

Cephalic Index In A Young Adult Nigerian Population

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ABSTRACT

Population variations in cephalic index are due to interactions between genetic and environmental factors. Besides its use in classifying populations, the shape of the head is known to be distinctive in some diseases. A cross sectional study of 402 male and 268 female students of University of Nigeria Enugu Campus was done. Their ages ranged from 20 to 28. The mean values of head length in males and females were 19.5 0.7cm and 15.7 0.6 respectively. The values for the head breadth were 18.6 0.6cm and 15.4 0.5cm respectively. Males had significantly higher values of head length and breadth than females, $p < 0.001$. The mean cephalic index of males was 80.9 3.7% while that of females was 82.8 3.3%. The sex dimorphism was statistically significant, $p < 0.01$. Sixty per cent of males and 78% of females were brachycephalic. Only 3% of males and 1% of females were dolichocephalic. Our study has provided normal values of head length and breadth, and cephalic index for our population. It also suggests that there is a secular growth trend towards brachycephalization in our population.

Key Words: Head length, Head breadth, Cephalic index

Variations in the shape of the head between and within populations have been reported by various authors. They result from complex interactions between genetic and environmental factors (Kasai et al. 1993). It is known that mongoloid populations have the largest head breadths in the world while Australian aborigines have relatively small head breadths (Kasai et al. 1993). Consequently the mongoloid populations are predominantly brachycephalic while Australian aborigines are predominantly dolichocephalic.

Besides its use in classifying populations, the shape of the head is also known to be distinctive in certain diseases or to predispose individuals to some diseases. Stolovitsky and Todd (1990) showed that dolichocephalic persons have otitis media less often than brachycephalic persons because of differences in the anatomy of the cranial base and the Eustachian tube. The cranial shape of Aperts syndrome is usually distinctive with a shortened head length, normal or slightly increased head breadth, and dramatically increased head height. The mean cephalic index is hyperbrachycephalic (Cohen and Kreiborg 1994)

There is a paucity of studies on the cephalic index of adult Africans. The studies on Africans have been mostly on fetuses. Ojikutu et al. (1980) studied the cranial index of Nigerians using autopsy cases. The aim of our was to provide normal values of cephalic index, and head length and breadth in a

healthy adult young adult Nigerian population.

MATERIALS AND METHODS

The subjects studied were students of the University of Nigeria Enugu Campus. Their ages ranged from 20 to 28. The head dimensions were measured with spreading calipers. The maximum head length is the distance between the glabella and the opisthocranion. While the maximum head breadth is the distance between the left and the right euryons. The latter are the most laterally projecting points on the sides of the head. The measurements were taken from 1990-1991.

Cephalic Index was calculated as:

$$\text{Cephalic index} = \frac{\text{Maximum head breadth}}{\text{Maximum head length}} \times \frac{100}{1}$$

Dolichocephalic	> 75
Mesocephalic	75 - 79.9
Brachycephalic	≥ 80

RESULTS

Table 1 shows the mean head length and breadth of males and females by age. Males had significantly higher head length and breadth than females, $p < 0.001$. The mean values of cephalic index of males and females are shown in table 2. Females had significantly higher cephalic index than males, $p < 0.01$

Table 1. Head Length and breath of males and females by age

	AGE(YR)	HEAD LENGTH (CM)			HEAD BREADTH(CM)	
		No	MEAN	SD	MEAN	SD
MALES	20	91	19.4	0.7	15.7	0.6
	21	73	19.5	0.6	15.7	0.5
	22	72	19.5	0.6	15.7	0.6
	23	51	19.5	0.7	15.9	0.5
	24-28	115	19.3	0.6	15.8	0.6
	ALL	402	19.5	0.7	15.7	0.6
FEMALES	20	83	18.6	0.5	15.3	0.5
	21	65	18.7	0.6	15.3	0.5
	22	53	18.6	0.6	15.4	0.4
	23	34	18.5	0.6	15.5	0.5
	24-28	33	18.6	0.6	15.5	0.5
	ALL	268	18.6	0.6	15.4	0.5

Table 2. Cephalic index of males and females by age

Age (yrs)	MALES			FEMALES		
	No.	MEAN	SD	No.	MEAN	SD
20	91	80.9	4.1	83	82.4	3.4
21	73	80.7	3.3	65	82.1	3.5
22	72	80.4	3.6	53	82.9	3.2
23	51	81.7	3.1	34	83.5	3.1
24-28	115	81.1	3.6	33	83.2	3.1
ALL	402	80.9	3.7	268	82.8	3.3

Table 3. Percentage distribution of cephalic index by age in males and females

	AGE	DOLICHOCEPHALIC			MESOCEPHALIC			BRACHYCEPHALIC		
		No	MEAN	SD	No	MEAN	SD	No	MEAN	SD
MALES	20	3			45			52		
	21	1			39			60		
	22	8			32			60		
	23	0			31			69		
	24-28	1			42			57		
	ALL	3			37			60		
FEMALES	20	1			24			75		
	21	2			23			75		
	22	0			23			77		
	23	0			15			85		
	24-28	0			12			88		
	ALL	1			21			78		

As shown in table 3, most of the subjects were brachycephalic. Sixty per cent of males and 78% of females were brachycephalic while only 3% of males and 1% of females were dolichocephalic.

Table 4 shows the cephalic index (CI) and head length (HL) and head breadth (HB) of males and females from various populations.

Table 4a. Comparative data on cephalic index of adult males

Country/people	Authors	Date	Age(yr)	No.	HL (cm)	HB(cm)	CI (%)
Japanese-Americans	Froehlich	1970	22.9	54	19.0	15.6	81.8
African-Americans	Michelson	1943	18+	57			76.9
Brazilian Indians	Eveleth et al.	1974	20-24	53	18.5	14.7	79.5
Japanese*	Kasai et al.	1993	28.8 (mean)	44	17.8	14.2	79.8
Australian Aboriginal*	"	1993	55 (mean)	53	19.0	13.2	69.6
	Jansen						
Kenyaans	1984		20-24	28	18.9	14.4	76.2
Nigerians*	Ojikutu et al.	1980	21-25	101			78.2
Nigerians	Present study	2003	20-28	402	19.5	15.7	80.9

Table 4b Comparative data on cephalic index of adult females

Country/people	Authors	Date	Age(yr)	No.	HL (cm)	HB (cm)	CI %
Japanese-Americans	Froehlich	1970	19.9	54.0	18.0	14.8	82.5
African-Americans	Michelson	1943	18+	409			77.5
Brazilian Indians	Eveleth et al.	1974	20-24	28	17.7	14.2	80.2
Japanese*	Kasai et al.	1993	27.9 (mean)	44	17.0	13.8	81.1
Australian Aboriginal*	"	1993	53.1 (mean)	53	18.2	12.8	70.1
Kenyaans	Jansen	1984	20-24	31	18.5	13.8	74.6
Nigerians*	Ojikutu et al.	1980	21-25	118			80.3
Nigerians	Present study	2003	20-28	268	18.6	15.4	82.8

* Studies on autopsy skulls.

DISCUSSION

The mean values of cephalic index of males and females in our study were 80.9 and 82.8 respectively. Females had significantly higher mean cephalic index than males. The sex dimorphism was about 1.9 units. Higher mean values of cephalic index in females were also reported by Kasai et al. (1993), Sato et al. (1992), Ojikutu (1980), Froehlich (1970) and Michelson (1943). On the contrary, Jansen (1984) noted a higher cephalic index in males than in females. The sex difference was 1.6 units in favour of males.

In both sexes, the mean values of cephalic index in our study were about 2.5 units higher than the values reported by Ojikutu et al. (1980). They did their study on autopsy skulls. This observation is in keeping with the report of Tanner (1963). He showed that the cephalic index is about two units higher in the living subject than for the skull. The mean cephalic index of 80.9 in our male subjects was 5.4 units higher than the 76.4 noted by Tanner (1963) for Igbo males. Michelson (1943) in a study of African-Americans reported a mean cephalic index of 76.9% for males and 77.5% for females. Their subjects were predominantly mesocephalic while our subjects

were predominantly brachycephalic. Secular changes towards brachycephalization can account for these observations. Secular changes in height in Nigerians were reported by Obikili and Singh (1992).

Secular changes towards brachycephalization have been documented in many populations. Archeological findings have shown a tendency for modern populations to be more brachycephalic than their predecessors (Tanner 1963). Brachycephalization is thought to be due to relatively higher increases in the head breadth in comparison with the head length as a result of improvements in nutrition (Kouchi 2000).

Secular changes towards brachycephalization just like secular changes in height will not continue for ever. Kouchi (2000) showed that the rapid brachycephalization in Japanese has recently ceased. Our study apart from providing normal values of cephalic index, head length and breadth, is expected to serve as a basis for future studies on brachycephalization or debrachycephalization in our population.

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