of right upper eyelids (HRUE). Interpapillary Distances (IPD).

### RESULTS

Results were obtained for the parameters mentioned above and these results were analysed by comparing parameters between two groups using independent sample t-test. The following comparisons were made.

- 1. Right and left side of the subjects
- 2. All males and female subjects
- 3. Primary school males and Secondary school males
- 4. Secondary school males and University males
- 5. Primary school females and Secondary school females
- 6. Secondary school females and University female

The tables below shows the mean standard deviation and independent t-test results of all the measured parameters as they are compared between the above mentioned groups.

Parameters	Left	Left Eye		Right Eye	
	Mean	StdDev	Mean	StdDev	P-value
Number of subjects	9	00		90	
Width of palpebral fissure (WP)	2.4144	0.2340	2.5144	0.2396	0.0051
Vertical Dimension of Palpebral	1.3178	0.2676	1.3144	0.2608	0.9326
fissure(VP)					
Height of upper eyelid (HUE)	0.6200	0.1730	0.6211	0.1673	0.9651

# Table 1:comparison between right and left eye

# Table 2:Comparison between All Males and All Female

Parameters	MALES		FEMALES		
	Mean	StdDev	Mean	StdDev	P-value
Number of subjects	45		45		
WPL	2.4267	0.2290	2.4022	0.2407	0.6229
WPR	2.5333	0.2374	2.4956	0.2430	0.4577
VPL	1.2711	0.2793	1.3644	0.2497	0.0982
VPR	1.2733	0.2783	1.3556	0.2379	0.1356
ICD	3.2378	0.3420	3.1533	0.3321	0.2379
HLUE	0.5956	0.1846	0.6444	0.1589	0.1816
HRUE	0.5956	0.1678	0.6467	0.1646	0.1482
IPD	5.6533	0.4920	5.5178	0.5306	0.2122

Fable 3:Comparison b	etween Primary School	Females and Secondary	School Females
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parameters	PRIMARY SCHOOL FEMALES		SECONDARY SCHOOL FEMALES		
	Mean	StdDev	Mean	StdDev	P-value
Number of subjects	15	15		15	
WPL	2.1933	0.1534	2.4400	0.1957	0.0006
WPR	2.3067	0.1831	2.5133	0.1767	0.0039
VPL	1.4867	0.2066	1.3000	0.3185	0.0672
VPR	1.4733	0.1831	1.3267	0.2939	0.1121
ICD	3.0467	0.3067	3.0800	0.3610	0.7872
HLUE	0.5667	0.1234	0.6467	0.1187	0.0812
HRUE	0.5867	0.1407	0.6400	0.1352	0.2990
IPD	5.1400	0.3269	5.4067	0.5365	0.1114

Table 4: Comparison between Secondary School Females and University Females

parameters	SECONDARY SCHOOL FEMALES		UNIVERSITY FEMALES		
	Mean	StdDev	Mean	StdDev	P-value
Number of subjects	15	15		15	
WPL	2.4400	0.1957	2.5733	0.2017	0.0767
WPR	2.5133	0.1767	2.6667	0.2257	0.0476
VPL	1.3000	0.3185	1.3067	0.1668	0.9434
VPR	1.3267	0.2939	1.2667	0.1839	0.5082
ICD	3.0800	0.3610	3.3333	0.2637	0.0366
HLUE	0.6467	0.1187	0.7200	0.1935	0.2212
HRUE	0.6400	0.1352	0.7133	0.1959	0.2428
IPD	5.4067	0.5365	6.0067	0.2604	0.0009

Parameters	PRIMARY SCHOOL		SECONDARY SCHOOL		
	MALES		MA	MALES	
	Mean	StdDev	Mean	StdDev	P-value
Number of subjects	15			15	
WPL	2.2800	0.1656	2.3939	0.2017	0.1037
WPR	2.4333	0.1234	2.4400	0.1765	0.9054
VPL	1.4533	0.1598	1.1600	0.3291	0.0056
VPR	1.4467	0.1552	1.1733	0.3369	0.0098
ICD	3.1067	0.3634	3.3733	0.2890	0.0344
HLUE	0.5733	0.08837	0.5833	0.2187	0.7464
HRUE	0.5733	0.08837	0.5733	0.1907	1.0000
IPD	5.3333	0.2320	5.6800	0.4693	0.0185

Table 5: Comparison between Primary School Males and Secondary School Males

Table 6:Comparison	between	Secondary	School	Males and	University	Males
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Parameters	SECONDARY SCHOOL MALES		UNIVERSIITY MALES		
	Mean	StdDev	Mean	StdDev	P-value
Number of subjects	15		15		
WPL	2.3933	0.2017	2.6067	0.1944	0.0064
WPR	2.4400	0.1765	2.7267	0.2658	0.0017
VPL	1.1600	0.3291	1.2000	0.2390	0.7062
VPR	1.1733	0.3369	1.2000	0.2390	0.8044
ICD	3.3733	0.2890	3.2333	0.3374	0.2324
HLUE	0.5933	0.2187	0.6400	0.2028	0.5494
HRUE	0.5733	0.1907	0.6200	0.2242	0.5442
IPD	5.6800	0.4693	5.9467	0.5330	0.1570

**N.B.** When p > 0.05, there is no significant difference between the values of that parameter between the two groups, but when p < 0.05, there is a significant variation and the values of the mean would show if there is an increase or a reduction.

### DISCUSSION

My studies showed that there was statistically no difference between the upper eyelids palpebral fissures, intercanthal and interpupillary distances of both eyes regardless of the age in both genders. There was statistically no difference in the measured parameters between all males and females measured. In females, there was statistical increase in the widths of the palpebral fissures of both eyes between primary schools and secondary school, and there was statistical in the intercanthal and interpupillary distances between secondary school and University females.

In males, there was statistical decrease in the heights of the palpebral fissures of both eyes and an increase in the intercanthal and inter pupillary distances between primary schools and secondary school, and there was statistical increase in the widths of palpebral fissures of both eyes between secondary school and University females.

Studies done by Liang and Zhang<sup>[20]</sup> et al, and Xu<sup>[21]</sup> et al, have shown that there is no significant difference between the left eye and right eye. In my study, the *p* value for all left and right eye is > 0.05. Our results

are similar to their investigation.

In Cartwright *et al.*'s <sup>[10]</sup> article on "Measurements of upper eyelid and eyebrow dimensions in healthy white individuals they found out that with increasing age, variation around the mean estimates for eyelid and eyebrow measurement increased, which may be indicative of variability across individuals in the physiologic response to the aging process, this was supported in our study to an extent as variations in palpebral fissure width, intercanthal distance and interpapillary distance showed increase in mean from primary school to university.

Our findings have supported the findings of Den Bosch *et al.*<sup>[13]</sup> in 'Topographic anatomy of the eyelids, and the effects of sex and age' research that aging mainly affects the size of the horizontal eyelid fissure, which lengthened by about 10% between the ages of 12 and 25. This was shown in the increase in mean of palpebral width between primary school subjects and university subjects.

### CONCLUSION

During the past decades, many authors have attempted

to define the aesthetic objectives of the eyebrow/eyelid position. However, their findings are largely based on individual preference and very little scientific findings. There is no standard protocol established for the measurement of the normal eye anatomical data.

With the result of this study I conclude that with age, no differentiation is created between both eyes in both genders and as a child grows and moves through the education system in Nigeria, there is an increase in the size of the palpebral fissures.

### RECOMMENDATIONS

I believe that the effects of age and gender to eyelid anatomy should be considered in all cases due to its importance in oculoplastic surgery and aesthetic correction and should be considered also to produce a cosmetically satisfying outcome. My study has contributed to the qualifying of the normal position of the eyelids and eyebrows of the Nigerian students and pupils in a scientific way. This study will help the plastic surgery/doctors in their reconstruction of eye position for patients with eye disorder, burn victims or other eye related diseases patients. We therefore hope that our data may be used as a guidance of surgical planes and reconstruction procedures for these age groups of Nigerian patients who live all over the world.

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