



CEPHALIC INDEX IN RELATION TO ACADEMIC PERFORMANCE AMONG STUDENTS OF BASIC MEDICAL SCIENCES, BAYERO UNIVERSITY KANO, NIGERIA

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Abstract

Cephalic index has been useful in categorizing human population of various ethnicities. This study aimed to determine the relationship between cephalic index and academic performance among students of Basic medical sciences, Bayero University Kano. It also determines the predominant anatomy head form. The sample size consists of 286 student aged 17-32 years 151 male and 135 female, socio-demographic data was collected through self administered pro-forma. Head length and breadth was measured with Sliding Vanier caliper to calculate cephalic index, student CGPA was also collected from the exam office through the pro-forma, data was analyzed using SPSS vision 20.0 (IBM). Statistical significance was considered at $p \leq 0.05$. The mean cephalic index of male and female were 79.51 ± 5.64 and 78.62 ± 4.54 respectively. Sexual dimorphism with respect to cephalic index was found to exist where males have significantly higher values than females ($p \leq 0.05$) was observed. Irrespective of sex differences, the predominant head form was found to be mesocephalic (43.0%) and the least prevalent was



ultradolichocephalic. No correlation between the cephalic index and the student CGPA was observed indicating that no relationship between Academic performance and Cephalic index.

Keywords: Cephalic index, mesocephalous, CGPA, Academic performance, Sexual dimorphism

INTRODUCTION

Nigeria is a country with a complex and varied ethnic composition of its population. Ethnic differences in cephalic indices among many populations have been demonstrated in Nigeria (Odokuma *et al.*, 2010; Maina *et al.*, 2011; Esomonu and Badamasi, 2012; Adebisi *et al.*, 2016). Some literatures have reported variation on cephalic index among various ethnic populations around the world (Mehta *et al.*, 2014; Patro *et al.*, 2014).

Cephalic index has been used in determination of racial affinity (Ilayperuma, 2011) and sexual differences (Ilayperuma, 2011; Maina *et al.*, 2011). It is the percentage of breadth (the distance between the most projecting points at the sides of the head, usually a little above and behind the ears) to length (distance between glabella and the most projecting point at the back of the head) in the skull (Shah *et al.*, 2015). Cephalic index have also been studied in various pathological conditions (Fawehinmi and Ligha, 2011; Maria and Manjunath, 2011), and comparison of changes in cephalic index between parents, offspring's or siblings can give information about the genetic transmission of the inherited characters (Shah and Jadhav, (2004). The relevant data on cephalic index of a population is very much essential in designing various orthopaedic and physiotherapeutic equipments of head and face like cranial remodeling Band (helmet), head phones, goggles etc by formulating standard sizes (Singh and Purkit, 2006).

Academic performance of university students is obtained through cumulative grade point Average (CGPA), which is a tool use to evaluate student's performance based on which final classification of degree is awarded. Faculty of basic medical sciences is one of the faculties in the college of health sciences, Bayero University Kano, having four department in it, which comprises of anatomy, biochemistry, nutrition and dietetics and physiology departments. The faculty has 1332 total number of students (DEAR, 2017).

Regarding the effect of racial, ethnic and geographical factors on head dimensions, the present study were carried out to relate the student's cephalic index with their academic performance using cumulative grade point Average (CGPA) in Bayero University Kano (BUK), as there are no known comparative studies in the past years or in other faculty or department of the University.



Materials and Methods

Study Area

The research was conducted in 8 local government areas of Kano metropolis (Kano Municipal, Gwale, Dala, Tarauni, Kumbotso, Nasarawa, Fagge and Ungoggo Local Governments) with a population of over 12 million located on latitude 12°02'N, longitude 08°30'E in the North-Western region of Nigeria (Ki - Zerbo, 1998; NPC, 2006). Kano is considered as the commercial and political nerve centre of northern Nigeria, with major inhabitants of Hausa and Fulani ethnic groups and also with many minority tribes representing virtually all tribes in Nigeria including a minute fraction of foreigners (Danasabe, 2000).

Study Design

Descriptive cross-sectional study was applied which involved 200L, 300L and 400L students of Basics Medical Sciences, Bayero University Kano (BUK). The sample size of approximately 286 was determined using $n = N/1+Ne^2$ from a population of 776 with sample error (e) of 5% (0.05) (Word Press, 2017). The inclusion criteria includes the following viz; Student from Faculty of Basic Medical Sciences, Bayero University Kano, whom must be free from any cranial deformity and also consented verbally. The exclusion criteria involve Students outside Faculty of Basic Medical Science Bayero University Kano, and those with cranial deformity.

Materials

Sliding Vanier caliper was used for the measurements and a Pro-forma with two sections viz; **Section A** for Socio-demographic Characteristics such as age, gender, level, program, etc. and **Section B** for Anthropometric Parameters which is head length, head breadth and cephalic index.

Methods

Appropriate anatomical landmarks were initially located for each subject and all measurements were taken thrice where mean was calculated to ensure accuracy. Definitions of landmarks, measuring techniques and instrument used were according to Singh and Bhasin (1989) as follow:

- i. Glabella: A point above the nasal root between the eyebrows and intersected by mid-sagittal plane.
- ii. Opisthocranium: It is the most posterior point on the posterior protuberance of the head in the mid sagittal plane.
- iii. Euryon: It is the most laterally placed point on the sides of the head.

The maximum head length was measured with the help of sliding vanier caliper from glabella to opisthocranium, while the maximum head breadth was measured as the maximum transverse diameter between euryon to euryon using sliding caliper. All measurements were recorded to



the nearest centimeter. The students CGPA was also collected from the exam office through the pro-forma and were ranked as first class, second class upper, second class lower and third class.



Plate i
Spreading Vanier caliper

Ethical Consideration

Ethical approval was obtained from Department of Anatomy, Faculty of Basic Medical Sciences, College of Health Sciences, Bayero University Kano to conduct this research.

Statistical Analysis

Data collected were analyzed using SPSS version 20.0. Absolute numbers and simple percentages were used to describe categorical variables. Quantitative variables were described using measures of central tendency [mean and median] and measures of dispersion (standard deviation). The Chi-square test was used in assessing the significant associations between categorical groups, and a p-value of 0.05 or less was considered statistically significant and correlation analysis were done to determine the relationship between the cephalic index and academic performance.

Results

Socio-demographic Characteristics

Out of the 286 students participated (52.8%) were male and (47.2%) female, within the ages range of 17 to 33years with means of 22.12 ± 2.54 , grouped into three viz; 17-20 years (27.6%), 21-25 years (61.9%), and 26-33 years (10.5%) (Table 1).



Table.1: Showing Distribution of socio-demographic of the respondents

Categories		Frequency	Percentage
Age groups	17-20yrs	79	27.6
	21-25yrs	177	61.9
	26-35yrs	30	10.5
Departments	Anatomy	79	27.7
	Physiology	111	38.8
	Biochemistry	96	33.6
Levels	200L	126	44.1
	300L	31	10.8
	400L	129	45.1
Fathers Occupation	Business	130	45.5
	Civil Service	139	48.6
	Others	17	5.9
Fathers level of education	None	19	6.6
	Primary	15	5.2
	Secondary	31	10.8
	Tertiary	221	77.3
Mothers level of education	None	24	8.4
	Primary	22	7.7
	Secondary	96	33.6
	Tertiary	144	50.3
Ethnicity	Hausa	216	75.5
	Fulani	26	9.1
	Yoruba	9	3.1
	Igbo	7	2.4
	Others	28	9.8

(27.6%), (38.8%) and (33.6%) were from Anatomy, Physiology and Biochemistry department respectively from year 2, 3 and 4. The fathers of the participant were 48% business oriented, 45.5% civil servants and 5.9% other professions. Most parent in this classification attained the level of tertiary education only hand few of 10.9% father or 33.4% mother and 5.2% father or 7.7% mother only attend secondary or primary and others 6.6% father or 8.4% mothers has no formal education. Majority (75.5%) belongs to Hausa ethnic group.

19.2% of the participants fall within the group of students with a cumulative grade point average (CGPA) within 1.50-2.49 which mean third class (TC), 46.5% have CGPA in the range 2.5-3.49 as second class lower division (SCL), 29% are with CGPA range from 3.50-4.49 as



second class upper division (SCU), and 5.2% having a CGPA between 4.50-5.00 are First class students (FC)(Figure 1)

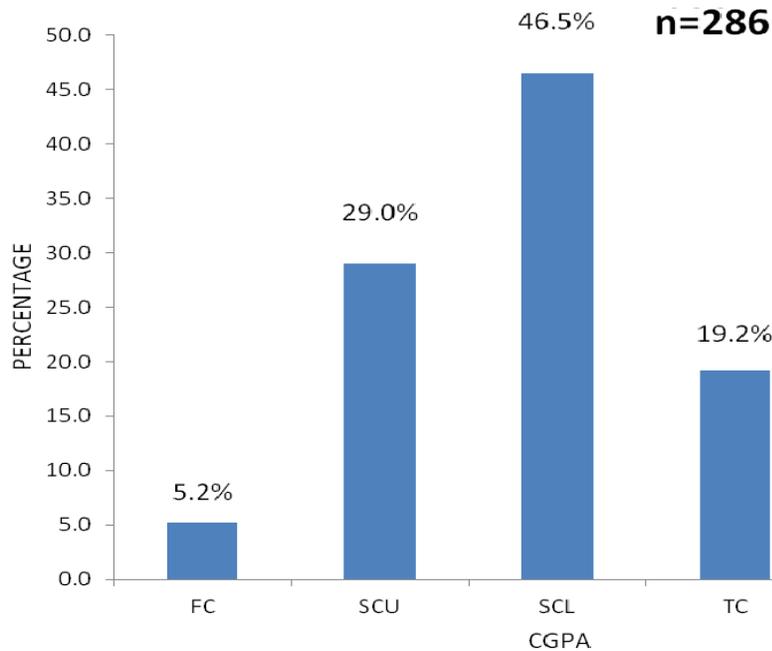


Figure 1: Participants Cumulative Grade Point Average (CGPA)

The result revealed that; in dolichocephalic, 5 of the participant have first class (FC), 17 have second class upper (SCU), 21 have second class lower (SCL), and 9 have third class (TC). Only 1 of the participant has FC in mesocephalic, 30 participantst with SCU, 66 participants with SCL, and 26 participants with TC. 7 participants have FC in brachycephalic, 32 participant with SCU, 29 with SCL and 15 with TC. Only 1 participant have FC in hyperbrachycephalic, 4 participants with SCU, 13 participants with SCL and 2 participants with TC. In ultrabrachycephalic only 1 participant have FC, 4 of the participants have SCL and 3 of the participants have FC (Figure 2).

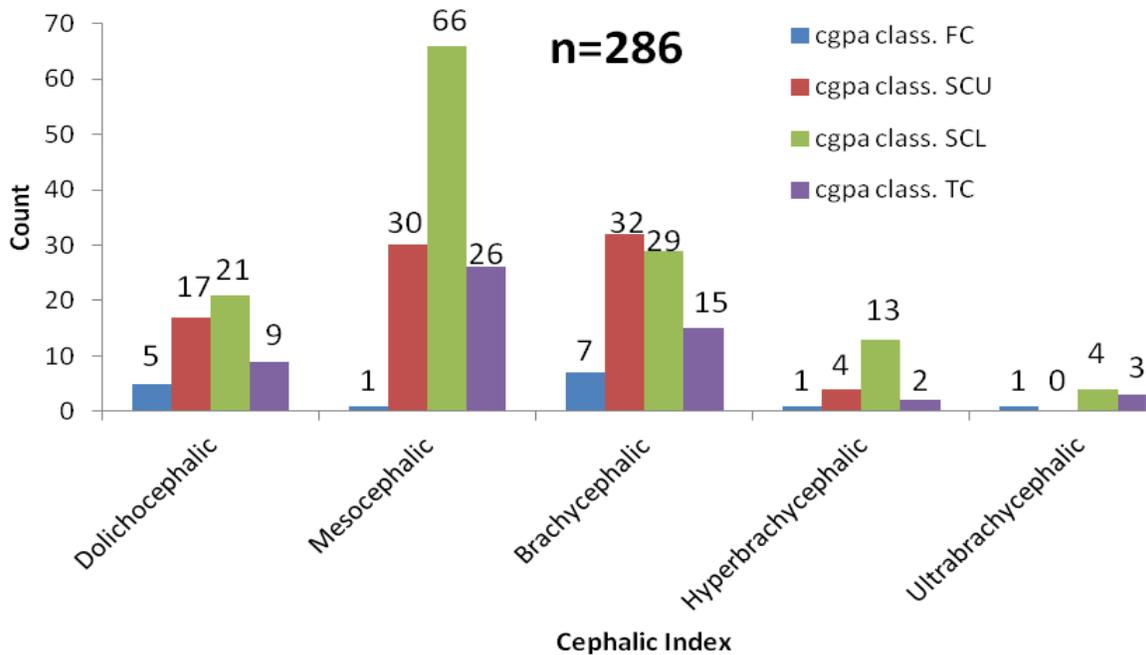


Figure 2: Participants association between cephalic index and CGPA

Minimum and maximum range distribution of the participants' head length (HL), head breadth (HB), cephalic index (CI) and CGPA. (Table 2)

Table.2: participants HL, HB,CI and CGPA

Parameter	Mean \pm SD	Min-Max
HL	18.76 \pm 0.76	15.10-20.60
HB	14.80 \pm 0.88	10.00-19.40
CI	79.10 \pm 5.16	55.00-102.29
CGPA	03.15 \pm 0.80	01.5-4.82

KEY: HL = Head length, HB = Head breadth, and CI = Cephalic index.

Frequency of head type according to Cephalic index shows that participants are mostly mesocephalic, 43.0%. (Table 3)



Table 3: Participants cephalic index distribution

Cephalic Index	Male		Female		Both	
	Frequency	%	Frequency	%	Frequency	%
Dolichocephalic	17	11.3	35	25.9	52	18.2
Mesocephalic	60	39.7	63	46.7	123	43.0
Brachycephalic	54	35.8	29	21.5	83	29
Hyberbrachycephalic	13	8.6	7	5.2	20	7.0
Ultrabrachycephalic	7	4.0	1	0.7	8	2.8
Total	151	100	135	100	286	100

Sex differences in the mean, and range values of head length, head breadth and cephalic index of the participants (Table 4)

Table 4: Descriptive statistics of sexual dimorphism among the participants

Parameter	Sex	Number	Min-Max	Mean ± S.D	p-value
HL	Male	151	15.10- 20.60	18.70 ± 0.78	0.003
	Female	135	16.90- 20.60	18.82± 0.73	
HB	Male	151	12.80- 90.40	14.84± 0.94	0.004
	Female	135	10.00-16.80	14.75± 0.82	
CI	Male	151	67.96-102.29	79.51± 5.64	<0.001
	Female	135	55.00-91.71	78.62± 4.54	

KEY: HL= Head length, HB= Head breadth and CI= Cephalic index.

Pearson correlation between CGPA and cephalic index of the participants revealed no statistically significant correlation between cephalic index and academic performance of the participants. ($r = -0.021$; $p > 0.05$). (Table 5).

Table 5: Showing Person correlation between CGPA and cephalic index

Variables	r	r ²	P value	p-value
CGPA-Cephalic index	-0.021	0.00441	0.721	0.003



Discussion

The average distribution of the participants head length (HL), head breadth (HB), cephalic index (CI) and CGPA are (18.76 ± 0.76) , (14.80 ± 0.88) , (79.10 ± 5.16) and (3.15 ± 0.80) respectively (Table 2). Majority of the participant were mesocephalic (43.0%) with cephalic index range (75-79.9) the least minority were ultrabrachycephalic (2.8%) with cephalic index range of (>90) (Table 3). The result of this study is similar to that observed by Akinbami, (2014), He found that 78.6% subject were mesocephalic, 11.4% dolichocephalic, 9% brachycephalic and 0.4% hyperbrachycephalic, It is worthy to note that the percentage of head type also varies in different population. In a study on 50 individuals in the IX Region of Chile, Del Sol, (2005) reported that 77% of the individuals were mesocephalic, 28% brachycephalic, 4% hyperbrachycephalic, and 2% dolichocephalic. Besides, in a study in India, it was shown that 41% of the students were mesocephalic, 37% brachycephalic, 14% hyperbrachycephalic, and 7% dolichocephali (Shah and Jadhav, 2004). The percentage of head shape observed in the different study may be connected with heredity factor. Environment may also have a secondary effect (Golalipour and Heydari, 2005; Golalipur, 2006). The kind of diet could also play a role in influencing the dominant head shape. Head shapes can also change from one generation to the other.

Cephalic index of males was observed to be significantly higher than those of females ($P < 0.01$) (Table 4), the reason for this difference cannot be immediately explained but it agrees with sexual dimorphism as reported by (Olotu *et al.*, 2009). The cephalic index of this study was almost similar to Fawehinmi's study in Port Harcourt, Nigeria, with mean cephalic index of 79.80 ± 5.74 (Fawehinmi *et al.*, 2008). The differences observed may be due to environmental, genetic, or even nutritional causes. Factors involved in suture patency and normal bone growth including hormonal factors, maternal smoking, and hyperthyroidism have been linked to early fusion of sutures. Alterations in the level of fibroblastic growth factor type 3 receptor genes and transcriptase factor receptor gene have also been implicated. In this present studies, males have a higher cephalic index when compared to females. The reasons for this difference are not clear but maybe attributed to the effect and interplay amongst growth, thyroid, and sex hormones. Similar investigation carried out on the cephalic indices of males and females of Gurung community in Nepal revealed a significant gender difference too (Lobo *et al.*, 2005). With male having a cephalic index of 83.10 which is lower than females with cephalic index of 84.60, this implies that cephalic index can be higher in any sex depending on the peculiarity of the population under study.

The present studies indicate no statistical significant correlation ($p > 0.05$) between cephalic index and academic performance of the participants as the correlative coefficient is inversely and very weakly associated ($r = -0.021$) (Table 5).



Conclusion

The present studies show that there is no relationship between Academic performance and Cephalic index of Basic Medical Sciences Students, Bayero University Kano, Nigeria, as the correlative coefficient is negative ($r = 0.02$), and $p > 0.05$ as such it is statistically not significant. However, sexual dimorphism was observed with $p < 0.01$, male showing higher cephalic index than female (79.78 ± 82 and 78.62 ± 4.55) respectively.



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