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Anthropometry of Some Selected Linear Body Dimensions of Ijaws of Southern Nigeria

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ABSTRACT

The aim of this study was to investigate the linear body anthropometry of Ijaws of southern Nigeria for future standardisation of three-dimensional negroid gross anatomical model. The research design was a non-experimental, cross-sectional design. The study made use of a total number of four hundred (400) participants whose ages ranged between 21 to 40 years with BMI range of 18.50 to <30.00. The Taro Yamane's formula was used to determine the minimum sample size. BMI and linear body anthropometric measurements were taken using standiometer, calibrated flexible meter tape, meter rule and weighing scale. Statistical analysis was done using statistical package for the social science (SPSS version 25.0) and Microsoft Excel 2019. Continuous variables were presented as mean±SD; minimum and maximum. Age was categorized into two groups (21 – 30 and 31 – 40) years while Body Mass Index (BMI) was also categorized into two; normal weight (18.5 – 24.9 designated $\leq$ 25.0) and slightly overweight (25.0 – 30.7 designated $\geq$ 25.0). Independent sample t-test was therefore carried out to determine significant difference in the measured anthropometric variables across age and BMI groups. The confidence interval was set at 95%, therefore $p < 0.05$ was considered significant. Results were presented in tables. Age related changes and variations in BMI were also observed in the anthropometric parameters. These anthropometric values will find use in the standardization of negroid gross anatomical models for medical studies and forensics.

Key Words: Linear, Whole body, Gross, Anatomical Modelling, Yoruba, Negroid

INTRODUCTION

Ijaw are a collection of people indigenous mostly to the forest regions of the Bayelsa, Delta, and Rivers States within the Niger Delta in Nigeria. Some are resident in Akwa-Ibom, Edo, and Ondo states also in Nigeria[1]. Due to their settlement along the coastal lines, their major occupation is fishing. Certain features in body characteristics distinguish different groups of people. Those distinguishing features of different races and ethnic groups are not randomly distributed but appear in geographical clusters. This variation is given rise to by the interaction of factors such as natural selection, genetics, nutrition, environment etc[2]. In human anatomy for instance, though anatomy describes the structure of the body as seen in most people and has traditional value in surgery, a wide range of ethnic and racial variation in the physical appearance and body proportions of different populations exists[3] . This inherent variation observed in cadavers together with the attendant overcrowding in dissecting rooms, difficulty in procurement and preservation of cadavers, as well as the need to learn layout to recreate common surgical operations were the motive behind the concept of anatomical modeling[4]. Anthropometric measurements have been adopted as methods in clinical and public health works, as they are applicable to large samples and can provide national estimates and data for the analysis of secular changes[5]. It is against this backdrop that this anthropometric study is embarked upon to catalogue ethnic specific values for this negroid population using their linear body dimensions.

MATERIALS AND METHODS

Research Design: The research design was non-experimental, cross-sectional design which catalogued values of some selected linear anthropometric body parameters of adult male Ijaws of southern Nigerian using anthropometric standards.

Sample Size and Sampling Technique: Participants were randomly selected from amongst adult male Ijaws resident in Yenegoa, Amassoma, Ogbia, Kaima, Igbogene and Sagbama in Bayelsa State. A total number of four hundred (400) adult males were used for the study. The minimum sample size was determined using the Taro Yamane's formula which states that:

$n = \frac{N}{1+N(e)^2}$ where n = minimum sample size, N = population size, e = error margin = 0.05.

Only adult males between the ages of 21 and 40 years with BMI of 18.50 to <30.00 were included in this study. It was ascertained that recruited subjects had both parents and four grand parents from the same ethnic group.

Exclusion criteria: Included factors that would negatively affect the outcome of the study such as mixed parentage and body deformities.

Ethical Considerations: Ethical clearance was sought and obtained from the Ethics Committee of the College of Health Sciences, University of Port Harcourt. Informed consent was obtained from all subjects.

Method: Measurements of some selected linear body anthropometric variables were carried out. The following linear measurements were taken using appropriate landmarks standing height, sitting height, arm span, biacromial breadth, upper limb length, elbow breadth, wrist breadth, biiliac breadth, thigh length, knee height and foot length.

Statistical Analysis: Statistical analysis was done using statistical package for the social science (SPSS version 25.0) and Microsoft Excel 2019. Continuous variables were presented as mean±SD; minimum and maximum. Age was categorized into two groups (21 – 30 and 31 – 40) years while Body Mass Index (BMI) was also categorized into two; normal weight (18.5 – 24.9 designated $\leq$ 25.0) and slightly overweight (25.0 – 30.7 designated $\geq$ 25.0). Independent sample t-test was therefore carried to determine significant difference in the measured anthropometric parameters according to age. The confidence interval was set at 95%, therefore $p < 0.05$ was considered significant.

RESULTS

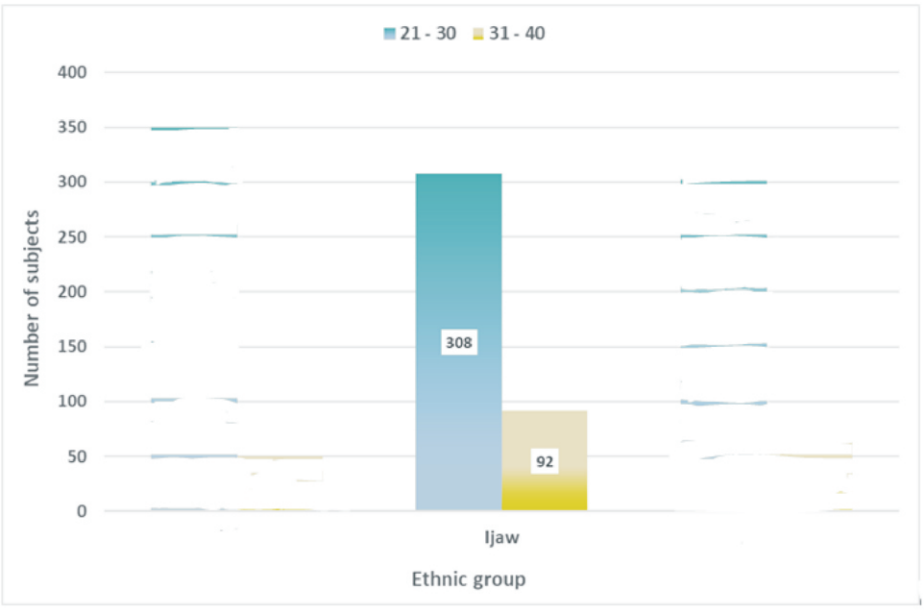

Figure 1: Distribution of subjects according to age group

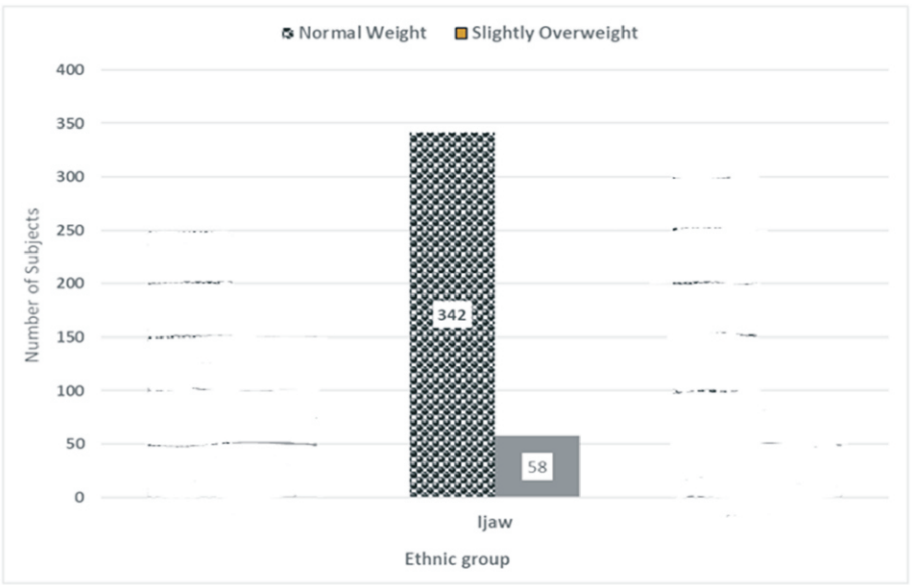

Figure 2: Distribution according to body mass index (BMI)

Table 1: Descriptive statistics of the measured Linear Body Parameters

Linear Body Parameters	[N = 400]		
	Mean ± SD	Min	Max
BMI (Kg/m^2)	22.15±3.21	18.60	30.00
Age (years)	27.43±5.35	21.00	40.00
Standing Height	183.09±5.56	152.80	191.20
Sitting Height	80.59±3.90	73.80	92.50
Arm Span	185.79±9.47	154.70	197.20
Bi-acromial Breadth	38.44±3.96	32.60	44.91
Upper Limb Length	76.64±7.39	62.40	90.30
Elbow Breadth	8.02±1.35	5.30	11.20
Wrist Breadth	5.98±0.87	4.20	7.91
Bi-iliac Breadth	28.10±2.12	24.50	30.92
Thigh Length	49.01±6.18	43.60	61.20
Knee Height	50.44±3.57	44.80	54.80
Foot Length	28.24±1.39	23.00	32.20

SD = Standard deviation, Min = Minimum, Max = Maximum

Table 1 shows descriptive statistics of the measured linear body parameters. The mean standing height was 173.09±5.56, sitting height (80.59±3.90), arm span (179.79±9.47), bi-acromial breath (38.44±3.96), upper limb length (76.64±7.39) elbow breadth (8.02±1.35), wrist breadth (5.98±0.87), bi-iliac breadth (28.10±2.12), thigh length 49.01±6.18, knee height (49.44±3.57) and foot length (26.24±1.39).

Table 2: Descriptive statistics of the measured linear body parameters according to age

Linear Body Parameters	Age group	N	Mean	SD	*t*-test			
					df	*t*-value	*p*-value	Inference
BMI (Kg/m^2)	21 – 30	308	22.08	3.22	398.00	-0.83	0.41	Not Significant
	31 – 40	92	22.40	3.18				
Standing Height	21 – 30	308	173.07	5.88	398.00	-0.15	0.88	Not Significant
	31 – 40	92	173.16	4.39				
Sitting Height	21 – 30	308	80.56	3.77	398.00	-0.33	0.74	Not Significant
	31 – 40	92	80.71	4.33				
Arm Span	21 – 30	308	179.73	9.66	398.00	-0.22	0.82	Not Significant
	31 – 40	92	179.98	8.84				
Bi-acromial Breadth	21 – 30	308	38.69	3.89	398.00	2.34	0.02	**Significant**
	31 – 40	92	37.60	4.13				
Upper Limb Length	21 – 30	308	76.74	7.21	138.18	0.49	0.63	Not Significant
	31 – 40	92	76.29	7.99				
Elbow Breadth	21 – 30	308	8.20	1.25	133.42	4.67	0.00	**Significant**
	31 – 40	92	7.42	1.46				

Wrist Breadth	21 – 30	308	5.97	0.88	398.00	-0.59	0.56	Not Significant
	31 – 40	92	6.03	0.84				
Bi-iliac Breadth	21 – 30	308	28.11	2.07	137.62	0.29	0.77	Not Significant
	31 – 40	92	28.04	2.31				
Thigh Length	21 – 30	308	48.70	6.02	139.00	-1.73	0.09	Not Significant
	31 – 40	92	49.03	6.62				
Knee Height	21 – 30	308	49.56	3.53	398.00	1.24	0.21	Not Significant
	31 – 40	92	48.03	3.70				
Foot Length	21 – 30	308	26.24	1.41	398.00	0.01	0.99	Not Significant
	31 – 40	92	26.24	1.32				

Table 2 shows the descriptive statistics of the measured linear body parameters according to age. Mean Standing Height for age group 21 – 30 was 173.07±5.88 while that of age group 31 – 40 was 173.16±4.39. Mean Sitting Height for age group 21 – 30 was 80.56±3.77 while that of age group 31 – 40 was 80.71±4.33. Arm Span for age grade 21 – 30 (179.73±9.66) whereas for age group 31 – 40 was 179.98±8.84. Bi-acromial Breadth for age group 21 – 30 was 38.69±3.89 while for age group 31 – 40 was 37.60±4.13. Upper Limb Length for age group 21 – 30 was 76.74±7.21 while that of age group 31 – 40 was 76.29±7.99. Mean Elbow Breadth for age group 21 – 30 was 8.20±1.25 while that of age group 31 – 40 was 7.42±1.46. Wrist Breadth for age group 21 – 30 was 5.97±0.88 while that of age group 31 – 40 was 6.03±0.84. Bi-iliac Breadth for age grade 21 – 30 (28.11±2.07) whereas for age group 31 – 40 was 28.04±2.31. Thigh Length for age group 21 – 30 was 48.70±6.02 while for age group 31 – 40 was 49.03±6.62. Knee Height for age group 21 – 30 was 49.56±3.53 while that of age group 31 – 40 was 48.03±3.70. Foot Length for age group 21 – 30 was 26.24±1.41 while that of age group 31 – 40 was 26.24±1.32. Independent sample t-test shows that Bi-acromial Breadth and Elbow Breadth on comparison between the age groups were statistically significant ($\rho<0.00$) while the others were not significant ($\rho>0.05$).

Table 3: Descriptive statistics of the measured linear body parameters according to BMI

Linear Body Parameters	BMI	N	Mean	SD	*t*-test			
					df	*t*-value	*p*-value	Inference
Age (years)	Normal weight	342	27.15	5.28	398.00	-2.59	0.01	Significant
	Slightly overweight	58	29.10	5.54				
Standing Height	Normal weight	342	182.92	5.76	398.00	-1.45	0.15	Not Significant
	Slightly overweight	58	184.07	4.17				
Sitting Height	Normal weight	342	80.56	3.86	398.00	-0.39	0.69	Not Significant
	Slightly overweight	58	80.78	4.15				
Arm Span	Normal weight	342	185.86	9.44	398.00	0.33	0.74	Not Significant
	Slightly overweight	58	185.41	9.72				
Bi-acromial Breadth	Normal weight	342	38.54	3.94	398.00	1.27	0.21	Not Significant
	Slightly overweight	58	37.83	4.06				
Upper Limb Length	Normal weight	342	76.76	7.49	398.00	0.79	0.43	Not Significant
	Slightly overweight	58	75.92	6.76				

Elbow Breadth	Normal weight	342	8.02	1.37	398.00	-0.23	0.82	Not Significant
	Slightly overweight	58	8.06	1.18				
Wrist Breadth	Normal weight	342	5.95	0.87	398.00	-1.47	0.14	Not Significant
	Slightly overweight	58	6.13	0.87				
Bi-iliac Breadth	Normal weight	342	28.05	2.14	398.00	-1.01	0.31	Not Significant
	Slightly overweight	58	28.36	1.99				
Thigh Length	Normal weight	342	49.27	6.27	84.83	2.30	0.02	Significant
	Slightly overweight	58	47.45	5.44				
Knee Height	Normal weight	342	50.41	3.58	398.00	-0.36	0.72	Not Significant
	Slightly overweight	58	50.59	3.52				
Foot Length	Normal weight	342	28.26	1.39	398.00	0.77	0.44	Not Significant
	Slightly overweight	58	28.11	1.41				

Table 3 shows the descriptive statistics of the measured linear body parameters according to BMI among Ijaw subjects. Independent sample t test shows that only the thigh length was statistically significant (ρ=0.02).

DISCUSSION

Mean standing height (173.09±5.56) in this study was lower those reported in Kosovo (178.79±6.07)[6], Bosnia and Herzegovina (183.9)[7], and Macedonia (178.10 ± 6.79)[8] but higher than that reported in India (165.96±6.33)[9]. Mean sitting height (80.59±3.90) was lower than that of the Kosovans (96.07±3.51)[6]. Mean arm span (179.79±9.47) was higher than those of Indians (166.40±7.20)[6] and Macedonians (178.78 ± 7.71)[8]. Mean bi-acromial breadth (38.44±3.96) in the present study was higher than that reported for the Turks (386.06±23.09mm (38.606cm))[10] and slightly lower than the values obtained in a Turko-Mongolic population in Central Asia High Altitude Population (CAHAP); (39.9) mean bi-acromial breadth for all CAHAP, (39.5) High Altitude Kirghizs, (40.1) Mid Altitude Kazakhs, (40.7) Low Altitude Kirghizs and (39.0) Low Altitude Uighurs[11]. Mean upper limb length (76.64±7.39) was higher than that reported in India (72.50±4.12) [11]. Mean elbow breadth in the present study (8.02±1.35) was higher than those obtained in the Turko-Mongolic population; 71mm (7.1cm) mean elbow breadth for all CAHAP, 70mm (7.0cm) High Altitude Kirghizs, 71mm (7.1cm) Mid Altitude Kazakhs, 71mm (7.1cm) Low Altitude Kirghizs and 71mm (7.1cm) Low Altitude Uighurs[11]. Mean wrist breadth (5.98±0.87) was higher than that of Turks (4.98±2.84)[12]). Mean bi-iliac breadth (28.10±2.12) was higher than that of the Turks (28.92±25.94)[10]. When compared to those of other populations, mean knee height (49.44±3.57) was higher than that of the Kori (42.42±4.25)[13] and lower than that reported for Caucasian Australians (51.1± 3.6)[14]. Mean foot length (26.24±1.39) was higher than that reported for a northern Indian population (20.22±1.90) (Singh et al., 2012) and the Kori population (25.26±1.2)[13]. Across age and BMI groups, much significant impact was not observed on some of the linear body parameters.

CONCLUSION

The study demonstrated racial variation. The normative values could find use in forensics. One major limitation of this study is that females were not included which did not allow for comparison to ascertain sexual dimorphism. It is therefore recommended that further studies be carried out among women on this subject.

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