Original Article

Some Anthropometric and Sociodemographic Parameters of School Age Respondents (10-20) Years in Garun Mallam, Kano State, Nigeria

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ABSTRACT

Background: Anthropometric characteristics vary from one ethnic group to another. The study was carried out to assess the anthropometric and sociodemographic characteristics of School-aged children and adolescents (10-20 years of age) in Garun Mallam Local Government Area, Kano State. **Methodology:** Four hundred subjects made up of 299 males and 101 females were recruited for this research. The anthropometric variables measured were height, weight, body mass index, head and neck circumferences, hand length, hand breadth, foot length, and foot breadth as well as some sociodemographic characteristics. All measurements were taken according to standard protocols. One-way Analysis of variance was used for the comparison of the parametric data among the four groups of independent categories and the Kruskal Wallis test was used for non-parametric data among two groups of independent categories. Pearson correlation was used to test for the correlation of all the measured anthropometry parameters. Data were analyzed using SPSS Version 17 and P<0.05. **Results:** Sexual dimorphism in the anthropometric variables such as height, weight, hand anthropometry, and foot anthropometry. There was no significant difference observed between the Igbos and Yoruba in both sexes (p>0.05). Hausas were relatively shorter in both sexes and all the measured anthropometry parameters had a strong positive correlation with each other. **Conclusion:** The study has documented some of the anthropometric parameters of School children and sociodemographic characteristics of the parents of children and adolescents of Garun Mallam Local Government of Kano State which can serve as baseline data.

Keywords: *Adolescence, Anthropometry, Children, Garun Mallam, Parameters*

Introduction

Anthropometric data for children reflect general health status, dietary adequacy, growth, and development over time.[1] Anthropometry is a necessary tool in developing standardized apparel sizing and a key component of nutritional status assessment in children as well as reflecting the general health status, dietary adequacy, growth, and development over time.[2] In adults, body measurement data are used to evaluate health and dietary status, disease risk, and body composition changes that occur over the adult lifespan.[1] Today, anthropometry plays an important role in industrial design, clothing design, ergonomics, and architecture where statistical data about the distribution of body dimensions in the population are used to optimize products. Changes in lifestyles, nutrition, and ethnic composition of populations lead to changes in the distribution of body dimensions (e.g. the rise in obesity) and require regular updating of anthropometric data collections.[3] Being overweight and obese are important public health problems because of their magnitude and impact on health. In 2012, the prevalence of overweight and obesity in

Mexican school children 5-11 years old was 34.4% (19.8% and 14.6%, respectively), and, in adolescents 12-19 years old, it was 34.9%.[4] In school children, this value was slightly higher (34.8%) in 2006, whereas in adolescents, it was lower (33.2%).[5] The term "Sociodemographic" refers to a group defined by its sociological and demographic characteristics.[6] Sociodemographic groups are used for analyses in the social sciences as well as for marketing and medical studies.[6] Demographic characteristics can refer to age, sex, place of residence, religion, educational level, and marital status.[6] Sociological characteristics are more objective traits, such as membership in organizations, household status, interests, values, and social groups.[7]

This present study was carried out to assess the relationship between anthropometric parameters and socio-demographic characteristics of School age respondents (10-20) years in Garun Mallam Local Government Area, Kano State.

Materials and method
Study location:
The study was conducted in Government **S**econdary **S**chool, Garun Mallam, Kano State. Garun Mallam is a Local Government Area in Kano State, Nigeria. Its headquarters are in the town of Garun Mallam on the A2 highway. It has an area of 214 km² and a population of 116,494 at the 2006 census. The postal code of the area is 711. Its coordinates are 11°41′N8°22′E.

Sampling:
The subjects were obtained through random selection and students from different classes were used as a sample of the research. 400 samples were obtained out of which 299 were males and 101 were female subjects, adopting the sample size determination of Usman, U. [10]. The consent of the school authority and the subjects was obtained before the commencement of the research work.

Inclusion criteria include:
  i. Only students of Government Secondary School, Garun Mallam
  ii. Only students between 10-20 years of age
  iii. Students with no physical deformities

Anthropometry Parameters: Body weight and height was measured simultaneously to the nearest 0.1kg and nearest cm respectively according to standard protocols of the WHO of 1995.

Neck circumference was measured at the seventh cervical margin below the laryngeal prominence (Adam's apple) and the head circumference was measured at the level of the maximum distance between the glabella and the back of the head in the midsagittal plane with a measuring tape to the nearest cm. The hand length was measured as a straight distance between the distal crease of the wrist joint and the most anterior projecting point (of the middle finger), and hand breadth was measured as a straight distance from the most laterally placed point on the hand of the 2nd metacarpal to the most medially placed point located on the hand of the 5th metacarpal, foot length was also measured as a direct distance from the most prominent point of the back of the heel to the tip of hallux or the tip of the longest toe and foot breadth was measured at the level of the metatarsophalangeal joint using digital vernier caliper to the nearest cm. Body Mass Index (BMI) was calculated from the Weight in kilogram and height in meters as BMI=Weight (kg)/Height (m)^2 for each subject.

Sociodemographic Characteristics: Data on the sociodemographic pattern was obtained using an administered questionnaire that was distributed and filled by the students. The information contained in the questionnaire included parents' ethnic group, educational level of the parents as well as their occupational status of the parents. The information from the students included, age in years, date of birth, sex, and some measurements were done on the students which included, weight, height, head and neck circumferences, hand and foot length, and hand and foot breadth.

Data analysis: Anthropometry data obtained were expressed as Mean ± S.D and sociodemographic characteristics were categorized and analyzed using Statistical Package for Social Sciences (SPSS) Version 17. Shapiro-Wilk's test for normality was conducted One-way Analysis of variance (ANOVA) was used for the comparison of parametric data among the four groups of independent categories and the Kruskal Wallis test was used for non-parametric data among two groups of independent categories. Pearson correlation was used to test for the correlation of all the measured anthropometry parameters.

Table 1: Descriptive Statistics of Age, Weight, Height, Body Mass Index, Head Circumference, and Neck Circumference (n = 400).

|	Mean	SD	Min.	Max
Age (Years)	15.52	2.88	10	20
Weight (kg)	41.00	11.49	19	75
Height (m)	1.54	0.12	1.29	1.84
BMI (kg)	17.00	3.03	11.24	31.50
Head Circumference (cm)	49.92	9.05	23	153.5
Neck Circumference (cm)	31.01	3.29	21.50	37.00

BMI = Body Mass Index, SD = Standard Deviation

Table 2: Descriptive Statistics of Measured Anthropometric Parameter (n = 400).

	Mean	SD	Min.	Max
Right Hand Length (cm)	7.24	2.20	11.20	22.50
Right Hand Breadth (cm)	7.68	1.06	5.00	10.20
Left Hand Length (cm)	17.10	2.23	11.00	22.90
Left Hand Breadth (cm)	7.54	1.08	5.00	10.20
Right Foot Length (cm)	21.89	3.26	15.0	28.10
Right Foot Breadth (cm)	8.09	1.05	5.40	10.30
Left Foot Length (cm)	21.78	3.31	14.70	28.50
Left Foot Breadth (cm)	7.96	1.05	5.10	10.40

Table 3: Frequency distribution of Ethnicity.

Ethnicity	Frequency	Percentage (%)
Hausa	319	79.8
Yoruba	15	3.8
Igbo	4	1.0
Others	62	15.5
Total	**400**	**100**
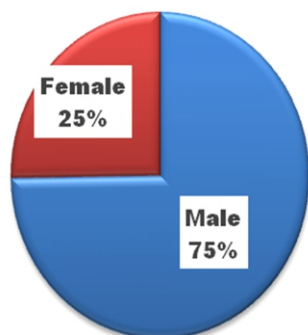
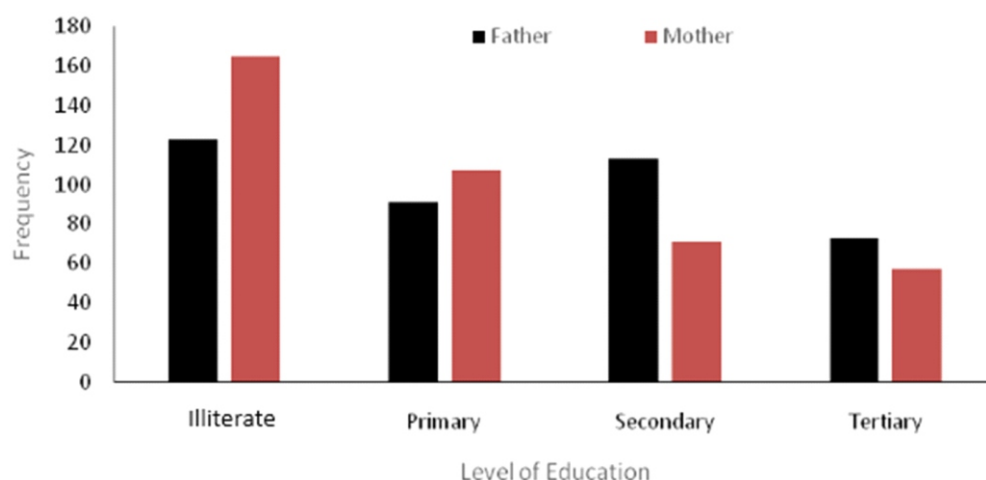**Figure 1:** Frequency Distribution of Sex

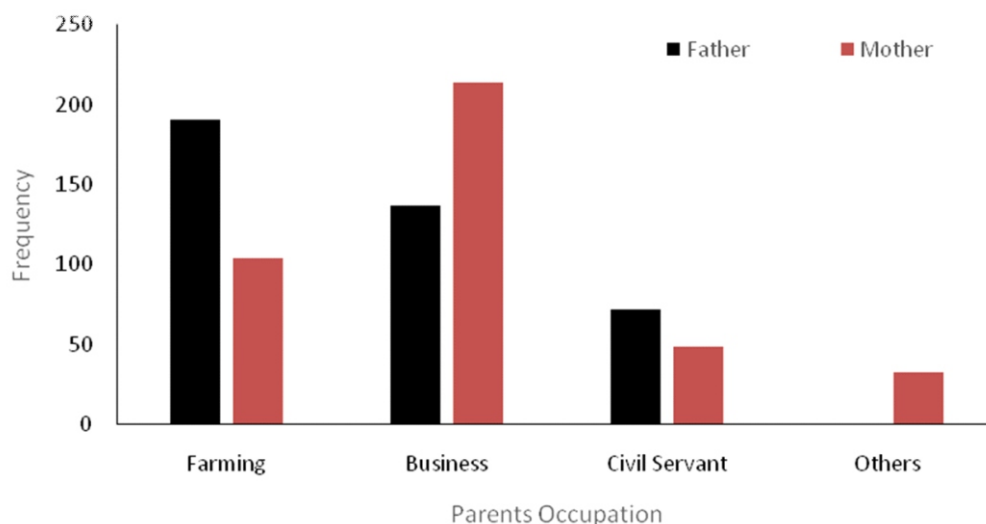**Figure 2:** Frequency Distribution of Parents level of education.

Figure 3: Frequency Distribution of Parental Occupation.

Figure 3 showed that the majority of the fathers' occupation is farming while the majority of the mothers' occupation is business.

Table 4: ANOVA table of age, height, weight, head circumference and neck circumference in male subjects express as Mean ± SD.

	Hausa (*n* = 239)	Yoruba (*n* = 6)	Igbo (*n* = 2)	Others (*n* = 52)	*F*	*P*
Age (Years)	15.81±3.01	15.33±1.97	16.50±3.54	16.77±2.54	1.666	0.175
Weight (kg)	1.55±0.13	1.59±0.11	1.63±0.08	1.58±0.11	1.343	0.260
Height (m)	41.60±11.57	40.17±11.13	38.00±11.31	45.46±11.44	1.751	0.157
BMI (kg)	17.03±2.93	15.68±1.90	14.25±2.98	18.13±3.47	3.049	0.057
HC (cm)	49.82±7.57	52.53±2.17	54.00±4.24	51.40±6.54	1.062	0.365
NC (cm)	30.81±3.53	32.40±0.71	31.75±1.06	32.13±2.85	7.953	0.051*

HC = Head Circumference, NC = Neck Circumference * p<0.05

The neck circumference of the three ethnic groups was statistically significant while the differences in the other variables were not.

Table 5: ANOVA table of Right-Hand Length, Right-hand breadth, left-hand length, left-hand breadth, Right foot length, Right foot breadth, left foot length, and Left foot breadth in male subjects expressed as Mean ± SD

	Hausa (*n* = 239)	**Yoruba** (*n* = 6)	**Igbo** (*n* = 2)	**Others** (*n* = 52)	*F*	*P*
Right HL(cm)	17.30±2.27	18.03±1.60	16.90±0.14	17.86±1.94	1.129	0.333
Right HB(cm)	7.69±1.10	7.42±0.69	7.45±0.78	7.99±1.04	1.353	0.257
Left HL(cm)	17.18±2.31	17.82±1.55	17.25±0.64	17.71±1.97	0.923	0.430
Left HB(cm)	7.57±1.11	7.38±0.92	7.30±0.99	7.84±1.10	0.995	0.422
Right FL(cm)	22.03±3.41	23.70±1.49	23.35±0.92	22.59±2.89	2.496	0.069
Right FB(cm)	8.09±1.12	7.98±0.70	7.75±0.50	8.21±0.99	0.278	0.841
Left FL(cm)	21.95±3.48	21.92±2.37	23.25±1.06	22.53±2.89	1.069	0.377
Left FB(cm)	7.96±1.13	7.77±0.52	7.95±0.92	8.14±0.97	0.486	0.693

HL = Hand Length, HB = Hand Breath, FL = Foot Length, FB = Foot Breath.

The differences in the anthropometric variables between the three ethnic groups were not statistically significant at p>0.05

Table 6: ANOVA table of age, height, weight, head circumference and neck circumference in female subjects express as Mean ± SD.

	Hausa (*n* = 239)	**Yoruba** (*n* = 6)	**Igbo** (*n* = 2)	**Others** (*n* = 52)	*F*	*P*
Age(years)	14.13±2.37	14.22±0.67	13.50±1.41	14.60±2.55	0.371	0.775
Height(m)	1.49±0.11	1.51±0.03	1.52±0.05	1.50±0.10	0.304	0.822
Weight(kg)	36.90±10.83	37.11±2.89	35.50±4.95	42.20±11.95	1.400	0.284
BMI	16.22±3.0	16.21±0.92	15.40±1.13	18.26±3.39	2.777	0.078
HC (cm)	48.92±14.18	51.22±2.54	49.50±4.24	49.17±8.05	0.058	0.968
NC (cm)	30.56±3.01	31.83±1.62	31.00±2.83	31.65±2.74	1.135	0.415

BMI = Body Mass Index, HC = Head Circumference, NC = Neck Circumference

The result in table 6 above showed the existence of differences in the anthropometric variables between the three ethnic groups which are not statistically significant at p>0.05

Table 7: ANOVA table of Right-Hand Length, Right-hand breadth, left-hand length, left-hand breadth, Right foot length, Right foot breadth, left foot length and Left foot breadth in female subjects expressed as Mean ± SD.

	Hausa (*n* = 239)	**Yoruba** (*n* = 6)	**Igbo** (*n* = 2)	**Others** (*n* = 52)	*F*	*P*
Right HL(cm)	16.58±2.16	17.41±0.92	16.60±1.56	17.26±2.47	0.909	0.470
Right HB(cm)	7.46±1.00	7.87±0.64	7.15±1.06	7.77±1.12	0.811	0.534
Left HL(cm)	16.43±2.18	17.24±0.93	16.40±1.56	17.07±2.46	0.869	0.488
Left HB(cm)	7.29±1.02	7.70±0.71	6.95±1.20	7.58±1.12	0.734	0.534
Right FL(cm)	20.83±3.13	22.08±1.20	20.85±1.34	22.15±3.31	1.695	0.204
Right FB(cm)	8.03±0.92	8.24±0.66	7.60±1.00	8.24±1.14	0.440	0.725
Left FL(cm)	20.69±3.14	21.98±1.24	20.70±1.41	22.00±3.31	1.718	0.631
Left FB(cm)	7.85±0.93	7.97±0.68	7.20±0.98	8.09±1.14	0.577	0.693

HL = Hand Length. HB = Hand Breath, FL = Foot Length. FB = Foot Breath

The differences in the anthropometric variables between the three ethnic groups were not statistically significant at p>0.05

Table 8: Kruskal - Wallis Test of Father's Level of education with BMI and Neck circumference

	Illiterate	Primary	Secondary	Tertiary	*F*	*P*
	Father's level of education					
BMI	181.49	219.29	199.07	211.32	6.386	0.094
Neck Circumference	174.09	21.3.73	201.53	226.92	11.460	0.009

BMI = Body Mass Index

Table 9: Kruskal - Wallis Test of Mother's Level of education with BMI and Neck Circumference

	Illiterate	Primary	Secondary	Tertiary	*F*	*P*
	Mother's level of education					
BMI	187.74	204.21	225.87	198.87	5.551	0.136
Neck Circumference	182.31	205.09	222.32	217.36	8.013	0.046

BMI = Body Mass Index

Table 10: Relationship between Age and Some Anthropometric Parameters of the Study Population

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Age	1												
2.Height	0.903**	1											
3.Weight	0.884**	0.859**	1										
4.BMI	0.697**	0.851**	0.886*	1									
5.HC	0.692**	0.703**	0.633**	0.501**	1								
6.NC	0.839**	0.852**	0.824**	0.657**	0.715**	1							
7.RHL	0.879**	0.910**	0.853**	0.674**	0.748**	0.873**	1						
8.RHB	0.831**	0.837**	0.821**	0.673**	0.703**	0.812**	0.902**	1					
9.LHL	0.885**	0.911**	0.851**	0.670**	0.745**	0.865**	0.993**	0.896**	1				
10.LHB	0.838**	0.831**	0.829**	0.685**	0.691**	0.807**	0.902**	0.980**	0.899**	1			
11.RFL	0.821**	0.863**	0.773**	0.590**	0.737**	0.828**	0.900**	0.835**	0.897**	0.819**	1		
12.RFB	0.765**	0.765**	0.748**	0.628**	0.667**	0.768**	0.841**	0.877**	0.831**	0.876**	0.797**	1	
13.LFL	0.822**	0.854**	0.770**	0.594**	0.732**	0.827**	0.889**	0.837**	0.887**	0.816**	0.984**	0.791**	1
14.LFB	0.795**	0.789**	0.781**	0.650**	0.670**	0.779**	0.856**	0.891**	0.850**	0.889**	0.801**	0.965**	0.803**

BMI = Body Mass Index, HC = Head Circumference, NC = Neck Circumference, RHL = Right Hand Length, RHB = Right Hand Breadth, LHL = Left Hand Length, LHB = Left Hand Breadth, RFL = Right Foot Length, RFB = Right Foot Breadth, LFL = Left Foot Length, LFB = Left Foot Breadth.   The anthropometric variables were strongly correlated to one another.

Discussion

Body mass index was categorized as normal, underweight, overweight, and obese using the world health organization cut-off[8] classification. The study indicated the difference in body mass index of males and females not to be statistically significant, which is not per the work of Ajayi *et al.*[9] in which they found that males and females had a significant difference in BMI in which the male had higher values.

Based on the present study, there was sexual dimorphism in anthropometric variables such as weight, height, BMI, head and neck circumferences, hand length, hand breadth, foot length, and foot breadth. This is in agreement with the work of Usman.[10] The study also indicated that male subjects had higher hand anthropometric variables than females which is in line with the work of Yunis.[11]

Age shows a correlation with height. A healthy child should grow normally, however some children grow taller than their age and this is in agreement with the work of Judith and Lori.[12] This could be genetic or eating behavior. The results also show that subjects whose parents have a higher level of education have higher anthropometric variables compared to those whose parents have a low level of education. This indicates that subjects whose fathers have a higher level of education have a better nutritional status, which may be likely due to their high income and provision of family needs as seen in tables 8 and 9.[13]

In comparison between the three ethnic groups concerning stature, hand and foot dimensions, there is no significant difference observed between the Igbos and Yorubas in both sexes, which agreed to the report of Ajayi *et al.*[9] in which they discovered that there was no statistical difference in the BMI of the Yoruba and Igbo ethnic groups. However, the result of this study indicated that the Hausa ethnic group was observed to be relatively shorter in both sexes. This is contrary to the findings of Numan *et al.*[14] which showed that the Yoruba ethnic group are significantly shorter and has significantly shorter hands than the Hausas and Igbos.

Conclusion

In conclusion, the study has documented some anthropometric parameters of school children and sociodemographic characteristics of the parents of children as well as the adolescents of Garun Mallam Local Government of Kano State, Nigeria which can be used as baseline data. The result of this study can also be very useful to anatomists and forensic anthropologists.

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